ASSOCIATION OF MANITOBA MUNICIPALITIES
MANITOBA MUNICIPAL ENERGY, WATER AND WASTE
WATER EFFICIENCY PROJECT
MUNICIPALITY OF MANITOU
FINAL REPORT
JUNE 2006

KGS GROUP

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

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June 2, 2006

File No. 05-1285-01-1000.6

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 Studies for Manitou– Final Report

Dear Mr. Tyler MacAfee:

Enclosed is the Final Report of the Manitoba Municipal Energy, Water and Wastewater Efficiency Study for the Town of Manitou with all comments incorporated.

Included with this submission are 10 hard copies of the report (3 in color, 7 in black and white) 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,

Meghan Kuypt

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

RBB/jl

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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 Manitou to reduce operating costs, conserve resources, and reduce greenhouse gas emissions.

An energy and water audit was conducted on eleven buildings in the Municipality of Manitou. 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 Municipality'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 plant equipment.
- Water – Replacing high flow water fixtures with water efficient fixtures.

Table E1 shows the energy consumption for each of the buildings from September 2004 to September 2005. This year was chosen as it represents the base year for energy and water consumption. This year was selected since the conditions of the buildings throughout this time most closely resemble the buildings' current conditions. All eleven buildings included in the energy and water audit use electricity. In addition, three of the buildings, the Arena, Fire Hall and Municipal Garage and the Outdoor Swimming Pool also use propane. Based on their annual bills, propane consumption in litres for the Arena and the Fire Hall and Municipal Garage was determined. 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 building types in Manitou. The pie chart displays the percentage of total energy density for each of the buildings. It ranges from a high of 39.7% for the Sewage Lift Station to a low of 0.7% for the Heritage Building, which is only used in the summer.

Tables E2 (a) and (b) show overall energy and water saving opportunities for all eleven buildings in the Town of Manitou. These tables 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 eleven buildings is 278,966 kWh, or 37% of the current total energy consumption.

There were three main issues that were noted during the course of this study that limited the potential for additional energy savings:

- Some buildings are infrequently used (e.g. Library, Fire Hall, Campground Change Room, Heritage Building).
- Some of the buildings have little or no ventilation (e.g. Manitou Opera House).
- Some of the buildings are unheated (e.g. Heritage Building, Library and Campground Change Room).

Water saving opportunities are shown in Table E2 (b) and are displayed as percent water savings, water savings in litres/year, and cost savings. Percentages shown in the table indicate the percent water savings that would result from replacing the existing water fixtures in all 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 from the water treatment plant was calculated to be $0.613 per cubic metre.

The results and recommendations from the water and wastewater audit are shown in Chapter 14 of this report. From the water system audit, it was determined that Manitou's water treatment plant produced a total of 127,959 m^3 of water from January 2004 to September 2005. The total amount of water sold by the Town was 112,925 $m^{3.}$ Of the remaining amount, 14,573 m^3 is unaccounted for water loss, 11.4% of the total water produced. Reduction in water losses would reduce chemical costs required for water treatment, reduce electrical energy consumed by the pumps and extend the longevity of the system.

Manitou's sewer collection system is strictly a sanitary sewage system. Surface water runoff is kept out of the system through a system of culverts and ditches. This limits the amount of infiltration and inflow into the sewage system, saving the Town on costs associated with pumping, treatment and storage of wastewater. In older parts of the Town, some weeping tiles and sump pumps are connected to the sanitary sewage system. Measures such as sealing manholes and lining pipes could potentially help the Town to decrease infiltration and inflows to the sewer system. In addition, it is recommended that the Town conduct a study to determine feasible alternatives to deal with extraneous water sources.

In addition to energy, water, and cost savings, other benefits have been identified:

- 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 August 2004 – August 2005

Site	Energy Density (kWh/m^2)	Area (m^2)	Electricity		Propane		TOTAL ENERGY	
			kWh	Cost ($)	kWh	Cost ($)	kWh	Cost ($)
Arena	132	2,453	282,960	$22,672	39,760	$3,399	322,720	$26,071
Opera House	247	260	64,200	$4,438	0	$0	64,200	$4,438
Campground Changeroom	276	23	6,410	$446	0	$0	6,410	$446
Child Care Centre	386	111	43,070	$3,113	0	$0	43,070	$3,113
Fire Hall & Municipal Garage	292	279	19,550	$1,531	61,759	$5,295	81,309	$6,826
Heritage Building	20	46	920	$278	0	$0	920	$278
Library	159	148	23,590	$1,801	0	$0	23,590	$1,801
Sewage Lift Station	1,173	23	27,246	$1,917	0	$0	27,246	$1,917
Municipal Admin Building & Recycling Depot	157	232	36,531	$2,683	0	$0	36,531	$2,683
Swimming Pool Outdoors	113	415	18,453	$1,449	28,594	$2,455	47,047	$3,904
Water Treatment Plant	670	144	96,716	$6,762	0	$0	96,716	$6,762
Totals	3,625	4,135	619,646	$47,091	130,113	$11,149	749,759	$58,240

Percentage of Total Energy Density for Buildings in Manitou

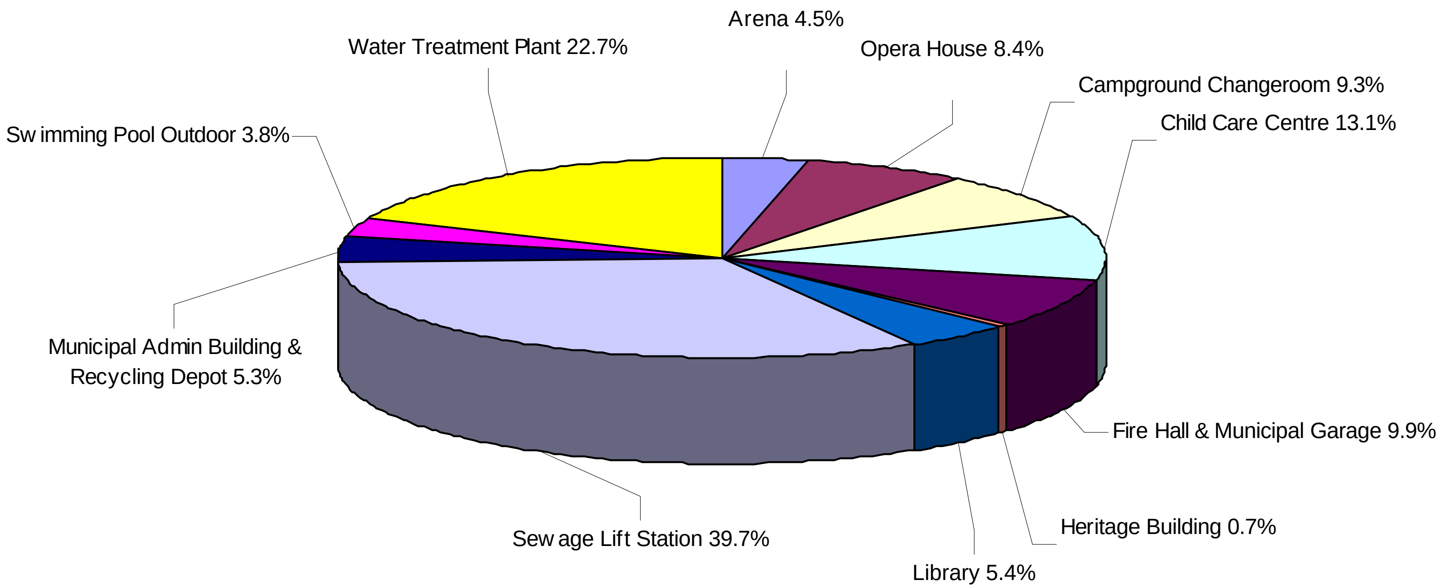

Table E2 (a): Summary of Energy Saving Opportunities for all 11 Buildings in Manitou

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 EXIT incandescent lamps with LED modules.	6	$50	$5	$80	$889	$581	1,419	$85	10.4	6.8	Arena
Retrofit 4' x1 T12 fluorescents with T8 ballast and tubes.	1	$55	$35	$60	$131	$108	67	$4	32.6	27.0	Childcare Centre
Retrofit 4' x2 T12 fluorescents with T8 ballast and tubes.	136	$55	$35	$60	$17,830	$14,729	7,862	$472	37.8	31.2	Arena, Manitou Opera House, Childcare Centre, Fire Hall & Municipal Garage, Municipal Admin Building & Recycling Depot and Water Treatment Plant.
Retrofit 8' x2 T12 fluorescents with T8 ballast and tubes.	52	$75	$40	$75	$8,892	$6,817	3,016	$181	49.1	37.6	Arena, Fire Hall & Municipal Garage and Swimming Pool Outdoors.
Replace exterior incandescents with high-pressure sodium lamps with photocell.	4	$155	$118	$195	$1,596	$1,427	3,942	$237	6.7	6.0	Arena
Replace exterior incandescents with high-pressure sodium incandescents.	14	$125	$100	$125	$3,990	$3,591	6,088	$366	10.9	9.8	Manitou Opera House, Library, Municipal Admin Building & Recycling Depot and Water Treatment Plant.
Replace interior incandescents/flood lights with compact fluorescents.	108	$15	$10	$13	$3,447	$2,832	13,797	$828	4.2	3.4	Arena, Manitou Opera House, Childcare Centre, Fire Hall & Municipal Garage, Heritage Building, Library, Sewage Lift Station and Water Treatment Plant.

Table E2 (a): Summary of Energy Saving Opportunities for all 11 Buildings in Manitou **Page 2 of 6**

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 indoor incandescent lights/flood lights with high pressure sodium lamps	9	$125	$100	$125	$2,565	$2,309	1,312	$79	32.6	29.3	Municipal Admin Building & Recycling Depot
Install occupancy sensor.	1	$55	$55	$35	$103	$103	848	$51	2.0	2.0	Swimming Pool Outdoors.
Install parking lot controller.	8	$100	$75	$15	$1,049	$821	1,056	$63	16.5	12.9	Childcare Centre and Municipal Admin Building & Recycling Depot and Water Treatment Plant.
Lighting Subtotal					**$40,492**	**$33,318**	**39,408**	**$2,366**			
ENVELOPE											
Add weather stripping & caulking to all existing doors - 3'x7' size.	20	$15	$15	$50	$1,482	$1,482	13,070	$850	1.7	1.7	Arena, Childcare Centre, Fire Hall & Municipal Garage, Library, Municipal Admin Building & Recycling Depot and Water Treatment Plant.
Replace & weather strip doors.	2	$350	$350	$100	$1,026	$1,026	5,176	$394	2.6	2.6	Childcare Centre and Fire Hall & Municipal Garage.
Replace & add weather strip to heritage style doors.	5	$525	$525	$100	$3,563	$3,563	9,786	$588	6.1	6.1	Manitou Opera House.
Replace unused glass door with a wall panel.	1	$250	$250	$250	$570	$570	546	$33	17.4	17.4	Library.

Table E2 (a): Summary of Energy Saving Opportunities for all 11 Buildings in Manitou

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											
Seal & caulk windows.	17	$5	$5	$25	$581	$581	3,039	$397	1.5	1.5	Childcare Centre, Library and Municipal Admin Building & Recycling Depot and Sewage Lift Station.
Replace windows & seal. [1]	56	$696	$668	$100	$50,817	$49,029	33,249	$2,068	24.6	23.7	Arena, Manitou Opera House, Childcare Centre, Fire Hall & Municipal Garage and Sewage Lift Station.
Add weather stripping & caulking to existing vehicle door. Repair crack in concrete.	1	$530	$530	$100	$718	$718	6,562	$564	1.3	1.3	Fire Hall & Municipal Garage (Fire Hall portion).
Add new weather stripping & caulking to vehicle door.	1	$30	$30	$100	$148	$148	2,650	$228	0.7	0.7	Fire Hall & Municipal Garage (Municipal Garage portion).
Upgrade roof insulation.[2]	4	$1,250	$1,184	$397	$7,512	$7,209	7,386	$443	16.9	16.3	Childcare Centre, Municipal Admin Building & Recycling Depot, Swimming Pool Outdoors and Water Treatment Plant.
Upgrade wall insulation. [2]	1	$3,840	$3,546	$3,840	$8,755	$8,420	3,716	$223	39.2	37.7	Library.
Envelope Subtotal					**$75,172**	**$72,746**	**85,180**	**$5,788**			

Table E2 (a): Summary of Energy Saving Opportunities for all 11 Buildings in Manitou

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*	
HVAC											
Install programmable thermostat; Setback temp to 15°C (59°F)	21	$300	$300	$300	$14,364	$14,364	52,750	$3,458	4.2	4.2	Arena, Manitou Opera House, Childcare Centre, Fire Hall & Municipal Garage, Library, Municipal Admin Building & Recycling Depot, Swimming Pool Outdoors, Sewage Lift Station and Water Treatment Plant.
Replace air conditioner with a high efficiency unit.	1	$3,500	$2,780	$0	$3,990	$3,169	6,947	$417	9.6	7.6	Library.
Upgrade boiler to a high efficiency boiler	1	$7,200	$7,200	$2,000	$10,488	$10,488	13,121	$1,128	9.3	9.3	Arena
Replace radiant heater with high efficiency furnace	2	$3,200	$3,200	$1,000	$9,576	$9,576	17,416	$1,498	6.4	6.4	Fire Hall & Municipal Garage
Install timer on HRV.	1	$323	$323	$100	$482	$482	2,707	$163	3.0	3.0	Municipal Admin Building & Recycling Depot.
HVAC Subtotal					**$38,900**	**$38,079**	**92,942**	**$6,664**			
HOT WATER											
Install water efficient metering faucets.	16	$309	$309	$150	$8,367	$8,367	13,414	$805	10.4	10.4	Arena, Manitou Opera House, Campground Change room, Childcare Centre and Fire Hall & Municipal Garage.
Install water efficient showerheads.	11	$21	$21	$50	$890	$890	4,008	$241	3.7	3.7	Arena, Campground Changeroom and Water Treatment Plant.

Table E2 (a): Summary of Energy Saving Opportunities for all 11 Buildings in Manitou

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*	
HOT WATER											
Replace water heater with instantaneous water heater.	8	$300	$300	$900	$10,944	$10,944	8,165	$490	22.3	22.3	Campground Changeroom, Childcare Centre, Fire Hall & Municipal Garage, Library, Municipal Admin Building & Recycling Depot, Sewage Lift Station and Water Treatment Plant.
Insulate piping for hot water heater tank. [3]	3	$167	$167	$167	$1,140	$1,140	4,771	$286	4.0	4.0	Arena, Manitou Opera House and Municipal Admin Building & Recycling Depot.
Replace water storage tank with insulated tank.	1	$2,800	$2,400	$1,000	$4,332	$3,876	1,229	$66	65.9	59.0	Arena.
Install temperature stats for the water heater tanks. Setback temperature to 32C (90F).	2	$300	$300	$300	$1,368	$1,368	1,504	$90	15.2	15.2	Arena.
Water Subtotal					**$27,041**	**$26,585**	**33,091**	**$1,979**			
MOTORS											
When replacing motors, replace with a high efficiency motor. [4]	12	$329	$329	$0	$4,501	$4,501	2,801	$168	26.8	26.8	Sewage Lift Station, Municipal Admin Building & Recycling Depot, Swimming Pool Outdoors and Water Treatment Plant.
Motors Subtotal					**$4,501**	**$4,501**	**2,801**	**$168**			

Table E2 (a): Summary of Energy Saving Opportunities for all 11 Buildings in Manitou

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*	
OPERATIONAL											
Driving zamboni ice outside rather then heating it inside in the pit.	N/A	$0	$0	$0	$0	$0	25,545	$2,197	0	0	Arena
Operational Subtotal					**$0**	**$0**	**25,545**	**$2,197**			

TOTALS	**Energy (kWh)**	**Cost ($)**	**CO_2 (Tonnes)**
Existing Annual Consumption/Cost/Emissions	749,759	$58,240	47.9
Estimated Annual Savings	278,966	$19,162	25.0
Percent Savings	37%	33%	52%

* NI = Cost does not include incentives, WI = Cost includes incentives
** The total cost column includes 14% taxes.
*** The cost assigned to electricity is 0.06004 $/kWh (rate taken from Manitoba Hydro's website) as of April 2005 and the propane costs are market value dependent. Average cost of propane is $0.535/L.
**** This is the overall payback period and may vary for individual buildings (refer to tables throughout report for payback years for a specific building).
[1] Average capital unit cost and installation costs were used for window upgrades.
[2] Average capital cost and installation costs were used for roof and wall insulation upgrades.
[3] Average capital and installation costs were used for insulating piping on hot water tanks.
[4] Average capital costs were used for upgrading motors.

Table E2 (b): Summary of Water Saving Opportunities for all 11 Buildings in Manitou

Description	Qty	Installed Cost/Unit ($)		Total Cost* ($)	Annual Water Savings (%)	Annual Water Savings (L)	Annual Water Savings ($)	Related Buildings
		Material	Labour					
Install water efficient metering faucets.	19	$309	$150	$9,942	80%	364,847	$224	Arena, Manitou Opera House, Campground Changeroom, Child-care Centre, Fire Hall & Municipal Garage, Library, Sewage Lift Station and Water Treatment Plant.
Install water efficient toilets.	20	$284	$150	$9,895	55%	1,992,230	$1,221	Arena, Manitou Opera House, Campground Changeroom, Child-care Centre, Fire Hall & Municipal Garage, Library, Municipal Admin Building & Recycling Depot and Water Treatment Plant.
Install water efficient urinals	2	$344	$200	$1,240	29%	285,000	$175	Manitou Opera House.
Install water efficient showers	11	$21	$50	$890	29%	106,963	$66	Arena, Campground Changeroom and Water Treatment Plant.

* The total cost column includes 14% taxes.

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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

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Sustainable Development Innovations Fund

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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:

- Angie Klassen, Chief Administrative Officer (Municipal Admin Building).
- Harry Hiebert (Arena)
- Larry Thompson (Arena)
- Al Thorieifson (Manitou Opera House)
- Jake Goertzen (Heritage Building)
- Garry Christoff (Fire Hall and Sewage Lift Station)
- Travis Long (Heritage Building and Outdoor Swimming Pool)
- Kathy Furniss (Municipal Admin. Building)
- Wilf Clayton (Recycling Depot)
- Bob Barrett (Water Treatment Plant)

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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 eleven buildings in the Town of Manitou to determine how these buildings could reduce both energy and water consumption. 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 Manitou to reduce operating costs, conserve resources, and reduce greenhouse gas emissions. All eleven buildings in the Town of Manitou were analyzed and the results are presented in separate sections throughout this report. The water and wastewater systems are discussed in Section 16.

1.3 METHODOLOGY

The buildings were toured on January 11 and 12, 2006 by Mr. Ray Bodnar, and October 25,2005 by Mr. Tibor Takach, both of KGS Group Engineering Consultants. These tours 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 the Town of Manitou's Chief Administrative Officer Angie Klassen 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 a new LEEDS building, the Pembina Wellness Centre, was an upcoming future project. An energy efficient structure, this building will employ a number of "green" options including, but not limited to the following:

- High R-values in roof and walls;
- Straw bale construction to maximize insulation of the building;
- Radiant heating coils in floor slab;
- South facing glazing to maximize daylight;
- Connect existing ground source heat pump for heating and cooling supply;
- Maximize shading on south entrance to prevent summer heat gain;
- Thermal chimney for exhausting heat;
- Passive cooling system;
- Displacement ventilation system;
- Low flush water conserving fixtures;
- Rainwater storage for domestic water use;
- Occupancy/Daylight sensors for lighting;
- Carbon Dioxide sensors trigger fresh air supply.

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 material cost estimates are preliminary. For complex measures such as 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 carbon dioxide, CO_2 emissions. Carbon dioxide is a greenhouse gas and thus contributes to global warming. Although over 95% of Manitoba's electricity is produced by hydropower, which emits very little CO_2, some of the electrical generating stations in Canada and the United States burn fossil fuels and emit large quantities of CO_2 into the atmosphere. By reducing the electrical energy consumption here in Manitoba, more of Manitoba Hydro's clean hydropower is available for offsetting the fossil-fuelled electrical generating stations. 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 three 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 are 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 sinks, toilets, urinals, and showers. The buildings are all metered off the Town's supply. Savings are shown as percentages of the current fixtures water consumption, water savings in litres/year and cost savings.

The water and wastewater systems in the Town of Manitou were analyzed and 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 ARENA

2.1 BACKGROUND

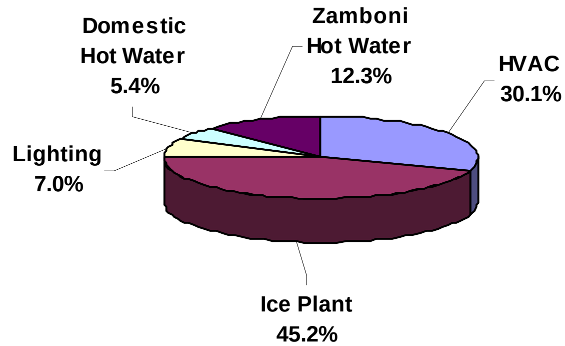
Constructed around 1972, the Manitou Arena is a 26,400 square foot building that contains a rink, a lobby and change room area. The rink area is un-insulated; and the lobby has 6" of insulation in the walls. The change rooms were renovated in 2003, a new zamboni room was added in 2000 and geothermal heating/cooling was installed in 1997. The geothermal system consists of one two-stage 15-ton heat pump used for ice making and three 5-ton heat pumps used for heating and cooling the arena. One 1.5 hP ground loop pump feed the heat pumps in the outdoor pool, which is next door to this facility. This building is occupied from the middle of November until the end of March.

Photo 1 - Arena

In the previous year, the Arena used 282,960 kWh of electricity and 39,760 kWh of propane. This amounted to a cost of $22.672 for electric energy and $3,399 for propane.

Table B.1.2 in Appendix A shows the monthly consumption of electric energy and propane from September 2004 until August 2005. As shown in the following pie chart, the largest portion of energy is consumed by the ice plant heat pump to generate ice for the facility.

Energy Breakdown (% of Total kWh) for the Arena



The hot water used to flood the rink is heated with a propane boiler. The pie chart above contains the domestic hot water consumption by electric energy and the zamboni hot water heating by propane energy. The hot water consumed by the water fixtures in the washrooms was calculated by estimating the occupancy of the building and the frequency at which these fixtures are used. From this, the total annual hot water consumption was then established.

There are six washrooms in this building, including six toilets, eight sinks, four urinals and eight showers. In addition, a large portion of the annual water consumption is used to flood the rink.

The building's water is metered from the town's water plant. Based on the current water fixtures, calculations were made to determine the percent reduction in water consumption when replacing these high flow fixtures with new water efficient fixtures.

2.2 ENERGY AND WATER SAVING OPPORTUNITIES

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

- The Arena is occupied for 48 hours a week from the middle of November until the end of March.

- The temperature of lobby area is maintained at 21°C (70°F) and the rink area is at -6°C (21°F).
- For the purpose of water consumption, the typical occupancy of the arena is taken as 60.
- The exit lamps and outdoor lights are on 24 hours per day, year round.

Table 1 Energy Saving Opportunities for the 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										
Fluorescents - Convert 4' T12s to 4' T8s (4' x2)	26	$55	$35	$60	$3,409	$2,816	806	$48	70.4	58.2
Fluorerscents - Convert 8' T12s to 8' T8s (8'x2)	24	$75	$40	$75	$4,104	$3,146	1,357	$81	50.4	38.6
Incandescents - Convert to compact fluorescents	39	$15	$10	$13	$1,245	$1,023	2,561	$154	8.1	6.7
Replace outdoor incandescent lamps with high pressure sodium lights with photocell	4	$155	$118	$195	$1,596	$1,427	3,942	$237	6.7	6.0
EXIT signs - Convert to LED modules	6	$50	$5	$80	$889	$581	1,419	$85	10.4	6.8
Lighting Subtotal					**$11,243**	**$8,993**	**10,085**	**$606**		
ENVELOPE										
Add weather strip to existing doors -all of 3'x7' size	9	$15	$15	$50	$667	$667	3,786	$227	2.9	2.9
Replace double pane window - 5' x 6' + seal all windows	11	$845	$795	$100	$11,850	$11,223	4,595	$276	43.0	40.7
Envelope Subtotal					**$12,517**	**$11,890**	**8,381**	**$503**		
HVAC										
Upgrade boiler to a high efficiency propane boiler	1	$7,200	$7,200	$2,000	$10,488	$10,488	13,121	$1,128	9.3	9.3
Setback Thermostats to 15C (59 F)	3	$300	$300	$300	$2,052	$2,052	23,621	$1,418	1.4	1.4
HVAC Subtotal					**$12,540**	**$12,540**	**36,742**	**$2,547**		
OPERATIONAL										
Driving zamboni ice outside rather then heating it inside in the pit.	N/A	$0	$0	$0	$0	$0	25,545	$2,197	0	0
Operational Subtotal							**25,545**	**$2,197**		
HOT WATER										
Install water efficient metering faucets	8	$309	$309	$150	$4,186	$4,186	1,203	$72	58.0	58.0
Install water efficient	8	$21	$21	$50	$648	$648	2,428	$146	4.4	4.4

		Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years	
showers										
		Material (NI*)	**Material (WI*)**	**Labour**	**NI***	**WI***	**kWh**	**$*** **	**NI***	**WI***
Insulate copper piping on HWT	1	$250	$250	$250	$570	$570	2,438	$146	3.9	3.9
Replace water storage tank with insulated tank.****	1	$2,800	$2,400	$1,000	$4,332	$3,876	1,229	$66	65.9	59.0
Installing temperature setback thermostats for the zamboni water heater tank.	2	$300	$300	$300	$1,368	$1,368	1,504	$90	15.2	15.2
Water Subtotal					**$11,104**	**$10,648**	**8,801**	**$520**		

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	322,720	$26,071	17.43
Estimated Annual Savings	89,554	$6,373	10.22
Percent Savings	28%	24%	59%

* NI = Cost does not include incentives, WI = Cost includes incentives
** The total cost column includes 14% taxes.
*** As of April 2005, the cost assigned to electricity is 0.06004 $/kWh (rate taken from Manitoba Hydro's website) and the average cost of propane is $0.535/L.
**** Replace one 250 gal. water storage tank with two 120 gal. Insulated storage tanks.

Table 2 Water Saving Opportunities for the Arena

Description	Qty	Installed Cost/Unit ($)		Total Cost* ($)	Annual Water Savings (%)	Annual Water Savings (L)	Annual Cost Savings ($)
		Material	Labour				
Install water efficient metering faucets.	8	$309	$150	$4,186	80%	32,102	$20
Install water efficient toilets.	6	$284	$150	$2,969	55%	82,650	$51
Install water efficient showers	8	$21	$50	$648	29%	64,792	$40
Install water efficient urinals	4	$344	$200	$2,481	45%	25,992	$16

* The total cost column includes 14% taxes.

2.3 GENERAL RECOMMENDATIONS

Lighting

The lighting analysis summary for the Arena is shown in Appendix B, Table B.1.3. The energy consumption from the exit signs can be reduced to 10% of the current consumption by replacing the incandescent bulbs with LEDs. Aside from the metal halides, the greatest consumption of energy is by the outdoor incandescent lamps. Upgrading these lamps to high-pressure sodium lamps with photocells would save over 3,900 kWh per year, with a payback of less than 7 years. Another short-term payback upgrade would be to replace the interior incandescent lights with compact fluorescent ballasts. This would save over 2,500 kWh per year, with a payback of less than 8.5 years. Replacing T12 fluorescents with T8s has significantly longer payback periods, ranging from 50 to 70 years.

Envelope

Moderate energy saving opportunities can be found by weather-stripping the doors, replacing all double pane windows and upgrading the roof insulation in the lobby. In particular, weather-stripping the existing doors has a substantial energy savings opportunity since the current heat loss through the cracks around the doorframes is over 3,700 kWh per year. Replacing the weather-stripping would reduce this heat loss with a payback period of less than three years. Upgrading the existing double pane windows that are located from the rink area to the lobby to triple pane units would save over 4,500 kWh per year. The payback for this energy savings opportunity is over 40 years; therefore it should be considered a long-term upgrade. Table B.1.4 in Appendix B shows the details for these calculations.

HVAC

Installing setbacks on the thermostats could result in substantial energy savings with a very short payback. The thermostats should be programmed such that the temperature is reduced to 15°C (59°F) when the building is unoccupied. Additionally, the thermostats should be wired into the light switches such that when the building is occupied and the lights are switched on, the thermostat would set to 21°C (70°F) during occupancy. Replacing existing thermostats with setback models would save over 23,600 kWh per year with a payback period of less than two years. Another significant ESO is to upgrade the existing propane boiler used to heat and melt the zamboni ice to a high efficiency unit. This would produce over 13,000 kWh of energy savings with a payback period of less then 9.5 years.

Water

Water savings for the Arena are shown above in Table 2. Savings are shown as annual savings in litres, in percentage and cost. Table B.1.5 in Appendix B shows the estimated water consumption results that were calculated based on a typical water fixtures and estimations of the occupancy of the Arena.

Replacing existing faucets and toilets with water efficient fixtures would result in an 80% and 55% water savings respectively. Upgrading the current showers to water efficient showers would produce a 29% water savings. In addition, replacing the water storage tank used to hold zamboni hot water with a proper insulated storage unit would save over 1,200 kWh per year. The existing tank is a homemade system that is poorly insulated with an open top. This allows heat and humidity to escape from the tank, contributing to poor efficiency and moisture damage in the room. Another energy savings opportunity with regards to hot water would be to install temperature setback thermostats on the zamboni water heater tank. The water temperature does not need to be maintained at 170ºF when the building is unoccupied and/or the rink surface is not being flooded. During these times, the water temperature could be lowered to 90ºF, saving over 1,500 kWh per year.

Operational

The ice rink is currently flooded three times each weekday and once an hour on weekends, for the duration the arena is open by the zamboni. Presently the zamboni-shaved ice is deposited in an indoor pit. A propane boiler heats the ice until it melts into water. With the number of times the ice is flooded and shaved, the pit is filled to maximum capacity twice a day. Melting it indoors has adversely affected the areas with the high humidity levels generated. By depositing the shaved ice outside a substantial amount of energy, over 25,000 kWh, would be saved. This savings has no labour or capital expense associated with it.

2.4 OPERATION AND MAINTENANCE

Based on the inspection of this facility, the following operation and maintenance activities should be performed immediately to reduce energy consumption:

- Clean filters on heat pumps.
- Provide training on geothermal heat pumps to operators/facility managers.

When the geothermal system was added in 1997, arena staff did not receive any training on its operation and maintenance. For this reason, staff are do not know its operation and maintenance procedures and hire a certified contractor for any adjustments that may be necessary to the system. The facility should employ the services of a certified contractor, preferably the one who installed the geothermal system, to train its staff. In training them, the municipality will ensure that the system is operating at maximum efficiency with staff that are educated and trained in its operation. In addition, it would enable the facility to perform any maintenance procedures themselves, saving both time and expense.

Refer to section 13 for more information.

3.0 MANITOU OPERA HOUSE

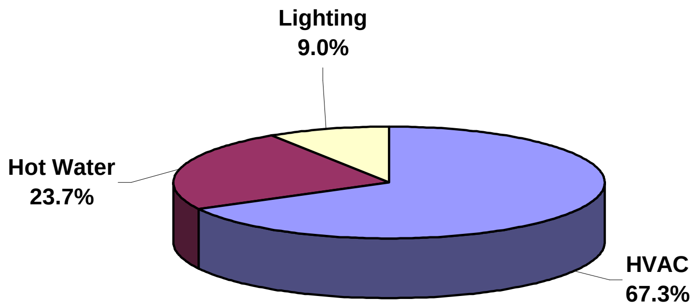
3.1 BACKGROUND

The Manitou Opera House was rebuilt in 1930 after a fire destroyed the original building. It is a 2,800 square feet heritage building. Any upgrades or renovations made to the building would need to maintain the existing heritage look, requiring both architectural and engineering input. Costs associated with materials and labour would likely be 50% higher to ensure the original architecture and aesthetics of the building is retained. Except for the east wall, insulation in the basement walls was upgraded in 1997. Other recent upgrades include installing a triple pane window in the basement and adding geothermal heat pumps in 1998. On average, the Opera House is occupied for 250 days a year, for approximately 10 hours a day.

Photo 2: Manitou Opera House

The annual electricity consumption for the hall is 64,200 kWh with a total cost of just over $4,400 for the year. The following pie chart shows the proportion of the total energy consumption used for heating pumps, hot water and lighting.

Energy Breakdown (% of Total kWh) for the Manitou Opera House



The Opera House is on the main floor of the building and the basement houses a music studio and change rooms. The building has two sinks, two urinals and three toilets. All are high flow water fixtures. The water supply is metered from the Town and estimations were made on the frequency at which the fixtures were used.

3.2 ENERGY AND WATER SAVING OPPORTUNITIES

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

- The Manitou Opera House is occupied for 2500 hours per year.
- The temperature of the hall is maintained at 21°C (70°F).
- For the purpose of water consumption, the typical occupancy of the building is 200.
- The outdoor lights are on 12 hours per day year round.

Table 3 Energy Saving Opportunities for the Manitou Opera House

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years	
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
LIGHTING										
Fluorescents - Convert 4' T12s to 4' T8s (4' x2)	14	$55	$35	$60	$1,835	$1,516	665	$40	46.0	38.0
Incandescents - Convert to compact fluorescents	22	$15	$10	$13	$702	$577	2,420	$145	4.8	4.0
Outdoor incandescents - convert to high pressure sodium lamps	3	$125	$100	$125	$855	$770	394	$24	36.1	32.5
Lighting Subtotal					**$3,393**	**$2,863**	**3,479**	**$209**		
ENVELOPE ****										
Replace and add weather strip to doors – 3' x7' size	5	$525	$525	$100	$3,563	$3,563	9,786	$588	6.1	6.1
Replace main floor double pane windows - 28" x 52"+ seal all	12	$645	$626	$100	$10,192	$9,932	6,861	$412	24.7	24.1
Replace main floor double pane windows - 28" x 94"+ seal all	14	$825	$791	$100	$14,763	$14,220	13,138	$789	18.7	18.0
Replace main floor double pane windows - 32" x 44" + seal all	2	$685	$667	$100	$1,790	$1,749	1,094	$66	27.2	26.6
Replace basement double pane windows - 26" x 12" +seal all	2	$220	$216	$100	$730	$720	421	$25	28.9	28.5
Replace basement double pane windows - 28" x 38" +seal all	2	$620	$606	$100	$1,642	$1,610	899	$54	30.4	29.8
Replace basement double pane windows - 26" x 40" +seal all	5	$625	$611	$100	$4,133	$4,053	2,228	$134	30.9	30.3
Envelope Subtotal					**$36,811**	**$35,846**	**34,426**	**$2,067**		
HVAC										
Setback Thermostats to 15C (59 F)	3	$300	$300	$300	$2,052	$2,052	1,508	$91	22.7	22.7
HVAC Subtotal					**$2,052**	**$2,052**	**1,508**	**$91**		
HOT WATER										
Insulate 50ft of piping for water heater tank	1	$125	$125	$125	$285	$285	1,164	$70	4.1	4.1
Install water efficient metering faucets.	2	$309	$309	$150	$1,047	$1,047	10,193	$612	1.7	1.7
Water Subtotal					**$1,332**	**$1,332**	**11,357**	**$682**		

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	64,200	$4,438	1.91
Estimated Annual Savings	50,771	$3,048	1.51
Percent Savings	79%	69%	79%

* NI = Cost does not include incentives, WI = Cost includes incentives
* *The total cost column includes 14% taxes.
*** As of April 2005, the cost assigned to electricity is 0.06004 $/kWh (rate taken from Manitoba Hydro's website).
**** Doors and windows are 50% more to replace then standard models to account for the added expense of maintaining the building's heritage look.

Table 4 Water Saving Opportunities for the Manitou Opera House

Description	Qty	Installed Cost/Unit ($)		Total Cost* ($)	Annual Water Savings (%)	Annual Water Savings (L)	Annual Cost Savings ($)
		Material	Labour				
Install water efficient metering faucets.	2	$309	$150	$1,047	80%	272,000	$167
Install water efficient toilets.	3	$284	$150	$1,484	67%	1,650,000	$1,011
Install water efficient urinals.	2	$344	$200	$1,240	60%	285,000	$175

* The total cost column includes 14% taxes.

3.3 GENERAL RECOMMENDATIONS

Lighting

Replacing existing incandescent lamps with compact fluorescents would result in a 2,420 kWh savings per year with a payback period of less than five years. Other energy savings opportunities in terms of lighting include converting the T12s with T8s lamps and upgrading the outdoor incandescent lights with high-pressure sodium lamps. However, the payback periods associated with these two opportunities are much longer at 46 and 36 years respectively. The lighting analysis summary table is shown in Appendix B as Table B.2.3.

Envelope

There is significant energy saving opportunities available with the Opera House's envelope. However, many should be considered for long-term projects since their payback periods range from 18 to 31 years. These include replacing all of the different sized double pane windows in the building with triple pane windows complete with sealant. Upgrading the five existing doors and repairing the weather–stripping would save over 9,700 kWh per year, more than 15% of the current annual energy consumption with a payback of just over six years. The results from these calculations are shown in Appendix B, Table B.2.4.

HVAC

Installing setbacks on the thermostats and maintaining the temperature at 15°C (59°F) as opposed to 21°C (70°F) when the building is unoccupied would save 1,508 kWh per year with a payback period of less than 23 years.

Water

The water analysis summary is shown in Table B.2.5 in Appendix B. Replacing the fixtures with water efficient fixtures would save between 60 and 80% of their current water consumption. In particular, replacing the existing high flow faucets to water efficient metering faucets would save the Manitou Opera House over 10,000 kWh per year with a very short payback period of less than two years. Insulating the copper piping for the current water heater tank is another energy savings opportunity with a payback period of just over four years.

Other Issues

There is currently no ventilation in the Opera House. Proper ventilation is recommended particularly when the building is fully occupied.

3.4 OPERATION AND MAINTENANCE

Based on the inspection of this facility, the following operation and maintenance activity should be performed immediately to reduce energy consumption:

- Fix leaking water fixtures (two sinks and one urinal).

Refer to section 13 for more information.

4.0 CAMPGROUND CHANGE ROOM

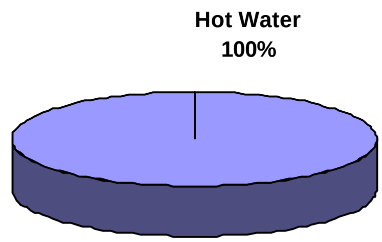
4.1 BACKGROUND

The Campground Change Room was built approximately 10 years ago and is a 250 square foot building. It is open for 18 weeks of the year during the summer season for 24 hours a day. Maximum occupancy for the building is 5 people at any given time.

Photo 3 – Campground Change-rooms

The building is unheated and has no lights within it. The total electricity consumption for the previous year was 6,412 kWh and was completely used for hot water heating as shown in the following pie chart.

Energy Breakdown (% of Total kWh) for the Campground Change Room



The water supply is metered and assumptions were made on the frequency at which the water fixtures are used.

4.2 ENERGY AND WATER SAVING OPPORTUNITIES

Tables 5 and 6 show summaries of the energy and water efficiency improvement opportunities for the Campground Change Room. The following assumptions were made in the calculations:

- The Campground Change Room is occupied for 18 weeks of the year, 24 hours a day.
- The building is not heated and has no lighting.
- For the purpose of water consumption, the typical occupancy of the Campground Change Room is 5.

Table 5 Energy Saving Opportunities for the Campground Change Room

Description	Qty	Installed Cost/Unit ($)			Total Cost ** ($)		Estimated Annual Savings		Simple Payback Years	
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
HOT WATER										
Install instantaneous hot water heater	1	$300	$300	$900	$1,368	$1,368	1,322	$79	17.2	17.2
Install water efficient metering faucets	2	$309	$309	$150	$1,047	$1,047	601	$36.05	29.0	29
Install water efficient showers	2	$21	$21	$50	$162	$162	1,241	$75	2.2	2.2
Water Subtotal					**$2,576**	**$2,576**	**3,163**	**$190**		

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	6,410	$446	0.19
Estimated Annual Savings	3,163	$190	0.09
Percent Savings	49%	43%	47%

* NI = Cost does not include incentives, WI = Cost includes incentives
** The total cost column includes 14% taxes.
*** As of April 2005 the cost assigned to electricity is 0.06004 $/kWh (rate was taken from Manitoba Hydro's website).

Table 6 Water Saving Opportunities for the Campground Change-Rooms

Description	Qty	Installed Cost/Unit ($)		Total Cost* ($)	Annual Water Savings (%)	Annual Water Savings (L)	Annual Cost Savings ($)
		Material	Labour				
Install water efficient metering faucets.	2	$309	$150	$1,047	80%	16,025	$10
Install water efficient toilets.	2	$284	$150	$990	67%	24,665	$15
Install water efficient showers	2	$21	$50	$162	29%	33,121	$20

* The total cost column includes 14% taxes.

4.3 GENERAL RECOMMENDATIONS

Water

Replacing existing showers with water efficient fixtures would save over 1,200 kWh of energy a year, 19% of the current annual energy consumption. Paybacks associated with this energy savings opportunity are just over two years. Other energy savings opportunities include upgrading the current faucets with water efficient metering faucets and installing an instantaneous hot water heater. Together, these two opportunities would save over 1,900 kWh per year with paybacks of 29 and 17 years respectively. The Campground Change Room's water analysis is shown in Appendix B, Table B.3.5.

5.0 CHILD CARE CENTRE

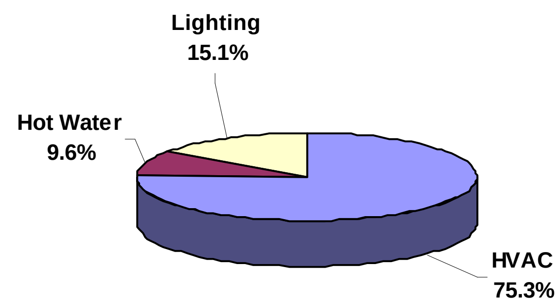
5.1 BACKGROUND

The Child Care Centre is a 60 year old 1484 square foot house with 2'x6' walls with stucco on the exterior and drywall on the interior. Both the main floor and the attached garage have been completely renovated into a daycare facility. Staff offices are located on the second floor and the church office is in the finished basement. The daycare facility, both the main floor and the garage, are occupied for twelve hours a day, from Monday to Friday. The basement office is used for six hours a week.

Photo 4: Child Care Centre

The electricity consumption for the previous year was 43,070 kWh with a total cost of $3,113. The pie chart below shows the breakdown of energy consumption for this building.

Energy Breakdown (% of Total kWh) for the Child Care Centre



The Child Care Centre has one sink and three toilets, all high flow water fixtures. Water is supplied by a metered system and assumptions were made on the frequency with which water fixtures are used.

5.2 ENERGY AND WATER SAVING OPPORTUNITIES

Tables 7 and 8 show summaries of the energy and water saving opportunities for the Child Care Centre. The following assumptions were made in the calculations:

- The Child Care Centre is occupied for 3432 hours on an annual basis.
- The temperature of the Child Care Centre is maintained at 21°C (70°F).
- For the purpose of water consumption, typical occupancy of the building is 20.
- The parking lot controller is used for 8 hours a day, 50 days of the year.

Table 7 Energy Saving Opportunities for the Child Care Centre

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years	
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$	NI*	WI*
LIGHTING										
Main floor fluorescents - convert 4' T12s to 4' T8s (4' x2)	10	$55	$35	$60	$1,311	$1,083	669	$40	32.6	27.0
Main floor incandescents - convert to compact fluorescents	9	$15	$10	$13	$287	$236	1,359	$82	3.5	2.9
Second floor - fluorescents -convert 4' T12 to 4' T8	1	$55	$35	$60	$131	$108	67	$4	32.6	27.0
Second floor -indoor incandescents-convert to compact fluorescents	3	$15	$10	$13	$96	$79	741	$45	2.2	1.8
Basement - convert 4' T12 to 4' T8 (4' x 2)	8	$55	$35	$60	$1,049	$866	535	$32	32.6	27.0
Basement - convert indoor incandescents to compact fluorescents	1	$15	$10	$13	$32	$26	151	$9	3.5	2.9
Install Parking Lot Controller	1	$100	$75	$150	$285	$257	120	$7	39.6	35.6
Lighting Subtotal					**$3,191**	**$2,655**	**3,643**	**$219**		
ENVELOPE										
Replace and add weather strip to door – 3' x7' size	1	$350	$350	$100	$513	$513	1,957	$118	4.4	4.4
Weather strip one 3' x 7' door	1	$15	$15	$50	$74	$74	1,262	$76	1.0	1.0
Replace broken window in basement - 30" x 12" + seal	1	$205	$200	$100	$348	$342	235	$14	24.7	24.3
Seal one window – 30" x 12"	1	$5	$5	$25	$34	$34	177	$11	3.2	3.2
Upgrade insulation in main play area (formerly garage) -roof.	1	$700	$525	$700	$1,596	$1,397	2,245	$135	11.8	10.4
Envelope Subtotal					**$2,565**	**$2,360**	**5,876**	**$353**		
HVAC										
Setback Thermostats to 15C (59 F)	5	$300	$300	$300	$3,420	$3,420	2,572	$154	22.2	22.2
HVAC Subtotal					**$3,420**	**$3,420**	**2,572**	**$154**		
HOT WATER										
Install instantaneous hot water heater	2	$300	$300	$900	$2,736	$2,736	1,194	$72	38.2	38.2
Install water efficient metering faucets.	3	$309	$309	$150	$1,570	$1,570	1,338	$80	19.5	19.5
Insulate piping on hot water tank.	1	$125	$125	$125	$285	$285	1,164	$70	4.1	4.1
Water Subtotal					**$4,591**	**$4,591**	**3,696**	**$222**		

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	43,070	$3,113	1.28
Estimated Annual Savings	15,786	$948	0.47
Percent Savings	37%	30%	37%

* NI = Cost does not include incentives, WI = Cost includes incentives
* *The total cost column includes 14% taxes.
*** As of April 2005 the cost assigned to electricity is 0.06004 $/kWh (rate taken from Manitoba Hydro's website).

Table 8 Water Saving Opportunities for the Child Care Centre

Description	Qty	Installed Cost/Unit ($)		Total Cost* ($)	Annual Water Savings (%)	Annual Water Savings (L)	Annual Cost Savings ($)
		Material	Labour				
Install water efficient toilets	3	$309	$150	$1,570	80%	35,693	$22
Install water efficient metering faucets	1	$284	$150	$495	55%	155,513	$95

* The total cost column includes 14% taxes

5.3 GENERAL RECOMMENDATIONS

Lighting

Replacing the incandescent lamps through out the entire building to compact fluorescent lamps would save over 2,240 kWh per year at payback periods ranging from 2.2 to 3.5 years.

Upgrading T12 lamps to T8s and installing a parking lot controller would save close to 1,400 kWh a year. However, these energy saving opportunities should be considered as long term projects since their associated payback periods are in the 30 to 40 year range.

Envelope

Replacing the front door with an energy efficient door complete with new weather-stripping would save close to 2,000 kWh with a payback period of 4.4 years. Weather-stripping the existing back door would save over 1,250 kWh with a short payback period of one year.

Other energy saving opportunities for the building's envelope includes sealing an existing window and upgrading the roof insulation in the garage. Together, these opportunities would save over 2,400 kWh per year, with paybacks of 3.2 and 4 years respectively. Replacing the broken window in the basement with a triple pane window produces a lower energy savings of 235 kWh with a significantly longer payback period of nearly 25 years.

HVAC

Installing setbacks on the five existing thermostats would save over 2,500 kWh per year, 5.8% of the current energy consumption. The temperature of the building would be lowered to 15°C (59°F) during unoccupied times and maintained at 21°C (70°F) during occupancy.

Water

Replacing existing faucets and toilets with water efficient fixtures would reduce water consumption for the Child Care Centre. Another energy savings opportunity would be to install an instantaneous water heater. Table B.4.5 in Appendix B shows the results from this analysis.

5.4 OPERATION AND MAINTENANCE

Based on the inspection of this facility, the following operation and maintenance activities should be performed immediately to reduce energy consumption:

- Replace filter in furnace.
- Replace broken window in the basement.

Refer to section 13 for more information.

6.0 FIRE HALL & MUNICIPAL GARAGE

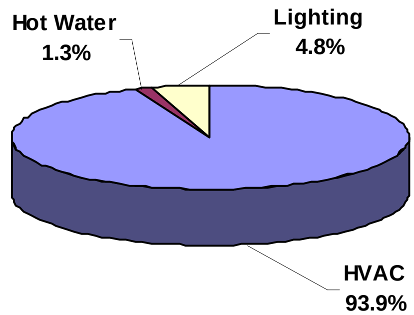
6.1 BACKGROUND

Built in approximately 1975, the Fire Hall and Municipal Garage are housed in the same facility. The Fire Hall is occupied for 1040 hours a year and the Municipal Garage for 1820 hours. The two areas share their electric and propane energy consumption.

Photo 5: Fire Hall & Municipal Garage

The two areas share electric and propane energy. From September 2004 until September 2005, the Fire Hall and Municipal Garage consumed 19,550 kWh of electric energy and 61,759 kWh of propane. The following pie chart shows how the energy is utilized between hot water heating, lighting and HVAC.

Energy Breakdown (% of Total kWh) for the Fire Hall & Municipal Garage



The two areas share one toilet and one sink. To estimate water saving opportunities, assumptions were made on the frequency of use of these fixtures.

6.2 ENERGY SAVING OPPORTUNITIES

Table 9 shows a summary of the energy saving opportunities for the Fire Hall and Municipal Garage. The following assumptions were made in the calculations:

- The Fire Hall area is occupied for 1040 hours per year.
- The Municipal Garage area is occupied for 1820 hours per year.
- The building uses both electric energy and propane.
- The outdoor lights are on 12 hours per day year round.
- The temperature is maintained at 21°C (70°F).

Table 9 Energy Saving Opportunities for the Fire Hall & Municipal Garage

Description	Qty	Installed Cost/Unit ($)			Total Cost ** ($)		Estimated Annual Savings		Simple Payback Years	
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
LIGHTING										
Fire Hall										
Convert 4' T12s to 4' T8 lamps (2x5)	10	$55	$35	$60	$1,311	$1,083	203	$12	107.7	88.9
Convert 8' T12s to 8' T8 lamps - (2x4) 75W	8	$75	$40	$75	$1,368	$1,049	341	$20	66.8	51.2
Convert incandescent lamp to compact fluorescent.	1	$15	$10	$13	$32	$26	75	$4	7.1	5.8
Municipal Garage										
MG Office: Convert 8' T12s to 8' T8 lamps - (2x1) 75W	2	$75	$40	$75	$342	$262	149	$9	38.2	29.3
MG Office: Convert 4' T12 to 4' T8 lamps - (2x1)	2	$55	$35	$60	$262	$217	71	$4	61.5	50.8
MG: Convert 8' T12s to 8' T8 lamps (2x2)	4	$75	$40	$75	$684	$524	451	$27	25.2	19.4
MG Workshop: Convert 8' T12s to 8' T8 lamps (2x1)	2	$75	$40	$75	$342	$262	226	$14	25.2	19.4
MG Workshop: Convert 4' T12s to 4' T8 lamps (4x2)	8	$55	$35	$60	$1,049	$866	284	$17	61.5	50.8
Lighting Subtotal					**$5,390**	**$4,290**	**1,800**	**$108**		
ENVELOPE										
Fire Hall										
Upgrade double pane windows - 2'x6' to triple pane. Add new weather stripping & caulking.	4	$755	$737	$100	$3,899	$3,817	2,752	$237	16.5	16.1
Add new weather stripping & caulking to pedestrian doors.	2	$15	$15	$50	$148	$148	2,524	$217	0.7	0.7
Add weather stripping & caulking to vehicle door. Repair concrete crack.	1	$530	$530	$100	$718	$718	6,562	$564	1.3	1.3
Municipal Garage										
Replace old wooden pedestrian door 3'x7' with a higher efficiency door. Add new weather stripping & caulking.	1	$350	$350	$100	$513	$513	3,219	$277	1.9	1.9

Description	Qty	Installed Cost/Unit ($)			Total Cost ** ($)		Estimated Annual Savings		Simple Payback Years	
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
ENVELOPE										
Add new weather stripping & caulking to vehicle door.	1	$30	$30	$100	$148	$148	2,650	$228	0.7	0.7
Envelope Subtotal					**$5,426**	**$5,344**	**17,708**	**$1,523**		
HVAC										
Fire Hall										
Replace radiant heater with high efficiency furnace.	1	$3,200	$3,200	$1,000	$4,788	$4,788	8,708	$749	6.4	6.4
Setback Thermostats to 15ºC (59 ºF)	2	$300	$300	$300	$1,368	$1,368	7,301	$592	2.3	2.3
Municipal Garage										
Replace radiant heater with high efficiency furnace	1	$3,200	$3,200	$1,000	$4,788	$4,788	8,708	$749	6.4	6.4
Setback Thermostats to 15C (59 F)	3	$300	$300	$300	$2,052	$2,052	6,563	$532	3.9	3.9
HVAC Subtotal					**$12,996**	**$12,996**	**31,280**	**$2,621**		
HOT WATER										
Install water efficient metering faucets	1	$309	$309	$150	$523	$523	80	$5	108.9	108.9
Replace tank with an instantaneous hot water heater.	1	$300	$300	$900	$1,368	$1,368	979	$59	23.3	23.3
Water Subtotal					**$1,891**	**$1,891**	**1,059**	**$64**		

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	81,309	$6,826	14.5
Estimated Annual Savings	51,847	$4,316	10.7
Percent Savings	64%	63%	74%

* NI = Cost does not include incentives, WI = Cost includes incentives
* *The total cost column includes 14% taxes.
*** As of April 2005 the cost assigned to electricity is 0.06004 $/kWh (rate taken from Manitoba Hydro's website) and the average cost of propane is $0.535/L.

Table 10 Water Saving Opportunities for the Fire Hall & Municipal Garage

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	$523	80%	2,135	$1

* The total cost column includes 14% taxes.

6.3 GENERAL RECOMMENDATIONS

Lighting

Energy saving opportunities for the Fire Hall and Municipal Garage in terms of lighting includes replacing all 8' T12s and 4' T12s with T8s and replacing interior incandescent bulbs with compact fluorescents. Payback periods associated with ESOs range from 7.1 years to over 100 years with a total potential savings of 1,800 kWh. The lighting analysis summary for this building is found in Appendix B, Table B.5.3.

Envelope

From Table 9, it can be seen that there are substantial ESOs found within the envelope of the building. Replacing the old wooden pedestrian door in the Municipal Garage, complete with new weather stripping would save over 3,200 kWh a year. Installing new weather stripping on both the pedestrian and vehicle doors in the Fire Hall, along with repairing the existing concrete crack would save over 9,000 kWh. Longer payback periods are found with upgrading the double pane windows to triple pane windows. Further details are shown in Appendix B, Table B.5.4.

HVAC

Another area of the building that has large energy saving opportunities is within the HVAC system. Installing setback thermostats in both the Fire Hall and Municipal Garage would reduce the temperature setting from 21°C to 15°C during non-occupancy hours and result in over 13,000 kWh of savings a year. Replacing the radiant heaters with high efficiency furnaces would produce over 17,000 kWh of savings, with payback periods of less than 6.5 years.

Water

The Fire Hall and Municipal Garage share one toilet and one faucet. Replacing the sink with a water efficient metering fixture would reduce water consumption, however the payback period is over 100 years. Replacing the existing toilet to a low flow fixture has an even longer payback period. Therefore, it was not included in the analysis. Another energy savings opportunity would be to install an instantaneous water heater. Table B.4.5 in Appendix shows the results from this analysis.

7.0 HERITAGE BUILDING

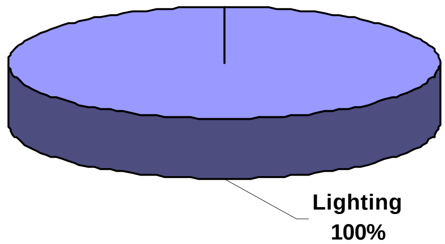
7.1 BACKGROUND

The Heritage Building, also called the Visitors Centre, is a small 500 square foot wooden structure that is without heat and water. Built approximately in 1920, the building is considered a heritage site and any recommended renovations would need to retain the existing aesthetics. The building is open for 18 weeks of the year for eight hours a day during the summer.

Photo 7: Heritage Building

The Heritage Building uses electricity exclusively with a total consumption of 920 kWh for the previous year. As shown in the following pie chart, 100% of the energy is consumed by lighting.

Energy Breakdown (% of Total kWh) for the Heritage Building



As previously stated, this building has no plumbing fixtures or heating.

7.2 ENERGY AND WATER SAVING OPPORTUNITIES

Tables 11 shows the energy saving opportunities for the Heritage Building. The following assumptions were made in the analysis:

- The Heritage Building is occupied for 1008 hours a year during the summer season.
- There is no heating, ventilation or air-conditioning in the building.
- The building has no water supply or plumbing fixtures.
- The outdoor lights are on for 504 hours a year, one half of the occupancy time.

Table 11 Energy Saving Opportunities for the Heritage 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										
Replace indoor incandescent flood lights with compact fluorescent lamps	3	$15	$10	$13	$96	$79	336	$20	4.8	3.9
Indoor Incandescents - Convert to compact fluorescents	4	$15	$10	$13	$128	$105	177	$11	12.0	9.8
Lighting Subtotal					**$223**	**$184**	**513**	**$31**		

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	920	$278	0.03
Estimated Annual Savings	513	$31	0.02
Percent Savings	56%	11%	67%

* NI = Cost does not include incentives, WI = Cost includes incentives
** The total cost column includes 14% taxes.
*** As of April 2005 the cost assigned to electricity is 0.06004 $/kWh (rate taken from Manitoba Hydro's website).

7.3 GENERAL RECOMMENDATIONS

Lighting

Any energy saving opportunities for the Heritage Building are with its lighting. Replacing the indoor incandescent lamps with compact fluorescents would produce a 177 kWh savings with a payback period of 12 years. Upgrading the existing indoor incandescent floodlights with compact fluorescent lights would save over 330 kWh in less than 5 years. To upgrade the outdoor lights by either replacing with high pressure sodium lamps or installing a photocell would produce energy savings, however the associated payback is over 120 years. Therefore, this ESO was not included in Table 11. The lighting analysis summary can be found in Table B.6.3.

8.0 LIBRARY

8.1 BACKGROUND

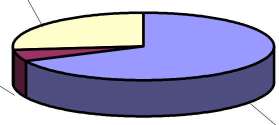
Built in 1989, the Library is a 1,596 square foot building that underwent renovations in 2002.

The building has vinyl siding with drywall, an un-insulated basement and is occupied for 17 hours a week year round.

Photo 8: Library

Electric energy consumption for the past year totalled 23,590 kWh for a cost of $1,801. The following pie chart shows the percentage of energy consumption used for heating, lighting and hot water in the library.

Energy Breakdown (% of Total kWh) for the Library



The Library has two sinks and two toilets, all high flow fixtures. The building's water supply system is metered from the town. Hot water consumption by the plumbing fixtures was calculated by estimating the occupancy of the building and the frequency at which these fixtures are used. From this, total annual hot water consumption was established.

8.2 ENERGY AND WATER SAVING OPPORTUNITIES

Tables 12 and 13 show the energy and water saving opportunities for the Library. The following assumptions were made in the analysis:

- The Library is occupied for 17 hour per week year round, on Tuesday, Thursday and Saturday.
- The outdoor lights are on 12 hours per day year round.
- For the purpose of water consumption, the typical occupancy is 4.
- The temperature in the building is maintained at 15°C (59°F) when not occupied.

Table 12 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										
Basement incandescents -100W - convert to compact fluorescents	10	$15	$10	$13	$319	$262	636	$38	8.4	6.9
Main floor - 60W incandescents convert to compact fluorescents	4	$15	$10	$13	$128	$105	156	$9	13.7	11.2
Outdoor incandescents - convert to high pressure sodium bulbs	5	$125	$100	$125	$1,425	$1,283	1,095	$66	21.7	19.5
Lighting Subtotal					**$1,872**	**$1,650**	**1,887**	**$113**		
ENVELOPE										
Replace unused 3'x7' glass door with wall panel	1	$250	$250	$250	$570	$570	546	$33	17.4	17.4
Add weather strip to existing doors -all of 3'x7' size	4	$15	$15	$50	$296	$296	2,133	$128	2.3	2.3
Add weather strip and caulking to windows - 2'x6' size	6	$5	$5	$25	$205	$205	1,024	$276	0.7	0.7
Insulate basement walls	1	$3,840	$3,546	$3,840	$8,755	$8,420	3,716	$223	39.2	37.7
Envelope Subtotal					**$9,827**	**$9,491**	**7,419**	**$660**		
HVAC										
Replace air conditioner with a high efficiency unit	1	$3,500	$2,780	$0	$3,990	$3,169	6,947	$417	9.6	7.6
Setback thermostat to 10ºC (50ºF)	1	$300	$300	$300	$684	$684	3,120	$187	3.7	3.7
HVAC Subtotal					**$4,674**	**$3,853**	**10,068**	**$604**		
HOT WATER										
Install instantaneous hot water heater	1	$300	$300	$900	$1,368	$1,368	1,225	$74	18.6	18.6
Water Subtotal					**$1,368**	**$1,368**	**1,225**	**$74**		

TOTALS	**Energy (kWh)**	**Cost ($)**	**CO_2 (Tonnes)**
Existing Annual Consumption/Cost/Emissions	23,590	$1,801	0.70
Estimated Annual Savings	20,599	$1,451	0.61
Percent Savings	87%	81%	87%

* NI = Cost does not include incentives, WI = Cost includes incentives
** The total cost column includes 14% taxes.
*** As of April 2005, the cost assigned to electricity is 0.06004 $/kWh (rate was taken from Manitoba Hydro's website).

Table 13 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 toilets.	2	$284	$150	$990	55%	8,812	$5

* The total cost column includes 14% taxes.

8.3 GENERAL RECOMMENDATIONS

Lighting

Replacing the incandescent lamps, both indoor and outdoor type, with compact fluorescents and high-pressure sodium lamps respectively would result in a savings of over 1,880 kWh per year. Associated payback periods for this energy saving opportunities range from 8.4 to approximately 22 years. Upgrading the T12 fluorescents to T8s would also save a significant amount of energy, over 1,100 kWh, however since payback periods are over 125 years they were not included in the analysis.

Envelope

There are four pedestrian doors that are each 3'x 7' in size. A large amount of heat is currently being lost through the cracks around these doors. From Table 12 it can be seen that replacing the weather-stripping around the doors would result in large annual energy savings of 2,133 kWh with a payback period of just over 2 years. Replacing weather stripping and caulking to the six windows would save over 1,000 kWh with a short payback period of less than one year. Other ESO include insulating the basement walls with R-20 insulation, which would produce over 3,700 kWh of savings, is less than 40 years. Replacing the unused 3'x7' glass door with a wall panel would save over 540 kWh per year with a payback period of 17.4 years.

HVAC

Replacing the existing programmable thermostat with a true 7-day programmable thermostat and setting the temperature back to 10ºC (50ºF) when the library is unoccupied would save over 3,100 kWh of heat in a typical year. In addition, energy savings of 6,947 kWh would result from replacing the existing air-conditioner with a high efficiency unit. Paybacks associated with these ESOs are 3.7 and 9.6 years respectively and have the potential to save over 10,000 kWh combined.

Water

As shown in Table 13, replacing the current water fixtures with water efficient units would reduce the water consumption. Replacing the water heater with an instantaneous water heater would have over 1,220 kWh per year with a payback period of less than 19 years.

9.0 SEWAGE LIFT STATION

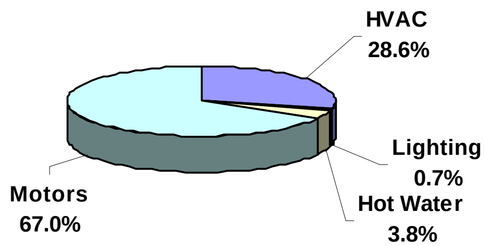
9.1 BACKGROUND

Constructed in the early 1960s, the Sewage Lift Station is a 250 square foot facility that is occupied for approximately 3.5 hours per week. Maximum occupancy for the building is 3 people at any given time.

Photo 9: Sewage Lift Station

The total electricity consumption for the previous year was 27,246 kWh with a total cost of $1,917. The following pie chart shows the breakdown of energy consumption for this building.

Energy Breakdown (% of Total kWh) for the Sewage Lift Station



The Town's distribution system provides water to station and assumptions were made on the frequency at which the water fixtures are used.

9.2 ENERGY AND WATER SAVING OPPORTUNITIES

Tables 14 and 15 show summaries of the energy and water efficiency improvement opportunities for the Sewage Lift Station. The following assumptions were made in the calculations:

- The Sewage Lift Station is occupied for approximately 3.5 hours per week year round.
- For the purpose of water consumption, the typical occupancy of the Sewage Lift Station is 3 people.
- During the winter months, the facility is maintained at 15ºC (59ºF).

Table 14 Energy Saving Opportunities for the Sewage Lift Station

Description	Qty	Installed Cost/Unit ($)			Total Cost ** ($)		Estimated Annual Savings		Simple Payback Years	
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
LIGHTING										
Convert 100W wet well light fixture to compact fluorescent.	1	$15	$10	$13	$32	$26	13	$1	40.6	33.3
Convert indoor incandescent lamps (300W) to compact fluorescents.	2	$15	$10	$13	$64	$52	81	$5	13.2	10.8
Lighting Subtotal					**$96**	**$79**	**94**	**$6**		
ENVELOPE										
Upgrade single pane window (53"x28") to triple pane window	1	$450	$373	$100	$627	$539	595	$36	17.5	15.1
Upgrade single pane window (18"x30") with triple pane windows	2	$290	$262	$100	$889	$825	431	$26	34.4	31.9
Add new weather stripping to existing windows	3	$5	$5	$25	$103	$103	745	$45	2.3	2.3
Envelope Subtotal					**$1,619**	**$1,467**	**1,771**	**$106**		
HVAC										
Setback Thermostats to 15C (59 F)	1	$300	$300	$300	$684	$684	936	$56	12.2	12.2
HVAC Subtotal					**$684**	**$684**	**936**	**$56**		
HOT WATER										
Install instantaneous water heater	1	$300	$300	$900	$1,368	$1,368	1,008	$61	22.6	22.6
Hot Water Subtotal					**$1,368**	**$1,368**	**1,008**	**$61**		
MOTORS										
When replacing 20 HP pump motors, replace with premium efficiency motors.	2	$470	$470	$0	$1,072	$1,072	537	$32	33.2	33.2
Motors Subtotal					**$1,072**	**$1,072**	**537**	**$32**		

TOTALS	**Energy (kWh)**	**Cost ($)**	**CO_2 (Tonnes)**
Existing Annual Consumption/Cost/Emissions	27,246	$1,917	0.81
Estimated Annual Savings	4,252	$261	0.13
Percent Savings	16%	14%	16%

* NI = Cost does not include incentives, WI = Cost includes incentives
** The total cost column includes 14% taxes.
*** As of April 2005, the cost assigned to electricity is 0.06004 $/kWh (rate taken from Manitoba Hydro's website).

Table 15 Water Saving Opportunities for the Sewage Lift Station

Description	Qty	Installed Cost/Unit ($)		Total Cost* ($)	Annual Water Savings (%)	Annual Water Savings (L)	Annual Cost Savings ($)
		Material	Labour				
Install water efficient metering faucets.	1	$309	$150	$523	80%	349	$0.21

* The total cost column includes 14% taxes

9.3 GENERAL RECOMMENDATIONS

Lighting

The Sewage Lift Station is occupied for a minimal amount of time. For this reason, the only lighting ESOs that are realistic is to upgrade the indoor incandescent lamps and wet well lamp to compact fluorescents. The lighting analysis summary table is shown in Appendix B as Table B.9.3.

Envelope

Energy saving opportunities within the building envelope produces the largest savings for this building. ESOs include upgrading all three single pane windows with triple pane windows, complete with new weather stripping. Over 1700 kWh of energy would be saved by these opportunities, approximately 6.5% of the annual energy consumption.

HVAC

Installing setback on the thermostat and maintaining the temperature at 15ºC (59ºF) during the summer months as opposed to 21ºC (70ºF) when the building is unoccupied would save 936 kWh per year with a payback period of just over 12 years.

Water

The water analysis summary for this building is shown in Table B.9.5 in Appendix B. There is only one sink in the facility and replacing it with a water efficient metering fixture would produce an unrealistic lengthy payback period. Therefore, it was not recommended for this building.

However, replacing the existing water heater with an instantaneous unit is included in the recommendations, saving over 1000 kWh per year.

Motors

When the existing pump motors require replacement, they should be upgraded to high efficiency motors. This would produce over 530 kWh of savings per year with a payback of less than 34 years.

There are several other motors in the facility, however due to the low occupancy rate, calculated paybacks were substantially longer and were not included in the ESO table.

10.0 MUNICIPAL ADMIN BUILDING & RECYCLING DEPOT

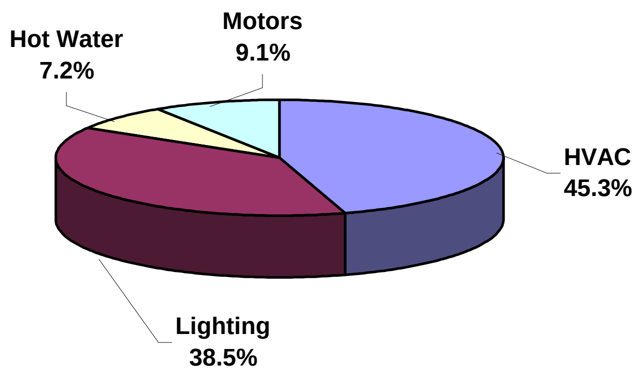
10.1 BACKGROUND

The Municipal Admin Building and Recycling Depot are situated in the same 2,500 square foot building. The building was constructed in 1997 and is made up of a metal exterior with a drywall interior. The Recycling Depot is attached to the east side the building and is unheated, while the Municipal Admin Office has a geothermal heating/cooling system and HRV ventilation system. The building is occupied from Monday to Friday for nine hours a day for the Municipal Admin portion and 21 hours a week for the Recycling Depot.

Photo 10: Municipal Admin Building & Recycling Depot

The total electricity consumption over the past year was 36,531 kWh at a cost of $2,683. The following pie chart displays the percentage of energy consumption used for heating, lighting, motors and hot water in the building.

Energy Breakdown (% of Total kWh) for the Municipal Admin Building & Recycling Depot



Plumbing fixtures for the building are located in the Municipal Admin Office. They include two sinks and two toilets; the later are high flow fixtures. The building's water supply is from a meter off the town's water supply. The hot water consumed by the water fixtures in the washrooms was calculated by estimating the occupancy of the building and the frequency at which these fixtures are used. Total annual hot water consumption was then established.

10.2 ENERGY AND WATER SAVING OPPORTUNITIES

Tables 16 and 17 show a summary of the energy and water savings opportunities for the Municipal Admin Building and Recycling Depot. The following assumptions were made in the analysis:

- The Municipal Admin Office is occupied for 45 hours per week year round.
- The Recycling Depot is occupied for 21 hours per week year round.
- The temperature is maintained at 21°C (70°F) in the office (Municipal Admin area).
- For the purpose of water consumption, the typical average occupancy between the two areas is 7.

Table 16 Energy Saving Opportunities for the Municipal Admin Building & Recycling Depot

Description	Qty	Installed Cost/Unit ($)			Total Cost ** ($)		Estimated Annual Savings		Simple Payback Years	
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
LIGHTING										
Municipal Admin Building										
Main floor - convert 4' T12s to 4' T8 lamps (2x28)	56	$55	$35	$60	$7,342	$6,065	4,455	$267	27.4	22.7
Install Parking Lot Controller	4	$100	$75	$150	$1,140	$1,026	576	$35	33.0	29.7
Recycling Depot										
Convert indoor incandescent lamps to outdoor high-pressure sodium lamps (150W).	8	$125	$100	$125	$2,280	$2,052	655	$39	58.0	52.2
Convert indoor incandescent lamp to outdoors high-pressure sodium lamp (300W).	1	$125	$100	$125	$285	$257	657	$39	7.2	6.5
Upgrade outdoor incandescents to high pressure sodium lamps	2	$125	$100	$125	$570	$513	657	$39	14.5	13.0
Lighting Subtotal					**$11,617**	**$9,912**	**7,001**	**$420**		
ENVELOPE										
Municipal Admin Building										
Replace caulking and weather stripping to pedestrian doors = 3'x7' size	2	$15	$15	$50	$148	$148	841	$51	2.9	2.9
Caulk windows - 4'x5' size	5	$5	$5	$25	$171	$171	757	$45	3.8	3.8
Caulk windows - 4'x6' size	2	$5	$5	$25	$68	$68	337	$20	3.4	3.4
Upgrade roof insulation	1	$625	$600	$625	$1,425	$1,397	950	$57	25.0	24.5
Envelope Subtotal					**$1,813**	**$1,784**	**2,885**	**$173**		
HVAC										
Setback Thermostats to 15C (59 F)	1	$300	$300	$300	$684	$684	1,315	$79	8.7	8.7
Install timer for HRV.	1	$323	$323	$100	$482	$482	2,707	$163	3.0	3.0
HVAC Subtotal					**$1,166**	**$1,166**	**4,022**	**$241**		
HOT WATER										
Municipal Admin Building										
Install instantaneous hot water heater	1	$300	$300	$900	$1,368	$1,368	1,323	$79	17.2	17.2
Insulate 50ft of copper piping on HWT	1	$125	$125	$125	$285	$285	1,169	$70	4.1	4.1
Water Subtotal					**$1,653**	**$1,653**	**2,493**	**$150**		

Description	Qty	Installed Cost/Unit ($)			Total Cost ** ($)		Estimated Annual Savings		Simple Payback Years	
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
MOTORS										
Recycling Depot										
When replacing 5 HP bailer motor-install a high efficiency motor.	1	$90	$90	$0	$103	$103	98	$6	17.5	17.5
Motors Subtotal					**$103**	**$103**	**98**	**$6**		

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	36,531	$2,683	1.09
Estimated Annual Savings	16,401	$985	0.49
Percent Savings	45%	37%	45%

* NI = Cost does not include incentives, WI = Cost includes incentives
** The total cost column includes 14% taxes.
*** As of April 2005, the cost assigned to electricity is 0.06004 $/kWh (rate taken from Manitoba Hydro's website).

Table 17 Water Saving Opportunities for the Municipal Admin Building & Recycling Depot

Description	Qty	Installed Cost/Unit ($)		Total Cost* ($)	Annual Water Savings (%)	Annual Water Savings (L)	Annual Cost Savings ($)
		Material	Labour				
Install water efficient toilets.	2	$284	$150	$990	55%	63,619	$39

* The total cost column includes 14% taxes

10.3 GENERAL RECOMMENDATIONS

Lighting

Upgrading all the lights, inside and outside the building with energy efficient models, along with installing parking lot controllers would save over 7000 kWh a year or 19% of the current energy used. Payback periods associated with these energy saving opportunities range from 7 to 58 years. The highest energy saving opportunity is to replace all T12s in the admin office to T8 lamps. Savings of 4,455 kWh are generated from this single option.

Envelope

Most of the energy saving opportunities for this building's envelope have short payback periods. These include replacing the weather-stripping and caulking for the existing pedestrian doors and caulking the windows. An additional energy saving opportunity, with a payback of 25 years, is to upgrade the roof insulation in the office area from the existing R-24 to R-40. The cumulative saving of all of these opportunities is 2,885 kWh per year.

HVAC

Installing a setback on the thermostat would save over 1,300 kWh of energy a year with a payback just under nine years. The thermostat should be programmed such that the temperature is reduced to 15°C (59°F) when the building is unoccupied. Another ESO related to the HVAC of the building is to install a timer on the existing HRV. Currently, the HRV operates 24 hours a day, 7 days a week. By installing a timer and having the unit turn off during unoccupied times, over 2,700 kWh of energy could be saved per year with a payback period of 3 years.

Water

As shown in Table 17, replacing the existing toilets in the washrooms with water efficient toilets would save 55% of the water consumed by the current fixtures. Other water related energy saving opportunities includes installing an instantaneous hot water heater and insulating the copper piping on the hot water tank.

Motors

When the existing bailer motor needs replacement, it should be upgraded to a high efficiency model. This would save around 100 kWh a year with a payback of 17 years.

10.4 OPERATION AND MAINTENANCE

Based on the inspection of this facility, the following operation and maintenance activities should be performed immediately to reduce energy consumption:

- Clean filters on HRV.
- Clean HRV intake.

Refer to section 13 for more information.

11.0 SWIMMING POOL OUTDOORS

11.1 BACKGROUND

Built in 2003, the Outdoor Swimming Pool is an 800 square foot structure complete with three water slides, a pool and a process building that houses the pool pumps, boilers and chemical feed system. The area is occupied from June to August for 13 hours a day, seven days a week.

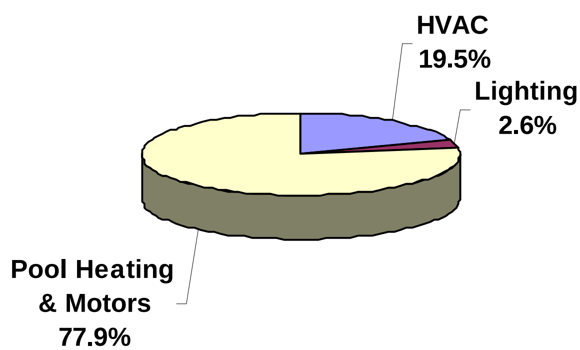
Photo 11: Swimming Pool Outdoors

The pool uses electric energy for geothermal heating, lighting and to run the motors. Propane is used for a back up boiler that is used to heat the pool at the start of the season. Three geothermal heat pumps provide the majority of pool heating during the summer.

The facility already uses a liquid solar blanket to reduce heat loss through evaporation. This product reduces evaporative losses by as much as 40%, a significant amount of energy and water. A transparent liquid cover for outdoors or indoor pools, the solar cover is a non-toxic, biodegradable product that is safe for filters and pumps. In addition, the product reduces humidity and is effective 24 hours a day, even when the pool is in use.

The following pie chart shows how the energy is consumed in a typical year.

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



11.2 ENERGY SAVING OPPORTUNITIES

Table 18 shows a summary of the energy saving opportunities for the Outdoor Swimming Pool. The following assumptions were made in the analysis:

- The Outdoor Swimming Pool is open from June until the end of August for 13 hours a day, seven days a week.
- There are no plumbing fixtures or domestic hot water capabilities on site.
- Three ten-ton heat pumps provide pool water heating in the summer.
- One three-ton heat pump provides heating and cooling for the building all year long.
- All heat pumps are tied into the Arena's ground water loop.
- The building is heated to 20ºC all winter to prevent pipes from freezing and to dissipate waste heat from the Arena's ice plant heat pump system.

Table 18 Energy Saving Opportunities for the Swimming Pool Outdoors

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years	
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
LIGHTING										
Fluorescents - convert 8' T12s to 8' T8s (2x8')	12	$75	$40	$75	$2,052	$1,573	491	$30	69.6	53.3
Install occupancy sensor to control lighting.	1	$55	$55	$35	$103	$103	848	$51	2.0	2.0
Lighting Subtotal					**$2,155**	**$1,676**	**1,340**	**$80**		
ENVELOPE										
Upgrade roof insulation in lobby	1	$264	$198	$264	$602	$527	456	$27	22.0	19.2
Envelope Subtotal					**$602**	**$527**	**456**	**$27**		
HVAC										
Setback Thermostats to 15C (59 F) in summer & 5C (41F) in winter.	1	$300	$300	$300	$684	$684	3,028	$182	3.8	3.8
HVAC Subtotal					**$684**	**$684**	**3,028**	**$182**		
MOTORS										
When replacing 15 HP pool pump motor, replace with a high efficiency motor.	1	$200	$200	$0	$228	$228	541	$32	7.0	7.0
When replacing 10 HP pool pump motor, replace with a high efficiency motor.	1	$150	$150	$0	$171	$171	244	$15	11.7	11.7
When replacing 7.5 HP pool pump motor, replace with a high efficiency motor.	1	$100	$100	$0	$114	$114	183	$11	10.4	10.4
When replacing 3.0 HP pool pump motor, replace with a high efficiency motor.	1	$75	$75	$0	$86	$86	73	$4	19.4	19.4
When replacing 1.0 HP pool pump motor, replace with a high efficiency motor.	1	$50	$50	$0	$57	$57	36	$2	26.3	26.3
Motors Subtotal					**$656**	**$656**	**1,078**	**$65**		

TOTALS	**Energy (kWh)**	**Cost ($)**	**CO_2 (Tonnes)**
Existing Annual Consumption/Cost/Emissions	47,047	$3,904	7.05
Estimated Annual Savings	5,902	$354	0.18
Percent Savings	13%	9%	3%

* NI = Cost does not include incentives, WI = Cost includes incentives
** The total cost column includes 14% taxes.
***As of April 2005, the cost assigned to electricity is 0.06004 $/kWh (rate taken from Manitoba Hydro's website). The average cost of propane is $0.535/L.

11.3 GENERAL RECOMMENDATIONS

Lighting

Energy savings of approximately 1,340 kWh would result from replacing the T12 lamps with T8s and installing an occupancy sensor to control lighting in the building. Paybacks are 70 and 2 years respectively.

Envelope

There are no windows in the process building and the doors are in good condition, therefore the only energy saving opportunity with the envelope is to upgrade the existing roof insulation to R-40. An annual energy savings of 456 kWh would result with a payback of 22 years.

Motors

When the existing five motors require replacement, they should be upgraded to high efficiency motors. This would achieve over 1,000 kWh of total energy savings with paybacks ranging from 7 to 26 years.

Pool Heating

Currently, all three-pool heat pumps are set for 28ºC (82ºF). Consideration should be given to staging these pumps to turn on at different pool water temperatures. This would reduce energy consumption, demand load and cost. Since the facility is not used during the winter season, consideration should be given to draining all pumps and piping at the end of the summer season and turning off the heat to the facility in the winter. This would save 16,795 kWh of heat energy over the year. Drain valves would be required at all low points in the system to ensure everything can be properly drained.

Another item to consider is that the 3 heat pumps at the pool are dissipating waste heat from the geothermal system in the arena. Shutting off the heat to the pool area may therefore have an adverse effect on the operation of the arena's geothermal system. This aspect should be verified.

12.0 WATER TREATMENT PLANT

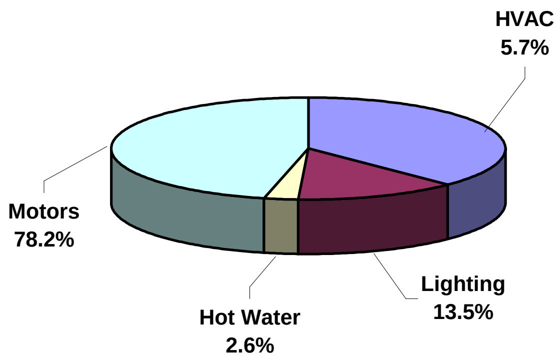
12.1 BACKGROUND

Built in 1963, the Water Treatment Plant is a 1554 square foot facility complete with an open main area, small-enclosed office and enclosed washroom and shower area. Mechanical upgrades were performed in the building in 2003. The facility is occupied for approximately 49 hours per week, year round.

Photo 12: Water Treatment Plant

In the previous year the Water Treatment Plant used 96,716 kWh of electric energy. The following pie chart displays how this energy was consumed in the facility.

Energy Breakdown (% of Total kWh) for the Water Treatment Plant



The building has two sinks, one shower and one toilet, all high flow fixtures. Estimates were made on the frequency at which these fixtures were used.

12.2 ENERGY AND WATER SAVING OPPORTUNITIES

Tables 19 and 20 show a summary of the energy and water saving opportunities for the Water Treatment Plant. The following assumptions were made in the analysis:

- The Water Treatment Plant is occupied for 2548 hours per year.
- The temperature of the Water Treatment Plant is maintained at 21°C (70°F).
- For the purpose of water consumption, the typical occupancy of the building is 3.

Table 19 Energy Saving Opportunities for the Water Treatment Plant

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years	
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
LIGHTING										
Fluorescents - Convert 4' T12s to 4' T8s (4' x2)	2	$55	$35	$60	$262	$217	173	$10	25.2	20.8
Convert indoor incandescent lamps to compact fluorescents.	9	$15	$10	$13	$287	$236	5,091	$306	0.9	0.8
Outdoor incandescents - convert to high-pressure sodium bulbs.	4	$125	$100	$125	$1,140	$1,026	3,942	$237	4.8	4.3
Install Parking Lot Controller	3	$100	$75	$150	$855	$770	360	$22	39.6	35.6
Lighting Subtotal					**$2,544**	**$2,248**	**9,566**	**$574**		
ENVELOPE										
Add new weather - stripping to pedestrian doors.	2	$15	$15	$50	$148	$148	2,524	$152	1.0	1.0
Upgrade roof insulation	1	$3,411	$3,411	$0	$3,889	$3,889	3,734	$224	17.3	17.3
Envelope Subtotal					**$4,037**	**$4,037**	**6,258**	**$376**		
HVAC										
Setback Thermostats to 15C (59 F)	1	$300	$300	$300	$684	$684	2,787	$167	4.1	4.1
HVAC Subtotal					**$684**	**$684**	**2,787**	**$167**		
HOT WATER										
Install water efficient showers	1	$21	$21	$50	$81	$81	339	$20	4.0	4.0
Install instantaneous hot water heater	1	$300	$300	$900	$1,368	$1,368	1,113	$67	20.5	20.5
Hot Water Subtotal					**$1,449**	**$1,449**	**1,452**	**$87**		
MOTORS										
When replacing 65 HP backup pump motor, replace with a high efficiency motor.	1	$1,530	$1,530	$0	$1,744	$1,744	745	$45	39.0	39.0
When replacing 15 HP distribution pump motor, replace with a high efficiency motor.	1	$375	$375	$0	$428	$428	172	$10	41.4	41.4
When replacing 7.5 HP distribution pump motor, replace with a high efficiency motor.	1	$220	$220	$0	$251	$251	86	$5	48.6	48.6
When replacing 7.5 HP backwash pump motor, replace with a high efficiency motor.	1	$220	$220	$0	$251	$251	86	$5	48.6	48.6
Motors Subtotal					**$2,673**	**$2,673**	**1,088**	**$65**		

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	96,716	$6,762	2.88
Estimated Annual Savings	21,151	$1,270	0.63
Percent Savings	22%	19%	22%

* NI = Cost does not include incentives, WI = Cost includes incentives
** The total cost column includes 14% taxes.
***As of April 2005, the cost assigned to electricity is 0.06004 $/kWh (rate taken from Manitoba Hydro's website

Table 20 Water Saving Opportunities for the Water Treatment Plant

Description	Qty	Installed Cost/Unit ($)		Total Cost* ($)	Annual Water Savings (%)	Annual Water Savings (L)	Annual Cost Savings ($)
		Material	Labour				
Install water efficient metering faucets.	2	$309	$150	$1,047	80%	4,892	$3
Install water efficient toilets.	1	$284	$150	$495	55%	6,927	$4
Install water efficient showers	1	$21	$50	$81	29%	9,051	$6

* The total cost column includes 14% taxes

12.3 GENERAL RECOMMENDATIONS

Lighting

Significant energy saving opportunities are available with lighting in the Water Treatment Plant. Replacing the indoor and outdoor incandescent lamps with compact fluorescents and high-pressure sodium lamps respectively would save over 9,000 kWh per year. Associated paybacks are less than one and five years respectively. Other lighting ESOs include upgrading 4' T12 to 4' T8 lamps and installing parking lot controllers. However, these ESOs have longer payback periods. Cumulative energy savings of all the lighting ESOs are over 9,500 kWh, approximately 10% of the current energy consumption.

Envelope

The exterior doors of the Water Treatment Plant are of sufficient insulation, however the weather stripping is damaged. Installing new weather-stripping for both doors would save over 2,500 kWh annually with a payback period of just one year. Another ESO within the building envelope would be to upgrade the existing roof insulation of the facility when replacement is required to a higher R-value.

HVAC

By installing setback on the facility's thermostat and maintaining the temperature at 15ºC (59ºF) as opposed to 21ºC (70ºF) when the building is unoccupied would save 2,787 kWh per year with a payback period of 4.1 years.

Water

The water analysis summary table is shown in Table B.11.5 in Appendix B. Replacing the fixtures with water efficient fixtures would save between 29 and 80% of their current water consumption. Due to the lengthy payback periods associated with upgrade of the fixtures, Table 19 only shows the replacement of the existing showerhead with a water efficient fixture. With a payback period of 4 years, this ESO is a feasible option. Installing an instantaneous hot water heater would save over 1,100 kWh per year with a payback of less than 21 years.

Motors

When replacing the existing motors for the plant's process systems, they should be upgraded to high efficiency motors. This would save over 1,000 kWh per year.

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 13.4) and maintenance activities (Section 13.5) 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. 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 incandescent bulbs 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. Photos 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.

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”. 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.

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 3°C “set-back” over a 12-hour period can reduce heating costs by 4%. Terminate ventilation during un-occupied periods.

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.

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, low-flush volume models that require only 6 L (1.3 Imp. gal.) per flush. Refer to the toilet and drain line reports on the Canadian Water and Wastewater Association (CWWA) website for advice in selecting a toilet that will perform well.

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 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.

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 savings opportunities suggested in this report range from simply changing a light bulb to installing a wall panel. Many of the simpler recommended upgrades could 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. A contractor should perform replacing the unused glass door with a wall panel.

Contractor Implementations

The majority of the energy saving opportunities will require a contractor. In terms of lighting, replacing the T12s with T8s requires 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 upgrading the wall and/or roof insulation.

In terms of HVAC, a contractor should be hired to install programmable thermostats and high efficiency air conditioner units.

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

For the water saving opportunities involving installing low-flow water 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

A consulting engineer should be consulted regarding any major renovations to the building envelope as well as the building HVAC systems to ensure the work is done properly and in accordance with building code requirements.

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, windows and wall insulation upgrade. 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 Municipalities Trading Company of Manitoba Ltd. (MTCML). Details on 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 project are included in 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 Manitou

A growing community, Manitou is undergoing continuous development. Knowledge gained from this efficiency study will be useful in future development projects. Future plans for this town include the Pembina Wellness Centre; a new building that will house a daycare, wellness centre, pool and hall. This new facility will be constructed in accordance with LEED standards for improved efficiency. The saving opportunities discussed throughout this report may be implemented into this new project, along with future endeavours that the Town may undertake.

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 and current members leave the council.

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 three 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 energy consumption in kWh taken from the building's hydro bill should be recorded in the "Billed Energy Consumption" column. The monthly propane consumption in L should be recorded in the "Billed Propane Energy" 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:

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

Where *NEC* is the Energy Normalized to year 2004-2005, *BEC* is the billed 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. For the Town of Manitou, data found for the Town of Morden was used. This data can be found for on the following website:

http://www.climate.weatheroffice.ec.gc.ca/climateData/monthlydata_e.html?timeframe=3&Prov=CA&StationID=29593&Year=2005&Month=3&Day=12

Once the "Billed Elec. Energy", the 'Billed Propane Energy" 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 AND SEWER AUDIT

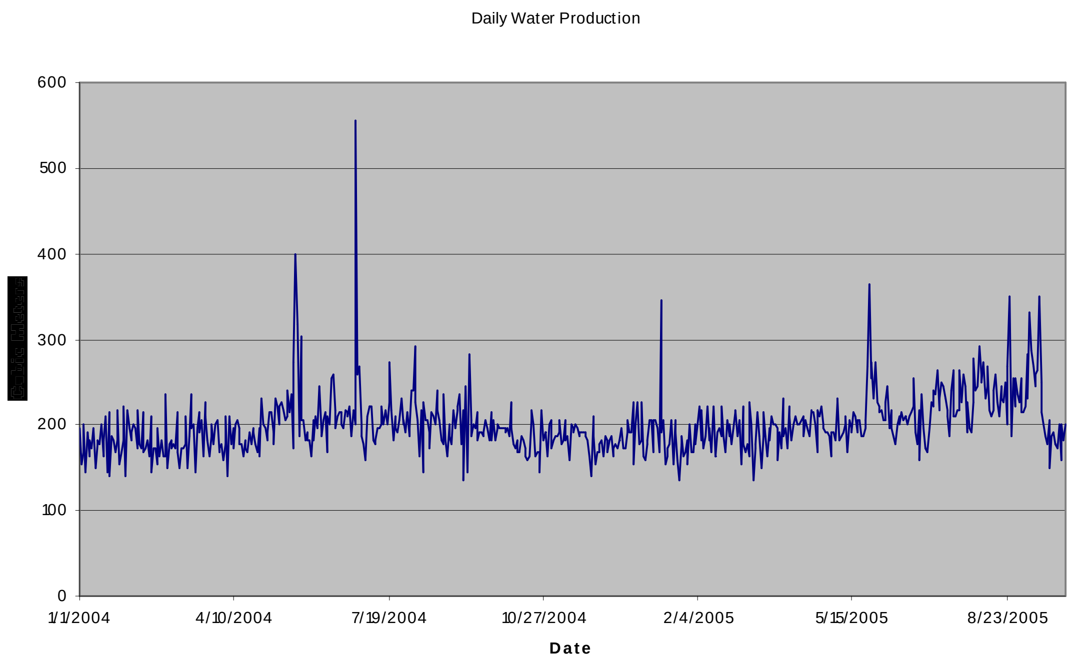
16.1 WATER SYSTEM OVERVIEW

The Town of Manitou constructed a water treatment and distribution system in 1963. In 2000, mechanical upgrades to the water treatment plant were performed.

Two submersible 5-horsepower pumps are located at the Manitou Dam pumping station and pump it to the water treatment plant. Once at the water treatment plant, the water is treated by lime-soda ash softening, coagulation, flocculation, sedimentation, filtration, activated carbon adsorption and final chlorination. Before entering the distribution system, fluoride is added to the water.

A 15-horsepower distribution pump provides water to the distribution system. If the distribution pump cannot keep up with demand, there is a 7.5-horsepower submersible backup distribution pump, or a 65-horsepower fire pump that can be used to pump additional water into the distribution system. Based on data provided, the average amount of water produced from January 2004 through September 2005 was approximately 200.2 m^3 per day with a maximum day flow of approximately 259.1 m^3 per day. From this data, the average water produced per capita is approximately 334.3 lpcd (litres per capita per day). 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



After being treated at the water treatment plant, the water is stored in three reservoirs. There is an underground reservoir located beneath the water treatment plant that has a storage capacity of approximately 90.9 m^3. There is also an external reservoir with a storage capacity of approximately 909.2 m^3 and a tower with a storage capacity of approximately 227.3 m^3.

The original distribution system was constructed in 1963 at the same time as the water treatment plant. According to data provided, the distribution system is approximately 8,110 m in length. The distribution system consists of approximately 645 m (2,115 ft) of 4-inch diameter asbestos concrete pipe; 5,054 m (16,580 ft) of 6-inch diameter asbestos concrete pipe, 838 m (2,750 ft) of 6-inch diameter cast iron pipe; 1,117 m (3665 ft) of 6-inch diameter PVC pipe; and 457 m (1500 ft) of 8-inch diameter asbestos concrete pipe. There is currently no program in place for replacing old piping. The distribution system is repaired and replaced as leaks are detected or breaks occur.

Table 21 lists the amount of water produced per quarter, as well as the amount of water consumed through metered uses, and the amount of water used in bulk sales or by the fire outlet, based on information received from operation staff.

Table 21 Water Consumption and Production by Quarter

Quarter	Bulk and Fire Water Use (m3)	Metered Water Use (m3)	Total Consumption (m3)	Total Water Produced (m3)	Total Unaccounted Water (m3)
March/04	125.2	15,715.8	15,841.1	16,593.2	752.2
June/04	88.8	16,675.1	16,763.9	18,998.1	2,234.2
Sept./04	62.4	17,138.8	17,201.2	18,607.1	1,406.0
Dec./04	30.7	15,452.2	15,482.9	16,961.5	1,478.6
March/05	34.3	15,656.7	15,691.1	16,925.1	1,234.0
June/05	70.2	16,479.6	16,549.7	18,825.4	2,275.6
Sept./05	48.8	15,806.8	15,855.5	21,048.4	5,192.9

For the most part, the total unaccounted-for water makes up between 7-12 percent of the total water produced at the water treatment plant. However, in the September 2005 quarter, the unaccounted for water made up approximately 24.2% of the total water produced at the treatment plant. There are a few factors that may have contributed to this increase in unaccounted water loss, such as a new leak in the distribution system or a water main break. It is recommended that the Town continue to monitor the amount of unaccounted-for water loss so that main breaks or new leakage problems can be caught as soon as possible.

The annual operating and maintenance cost for the treatment and distribution systems was $40,758.22 in 2004, and $50,437.30 in 2005

The cost associated with the Town of Manitou's unaccounted-for water loss if given in Table 22.

Table 22 Cost of Unaccounted-For Water Loss

Unaccounted-For Water Loss (m3)	
	January 2004 - September 2005
Total Water Produced	127,959
Total Water Sold	112,925
Authorized Unmetered Water Use[1]	461
Total Unaccounted-For Water Loss	14,573
Percent Unaccounted-For Water Loss	11.4%
Unit Cost per Cubic Meter[2]	$0.613
Cost of Unaccounted-For Water Loss	$8,933.50

[1] Based on information obtained from operation staff.
[2] Based on the operation and maintenance costs from 2004 and 2005.

Based on information provided, the Town lost approximately $8,930 due to unaccounted-for water loss over the period from January 2004 through September 2005, or approximately $5,115 annually. This cost may not be completely accurate, since the error of the distribution meter was unknown, and the overall error on the client water meters was estimated.

16.1.1 Water Meters

There is a 4-inch Neptune Trident water meter that measures water entering the distribution system at the water treatment plant in imperial gallons. Also, there is a 2-inch Neptune style G meter on the truck fill line, and a 3-inch Rockwell International flow meter that measures the amount of water used when the filters are backwashed.

Data provided shows that there are currently 379 water meters along the distribution system that measure water consumption on a per client basis, and that all of these meters have been tested within the last 20 years. Although a specific number could not be provided, operations personnel indicate that approximately 80 to 85% of the client meters have brass components, while the rest have plastic components. Table 23 shows the breakdown by meter size.

Table 23 Water Meter Breakdowns by Size

Meter Size	5/8 "	3/4"	1"	1.5"	2"
Number	363	4	5	4	3

16.1.2 Pumps

The two raw water pumps are located at the raw water pumping station, while all of the other pumps are located within the water treatment plant. Table 24 lists the relevant available pump data.

Table 24 Water Pump Data

Function	Motor Size (hp)	Motor Manufacturer
Fire Pump	65	Teledyne Wisconsin
Distribution Pump	15	Baldor
Submersible Distribution Pump	7.5	Goulds
Submersible Backwash Pump	7.5	Goulds
Submersible Raw Water Pumps (2)	5	Goulds

16.1.3 Water Rates

Based on information provided, meters are read and clients are charged quarterly. Clients pay a flat service charge of $7.50 per quarter for water and sewer service, which includes a certain amount of water, based on the size of the client's water meter. If a client consumes more water than is covered by the water included in the quarterly minimum charge, the client is charged at a rate of $9.50 per 1,000 imperial gallons. Both water service and sewer service are included in the additional rate. Table 25 lists the minimum quarterly fees based on the size of a client's water meter.

Table 25 Minimum Quarterly Water Rates for the Town of Manitou

Charges per Quarter	Meter Size				
	5/8”	¾”	1”	1.5”	2”
Service Charge	$7.50	$7.50	$7.50	$7.50	$7.50
Water	$21.30	$42.60	$85.20	$213.00	$532.50
Sewer	$7.20	$14.40	$28.80	$72.00	$180.00
Total Quarterly Minimum	$36.00	$64.50	$121.50	$292.50	$720.00
Water Included in Rate (Imp. Gal)	3,000	6,000	12,000	30,000	75,000

16.1.4 Maintenance Programs

There is currently no scheduled maintenance program in place at the water treatment plant; however, the 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.

The Town does not have a program for flushing the distribution lines, but fire hydrants are inspected yearly. Information provided states that main breaks only occur on average once every three years. Also, the Town previously undertook a leak detection survey and no leaks were detected even though operation staff indicates that one was present at the time of the survey. The completion date of the leak detection survey was not provided.

16.2 WATER 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.

Although the Town repairs leaks in the distribution system as they are detected, a program of regular scheduled leak detection can help prevent water loss from occurring in the future.

16.2.1 Unaccounted-For Water Loss

As calculated from the data supplied by the Town of Manitou, the Town has an unaccounted-for water loss of approximately 11.4% over the period from January 2004 through September 2005.

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 Manitou 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 Water Losses

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 dates when breaks or flushing occur and that the amount of water lost or used is estimated. This will increase the accuracy of any water audit performed in the future.

16.2.2 Maintenance Program

The Town should be congratulated on having had client water meters tested for accuracy. However, according to data published in the American Water and Wastewater Association (AWWA) journal, meters with entirely brass components that have not been calibrated in 20 years have an accuracy of approximately 98.75%; while meters that have plastic components have an accuracy of only approximately 93.51%. From this data, it can be seen that the Town of Manitou water consumption readings should be relatively accurate due to the majority of the meters having brass internal components. It is recommended that the Town develop a program for testing the accuracy of client water meters. One cost effective method would be to hire a summer student that would test the accuracy of the meters.

The Town should inspect the main water treatment plant meter and complete meter calibration on a routine basis. This will allow the Town to have accurate records pertaining to total water production and will give some indication as to whether leaks or breaks have occurred in the distribution system, which would be evidenced through an increase in overall water production without a corresponding increase in water consumption.

16.2.3 Possible Cost Savings

For the most part, according to information received, the Town of Manitou's water treatment and distribution systems appear to be run fairly efficiently. It is possible for the Town to reduce the amount of unaccounted-for water loss in the system through the completion of a leak detection survey. Assuming leak detection costs of approximately $300/km of main, not including mobilization costs, a leak detection survey may amount to approximately $2400 based on the 8 km of main located in the Town. If the Town was able to reduce the amount of unaccounted-for water lost through the system by half or 6% total losses, the Town could experience an annual savings of approximately $2,550 that approaches the approximate cost for a leak detection survey, assuming all unaccounted water is attributed to leakage. These costs do not include costs that may be required for Consultant fees or the actual repair costs. A leak detection survey of the distribution system may prove to be beneficial for accounting for water losses for the Town of Manitou, however costs presented do not include repair costs or consultant fees. The Town may also wish to first calibrate consumer meters to ensure losses are attributed to distribution system leakage.

The one area that could use some improvement appears to be the backwashing procedures. From information received, approximately 18,800 m^3 (4,136,700 imperial gallons) of water was used for backwashing the filters for the period from January 2004 through September 2005. Comparing this volume to the measured volume of treated water produced at the treatment plant shows that backwash water accounts for approximately 14.7% of the water processed at the plant. Typical values for the amount of treated water used to backwash filters range from 1% to 6%. If the Town of Manitou was able to reduce the amount of water used to backwash the filters to 6%, chemical costs and pumping costs would be reduced, with annual chemical costs decreasing by as much as 8%. A reduction of 8% in backwash water consumption would save approximately $6,250 annually at the estimated production cost including chemical costs and associated consumables.

It is recommended that the Town of Manitou consider performing a filter audit to determine if a decrease in the amount of water used for backwashing would be feasible. Costs for a filter audit may range from $3000 to $5000. This does not include costs associated with modifications to the filters or any upgrades that may be required.

16.3 SEWER SYSTEM OVERVIEW

The Town of Manitou's sewer collection and treatment system was constructed in the early 1960s. According to operation staff, the system is approximately 7,914 m (25,963 ft) in length. The system consists of approximately 745 m (2,445 ft) of 12-inch diameter asbestos concrete pipe; 876 m (2,875 ft) of 10-inch diameter asbestos concrete pipe; 4,032 m (13,228 ft) of 8-inch diameter asbestos concrete pipe; 957 m (3,140 ft) of 8-inch diameter clay tile pipe; and 1,303 m (4,275 ft) of 8-inch diameter PVC pipe. According to data provided, there are 79 manholes located throughout the collection system, which allow access for any maintenance that is required.

The sewage collection system is strictly a sanitary sewer system. Surface water runoff is diverted through a system of ditches and culverts, keeping the runoff out of the sewer system. The major advantage of a sewer system for strictly sanitary flows is that the amount of infiltration and inflow into the sewer system will be limited, thus saving the Town money on pumping costs, as well as reducing the lagoon capacity required to treat and store the wastewater. According to operation staff, some weeping tiles and sump pumps are connected to the sanitary sewer system, but these are mainly found in the older areas of town.

The waste flows to one of three sewage lift stations, located on View Street, Hamilton Street, and Voth Street. These sewage lift stations then pump the collected sewage to the Main lift station, which then pumps the wastewater to the lagoon. The lagoon has two cells. The primary cell covers 6.8 acres, while the secondary cell covers 8.5 acres. After treatment, the lagoon discharges to the Mary Jane Creek.

The annual operating and maintenance cost for the sewer system was $91,742.80 in 2004, which included some sewer main replacement, and $31,742.80 in 2005.

16.3.1 Pumps

The View Street and Hamilton Street sewage lift stations each have one pump; whereas both the Voth Street and the Main lift stations have two pumps. All of the pumps are located within their respective lift stations. Table 22 provides the available relevant pump data.

Table 26 Lift Station Pump Data

Function	Motor Size (hp)	Pump Manufacturer
View Street Lift Station Pump	3.8	GSW
Hamilton Street Lift Station Pump	3.7	Barnes
Voth Street Lift Station Pumps (2)	2	Barnes
Main Lift Station Pumps (2)	20	Flygt

16.3.2 Sewer Rates

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

16.3.3 Maintenance Programs

There is currently no scheduled maintenance program in place. Any problems that arise are dealt with as soon as possible.

16.4 SYSTEM AUDIT RESULTS

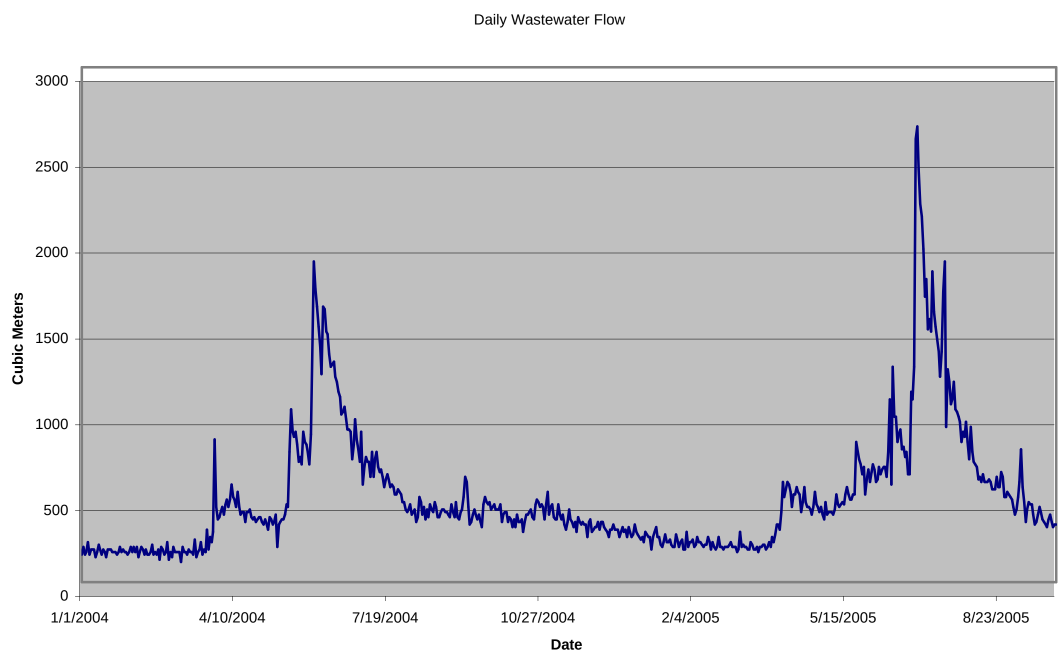
Since Manitou operates a sewer system that is not designed to collect storm water or runoff, it is expected that there will not be a large discrepancy in the volume of water pumped to the lagoon over the course of a year. Some infiltration and inflow should be expected, since, as mentioned in the water 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 Main lift station, the total volume of wastewater flowing through the system was estimated as the amount of wastewater flowing through the

Main lift station. Pump hours were used in order to try and develop an estimate of the flow through the system. Using pump hours to estimate flows can be very inaccurate and will be affected by pump plugging, worn impellers, and other conditions, which result in a reduced volume of sewage actually pumped than would be expected for the recorded time frame. This will result in an exaggerated volume of sewage pumped. The second problem encountered with using pump hours is that the actual operating conditions were unknown; however, according to operation staff, the pumps at the main lift station operate at a flow rate of approximately 40.54 l/s (535 igpm). Once again, if the pumps are operating at a flow rate lower than this, it could lead to an exaggeration of the volume of sewage pumped. For these two reasons, it is recommended that the Town install a flow meter, such as a magnetic flow meter, at the Main lift station so that the volume of wastewater flowing through the collection system could be better estimated in the future.

Chart 2 shows the daily flow of wastewater through the Main lift station for the period from January 2004 through September 2005.

Chart 2 Daily Wastewater Flows



As can be seen in Chart 2, the system experiences a significant increase in flow around June in both 2004 and 2005. From this result, it can be assumed that the sewer system is experiencing inflow and infiltration. The total infiltration and inflow for the Town of Manitou, as calculated from the data provided, is approximately 1,824-l/cm•km•day (litres per centimetre of equivalent pipe diameter per kilometres 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 Manitou's inflow and infiltration rate is greater than the 1,394 value, infiltration and inflow reduction methods may be cost effective. Through measures such as sealing manholes and lining pipes, the Town could potentially decrease infiltration and inflows to the sewer system. Further study should be conducted to determine the feasibility of these infiltration reduction options, since they may not be cost effective in the Town of Manitou's specific case. Reducing infiltration will reduce pumping costs and extend the effective life of the lagoons.

The Town should conduct a study in order to determine feasible options to deal with the extraneous water sources. This study would likely include a detailed review of manholes within the system and the televising of the sewage collection system.

In addition, many communities now require the disconnection of weeping tiles, sump pumps and rain leaders from the sanitary sewer system in order to reduce the impact on wastewater treatment facilities. Consideration should be given by the Town of Manitou to eliminate extraneous sources of water from entering the sanitary system, if possible.

16.4.1 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.

16.6 RECOMMENDATIONS

It is recommended that the Town:

1 Develop a program for assessing the accuracy of client water meters.

2 Develop a program for scheduled leak detection of the water distribution system.

3 Continue determining the annual unaccounted-for water loss percentage to determine when a leakage prevention program would be justified.

4 Conduct a filter audit to determine if the filter backwash procedure could be optimized.

5 Develop a routine maintenance program for the lift station pumps to ensure they continue to work at an efficient level.

6 Conduct a study on the feasibility of options such as sealing manholes and lining sewer pipes to reduce the effects and costs of infiltration entering the sanitary sewer system.

7 Install a flow meter at the Main sewage lift stations and take daily meter readings so that the amount of water flowing through the collection system is known.

8 Provide public education on the water and wastewater treatment systems as discussed in Section 16.5

APPENDIX A

INVENTORY SHEETS

TABLE OF CONTENTS – APPENDIX A

BUILDING INSPECTION INVENTORY
Revision 2

Municipality: Manitou	**Date:** January 11, 2006
Toured By: Ray Bodnar, Harry Hiebert, Larry Thompson & Travis Long	**Construction Date:** ~1972
Building: Arena	**Renovations:** Change rooms renovated in 2003. New zamboni room in 2000. Geothermal added in 1997.
Address: 212 Carrie	
L x W x H: See below. **Area:** See below.	
Building Capacity: 600	
Building Floor Plan: (In feet) Rink: 200 x 108 x 22 Lobby: 108 x 38 x 11 Change room: 108 x 38 x 11	**Occupied Times:** November 15 – March 30 M-F: 4pm-10pm Sat & Sun: 9am –6pm

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: Metal clad no insulation in rink (not heated). 6” walls R20 for lobby – to be confirmed.
Roof Type/R-value: 12” blown-in in the attic.
Door Type/weather stripping: 4 ped. doors from lobby to outdoors – no caulking and poor weather-stripping. 5 ped. doors from lobby to rink – poor weather-stripping.
Window type/caulking: None to outside. 11 – 6’x5’ windows – 2 pane – lobby to rink area.
Other:
MECHANICAL
Heating System: 3 geothermal heat pumps for space heating & cooling. Electric unit heater in ice plant room. Propane boiler for zamboni’s water heating and ice melting.
Cooling System: Geothermal
Ventilation System: Propeller fan in rink - too small for ice making with 2 vents @ opposite end. Kitchen exhaust fan (grease system). No MVA.
HVAC Controls: 3 Heat/cool stats – no set back
HVAC Maintenance/Training: No training on geothermal. HP filters are dirty.
Water Supply System: Metered from Town.
Domestic Hot Water System: 2- 270L electric tanks: 4500 W each. No pipe insulation. **Water Fixtures:** 6 toilets, 8 sinks, 4 urinals, 8 showers. All fixtures are high flow units.

ELECTRICAL	
Indoor Lighting: 4' x 2 – 13 T12 (34W).	8'x2 – 12 T12s
39 – 100 W incandescents.	24 – 400 W metal halide in rink (not enough light).
Outdoor Lighting: 2 – 100W incandescent & 2 other lights on all day.	
Exit Signs: 6 incandescent.	
Motors:	
Parking Lot Plugs: None.	

OTHER BUILDING SYSTEMS
Zamboni ice pit melted by propane heater. 6' x 4' 4' deep pit (one) full of ice melted per day instead of dumping Outside. 199 MBH instantaneous boiler on propane. Old 250 gal oil tank used for water heating. Tank is poorly insulated & open top venting into room.

PROCESS SYSTEMS
15 ton geothermal ice plant – marginal in size.

BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
Zamboni room too humid due to ice melting & poor water heater - mould + insulation damage will occur. Boiler corrosion. Propane & hydro in building.

NOTES
Lobby to be renovated with building addition including rink windows. Heat pump in basement & main floor set up to waste heat outside. No drawings of the geothermal system & no training by contractor. No ventilation in the change rooms (to come).

BUILDING INSPECTION INVENTORY
Revision 2

Municipality: Manitou	**Date:** January 11, 2006
Toured By: Ray Bodnar, Travis Long & Al Thorieifson	**Construction Date:** 1930 after it had burned down.
Building: Manitou Opera House **Address:** 325 Main Street **L x W x H:** 75’ x 36’ x 19’ — **Area:** 2700 SF **Building Capacity:** ~200	**Renovations:** 1997 – wall insulation upgraded in basement excluding east wall. One new 3-pane window added in the basement. 1998 –geothermal added.
Building Floor Plan: Main floor- opera house. Basement –music studios & change rooms.	**Occupied Times:** On average: 250 days/year for 10 hours/day. Varies with usage.

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: Basement is 6” fibreglass except the east wall. Main floor has 6” walls with woodchips & plaster.
Roof Type/R-value: 3 ft of blown in paper savings into the attic -acceptable.
Door Type/weather stripping: 5 old wooden doors – poor weather stripping & no caulking (can’t replace).
Window type/caulking: Main floor : 12 – 28” x 52” ; 14- 28” x 94” ; 2 – 32” x 44” Basement: 2- 26” x 12” ; 2 – 28” x 38” ; 5 – 26” x 40”
Other:
MECHANICAL
Heating System: 3 – geothermal heat pumps.
Cooling System: See above.
Ventilation System: No ventilation.
HVAC Controls: 3 standard HP stats.
HVAC Maintenance/Training: HP filters clean. 2 leaking sinks & urinal.
Water Supply System: Meter system.
Domestic Hot Water System: 1 – Electric 175L tank (3000W x 2 elements). No insulation on piping.
Water Fixtures: 2 sinks with auto shut offs. 3 very high flow toilets @ 18L/F. 2 – high flow urinals.

ELECTRICAL
Indoor Lighting: 22 – 60W incandescent bulbs. 7 – (4'x2) T12s @ 40W.
Outdoor Lighting: 3 – 60W incandescents
Exit Signs: None
Motors:
Parking Lot Plugs: None
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
NOTES

BUILDING INSPECTION INVENTORY

Revision 2

Municipality: Manitou		**Date:** January 11, 2006
Toured By: Ray Bodnar, Travis Long & Garry Christoff		**Construction Date:** ~ 10 years old
Building: Campground change room		**Renovations:**
Address: 345 Edith Street		
L x W x H: 21' x 10 ' x 8'	**Area:** 210 SF	
Building Capacity: 5 intermittent.		
Building Floor Plan: Change rooms, washrooms & shower.		**Occupied Times:** Summer use only.

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: Building not heated.
Roof Type/R-value:
Door Type/weather stripping:
Window type/caulking:
Other:

MECHANICAL
Heating System: None
Cooling System: None
Ventilation System: None
HVAC Controls:
HVAC Maintenance/Training:
Water Supply System: Water meter.
Domestic Hot Water System: 270L electric water heater @ 4500 W.
Water Fixtures: 2 sinks, 2 toilets & 2 showers.

ELECTRICAL
Indoor Lighting: None.
Outdoor Lighting: None.
Exit Signs:
Motors:
Parking Lot Plugs:
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
NOTES

BUILDING INSPECTION INVENTORY
Revision 2

<table>
<tr><td colspan="2">Municipality: Manitou</td><td>Date: January 12, 2006</td></tr>
<tr><td colspan="2">Toured By: Ray Bodnar</td><td>Construction Date: ~1946</td></tr>
<tr><td colspan="2">Building: Child Care Centre</td><td rowspan="4">Renovations:
House used for day-care; garage converted into day-care.</td></tr>
<tr><td colspan="2">Address: 258 Hamilton</td></tr>
<tr><td>L x W x H: See below.</td><td>Area: 1484 SF</td></tr>
<tr><td colspan="2">Building Capacity: 20</td></tr>
<tr><td colspan="2">Building Floor Plan: Main floor day-care (garage). Second floor –staff office. Basement – church office.
Garage: 24’x24’
Between house and garage: 10’x14’
House: 24’x32’</td><td>Occupied Times:
Day-care: M-F from 6am - 6pm
Basement: 6 hrs/wk</td></tr>
</table>

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: 2 x 6 walls with stucco outside & vinyl siding (garage). Drywall inside. Finished basement.
Roof Type/R-value: Unknown.
Door Type/weather stripping: Poor front door –wood. Poor weather-stripping & caulking. Back door insulated – poor w/s and caulking.
Window type/caulking: 3 pane – 1990 in house. 3 –pane in garage.
Other:
MECHANICAL
Heating System: Electric baseboard in garage and main floor (2). Baseboards in basement (2). Electric furnace.
Cooling System: 2 ton –A/C standard efficiency.
Ventilation System: None – kitchen exhaust
HVAC Controls: Standard stats (3) + 2 in basement.
HVAC Maintenance/Training: Filter removed from furnace. 30” x 12” broken window in basement.
Water Supply System: Water meter.
Domestic Hot Water System: 175-L electric tank.
Water Fixtures: 1 sink, 3 toilets – all high flow fixtures.

ELECTRICAL
Indoor Lighting: Second floor: 1 – (4'x2) T12 @ 40W. 3-100W incandescents. Main floor: 5 – (4'x2) T12. 9- 60W incandescents. Basement: 4- (4'x2) T12. 1- 60W incandescent.
Outdoor Lighting: Not used.
Exit Signs: None
Motors:
Parking Lot Plugs: 1 in use.
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
NOTES

BUILDING INSPECTION INVENTORY
Revision 2

Municipality: Manitou	**Date:** January 12, 2006
Toured By: Ray Bodnar & Garry Christoff	**Construction Date:** ~1975
Building: Fire Hall (same building as the Garage).	**Renovations:** Wall/roof insulation added.
Address: 300 Front Ave.	
L x W x H: 48 x 57 x 18’ — **Area:** 2736 SF	
Building Capacity: 12 – for meetings intermittently.	
Building Floor Plan: Fire Hall + meeting room.	**Occupied Times:** 20 hrs/wk lights are on.

ARCHITECHTURAL/STRUCTURAL

Wall type/R-value:
- Walls + roof the same. Shingles + metal cladding.
- R22. 7” Fibreglass dome shape. Drywall inside.

Roof Type/R-value: See walls.

Door Type/weather stripping:
- Insulated vehicle door – stripping is 7/10 14’ x 12’.
- Floor cracks let air in. No caulking.
- 2 ped doors –poor w/s and no caulking.

Window type/caulking:
- 2 pane –no caulking (2’ x 6’ – 2”).
- Meeting room 2 covered up in shop.

Other:

MECHANICAL

Heating System:
- Electric baseboard in the meeting room with manual stat.
- Radiant heater in garage with manual stat.

Cooling System: None

Ventilation System:
- Exhaust vent in meeting room.

HVAC Controls:
- Manual stats (2).

HVAC Maintenance/Training:

Water Supply System:
- 2” line for truck filling.

Domestic Hot Water System:
- 175L 3000W electric tank – insulated water lines.

Water Fixtures:
- 1 toilet + 1 sink – both high flow. 13LPF toilet.

ELECTRICAL
Indoor Lighting: • **Garage:** 4 (8' x 2) T12s@ 75W. 1- 100W incandescent. • **Meeting Room:** 5 (4' x 2) T12s @ 40W.
Outdoor Lighting:
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: Manitou		**Date:** January 12, 2006
Toured By: Ray Bodnar & Garry Christoff		**Construction Date:** 1975
Building: Municipal Garage (Same as Fire Hall).		**Renovations:** Same as Fire Hall, except 4" in walls/roof.
Address: 300 Front Ave.		
L x W x H: 41' x 48' x 18'	**Area:** 1968 SF	
Building Capacity: 2		
Building Floor Plan: Vehicle garage, office, water meter repair & workshop.		**Occupied Times:** M-F from 8am – 5pm.

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: Shingles + drywall with 4" insulation = R10.
Roof Type/R-value: Same as walls.
Door Type/weather stripping: 1 old wood ped door- poor w/s with ¼" gap + no caulking. ▪ 1 insulated vehicle door (12' x 9') – poor w/s + no caulking.
Window type/caulking: None.
Other:
MECHANICAL
Heating System: Radiant heater in garage; baseboard in office; unit heater in repair shop.
Cooling System: None.
Ventilation System: None.
HVAC Controls: Standard stats.
HVAC Maintenance/Training:
Water Supply System: Water meter.
Domestic Hot Water System: In Fire Hall.
Water Fixtures: In Fire Hall.

ELECTRICAL
Indoor Lighting: ▪ Office: 1 – (8' x 2) T12 @ 75W & 1- (4'x2) T12 @ 40 W. ▪ Garage: 2- (8' x 2) T12 ▪ Workshop: 1 – (8' x 2) T12 & 2 –(4' x 4) T12 @ 40 W.
Outdoor Lighting: Good.
Exit Signs: None.
Motors:
Parking Lot Plugs: 1 – not used.
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
NOTES

BUILDING INSPECTION INVENTORY
Revision 2

Municipality: Manitou		**Date:** January 12, 2006.
Toured By: Ray Bodnar		**Construction Date:** ~ 1920.
Building: Heritage Building (Visitors Centre).		**Renovations:** Heritage Building restored as such.
Address: Main St. + Hwy 3.		
L x W x H: 23 x 17 x 8'	**Area:** 391 SF	
Building Capacity: 1		
Building Floor Plan: Open reception area.		**Occupied Times: Summer** only – see sign.

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: Logs. Not heated.
Roof Type/R-value:
Door Type/weather stripping:
Window type/caulking:
Other:
MECHANICAL
Heating System:
Cooling System: Not air-conditioned.
Ventilation System: Windows.
HVAC Controls:
HVAC Maintenance/Training:
Water Supply System: None.
Domestic Hot Water System: None.
Water Fixtures: None.

ELECTRICAL
Indoor Lighting: 4 – 60W incandescents. 3 –flood lights.
Outdoor Lighting: 2 – 150W Floods – on a timer.
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: Manitou		**Date:** January 12, 2006.
Toured By: Ray Bodnar & Jake Goertzen.		**Construction Date:** 1989
Building: Library		**Renovations:** Renovated in 2002.
Address: 418 Main Street.		
L x W x H: 42 x 38 x 12’	**Area**: 1586 SF	
Building Capacity:		
Building Floor Plan: Library and office.		**Occupied Times:** 17 hrs/wk: Tuesday, Thursday & Sat.

ARCHITECHTURAL/STRUCTURAL

Wall type/R-value:

- R22 vinyl siding with drywall.
- Basement walls are not insulated.

Roof Type/R-value:

- R 50 in the attic.

Door Type/weather stripping:

- 2 ped doors – poor glass, one not in use, 2-pane type.
- 2 – good insulated doors - NOT USED.
- All doors need caulking.

Window type/caulking:

- 3 pane windows – require caulking
- 2’ x 6’ – 6 in number

Other:

MECHANICAL

Heating System: Electric furnace.

Cooling System: A/C split system.

Ventilation System: None to furnace.

- 2 Broan fans in the washroom.

HVAC Controls: Temperature setback stat set to 65ºF from 5pm until 9am for weekdays and weekends.

HVAC Maintenance/Training: Clean filter.

Water Supply System: Metered.

Domestic Hot Water System: 52-gal electric water tank. No insulation. 3000W.

Water Fixtures: 2 sinks + 2 toilets – all high flow fixtures.

ELECTRICAL
Indoor Lighting: ▪ Basement: 10-100W incandescents & 1-(4’ x 2) T12s @ 34W. ▪ Main Floor: 4 – 60W incandescents & 17 – (4’ x 4) T12s @ 34W.
Outdoor Lighting: ▪ 5 – 100W incandescents.
Exit Signs: None.
Motors: None.
Parking Lot Plugs: None.
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
NOTES

BUILDING INSPECTION INVENTORY
Revision 2

Municipality: Manitou		**Date:** October 25, 2005
Toured By: Tibor Takach & Gerry Christoff		**Construction Date:** Early 60's
Building: Sewage Lift Station		**Renovations:** None
Address: Front Avenue		
L x W x H: 3m x 5m x 2.5m	**Area:** 15 m^2 (161.5 SF)	
Building Capacity:		
Building Floor Plan: Square floor plan		**Occupied Times:** Daily for approximately ½ hour

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: • 2x4 construction, asbestos board interior sheeting, blown in insulation, stucco exterior. Assumed to vapour barrier and exterior sheeting.
Roof Type/R-value: • 2x4 framed roof construction, unknown insulation (assumed blown in), plywood sheeting, and asphalt shingles.
Door Type/weather stripping: • Double interior/exterior door assembly at entrance • 34" metal insulated exterior door • 34" solid wood core interior door; weather stripping and door seep in place.
Window type/caulking: • 53" x 28" vertical sliding (sash) windows; single pane • 2 – 18"x30" sliding windows, single pane.
Other:
MECHANICAL
Heating System: • Wall mounted 3 kW space heater • Interior temperature maintained about 10°C - 15°C during winter months • Ceiling mount air handling unit; 600V; 3kW, motorized damper
Cooling System: None
Ventilation System: • Wetwell ventilation consists of a ¼ hp; 230V; 60 hz; 6 amp; continuous duty, Canadian Blower; C-size Babyvent
HVAC Controls: • Thermostat for building temperature control
HVAC Maintenance/Training:
Water Supply System: • Town distribution system provides water to plant
Domestic Hot Water System: • Rheenglas Standard, 1500W single element, electric water heater, 36L capacity

Water Fixtures: 1 sample sink with hot/cold fixture.
ELECTRICAL
Indoor Lighting: • 2 – 300 W incandescent fixtures • 1 – 100 watt wetwell light fixture
Outdoor Lighting: • photocell actuated sodium light (or metal halide)
Exit Signs: • None
Motors:
Parking Lot Plugs: • None
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
Main Lift Station (Front Avenue): • 2 Flygt pumps, no soft start/stop or VFD control. • Pumps consist of Flygt Model 3152.181, 20 hp, 1750 rpm, 600V, 3 phase, 60 hz, 100mm suction discharge, 63.3 % efficiency. • Pumps rated at 47 L/s @ 21 m TDH (535 igpm) **View Street Lift Station:** • 1- GSW model # 3SE-201; 3.8 hp; 230 V; single phase; 60 hz; 1750 rpm; 18.5 A; Code A. • Float switch operation **Hamilton Street Lift Station:** • 1 – Barnse; Model 3SE3724L; 3.7 hp; 230 V; single phase; 60 hz; 1750 rpm; FLA 17.5; Code A Class B; Imp. Diam. 6.5”. **Voth Street lift Station:** • 2 – Barnes; model SE203; 2 hp; 230 V; 3 phase; 14 amp.
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
• 200 A; 600 V; 3 phase, main power supply
NOTES
• Three other lift stations feed into the main lift station. • Main lift station is the only one that is monitored.

BUILDING INSPECTION INVENTORY
Revision 2

Municipality: **Manitou**	**Date: January 11, 2006**
Toured By: Ray Bodnar & Kathi Furniss.	**Construction Date:** 1997
Building: Municipal Admin Building.	**Renovations:** Totally renovated (New Building) in July 1997.
Address: 261 Main Street.	
L x W x H: 50' x 50' x 12' — **Area:** 2500 SF	
Building Capacity: 7 (12 in the summer).	
Building Floor Plan: Office with basement. Recycling Depot attached on East Side (Refer to Drawing).	**Occupied Times:** M-F from 8am – 5pm.

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: ▪ 2' x 6' walls – R28. ▪ Metal exterior/drywall interior.
Roof Type/R-value: ▪ Metal and drywall. ▪ R-value is unknown in Attic space.
Door Type/weather stripping: ▪ 2 ped doors with 5/10" weather –stripping & no caulking.
Window type/caulking: ▪ 5 – 4' x 5' ▪ 2 – 4' x 6' ▪ All 3 pane & no caulking.
Other:
MECHANICAL
Heating System: Geothermal system to ground loop.
Cooling System: Geothermal.
Ventilation System: Van EE HRV Raas 24/7. ▪ Disconnected from the heat pump – blowing into the basement.
HVAC Controls: Heat/cool stat – no setback.
HVAC Maintenance/Training: Water treatment? Filters are clean. ▪ HRV intake plugged with dirt.
Water Supply System: Water meter off town water.
Domestic Hot Water System: 175-L electric water heater. No insulation on piping.
Water Fixtures: 2 sinks – low flow. ▪ 2 toilets – high flow.

ELECTRICAL
Indoor Lighting: ▪ Basement: 14 – (4' x 2) T12s @ 34W. Hardly used in basement. ▪ Main floor: 28 – (4' x 2) T12s & 5 – 60W incandescents.
Outdoor Lighting: Good lighting.
Exit Signs: None
Motors:
Parking Lot Plugs: 4 plugs.
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
NOTES

BUILDING INSPECTION INVENTORY
Revision 2

Municipality: Manitou	**Date:** January 11, 2006.
Toured By: Ray Bodnar, Kathi Furniss & Wils Clayton.	**Construction Date:** 1997 – Same as Municipal Office.
Building: Recycling Depot. **Address:** 261 Main Street (same as Municipal Office). **L x W x H:** 50' x 50' x 16' — **Area**: 2500 SF **Building Capacity:** 1	**Renovations:**
Building Floor Plan: 1 large room – NOT HEATED.	**Occupied Times:** 21 hrs/weeks for 3hrs/day, 7 days/wk.

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: ▪ Metal clad & no insulation.
Roof Type/R-value: ▪ Metal & drywall.
Door Type/weather stripping: ▪ 2 ped doors ▪ 1 vehicle door.
Window type/caulking:
Other:
MECHANICAL
Heating System: None.
Cooling System: None.
Ventilation System: Wall fan c/w BDD.
HVAC Controls: Manual.
HVAC Maintenance/Training:
Water Supply System: None.
Domestic Hot Water System: None.
Water Fixtures: None.

ELECTRICAL
Indoor Lighting: 8 – 150W incandescents & 1 –500W incandescent.
Outdoor Lighting: 2 –150W incandescents.
Exit Signs: None.
Motors:
Parking Lot Plugs: None.
OTHER BUILDING SYSTEMS
Interior lights on time & occupancy sensor.
PROCESS SYSTEMS
Cardboard crusher (bailer) ~ 5hp. Bailer used 3 hrs/day for 7days/wk.
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
Hydro only. No gas in town.
NOTES

BUILDING INSPECTION INVENTORY

Revision 2

Municipality: Manitou		**Date:** January 11, 2006
Toured By: Ray Bodnar & Travis Long.		**Construction Date:** 2003
Building: Swimming Pool Outdoors.		**Renovations:** None.
Address: 412 Souris Ave.		
L x W x H: 20' x 40' x 8'	**Area:** 800 SF	
Building Capacity: 1		
Building Floor Plan: Process Building for pool. 3 water slides: kids, flume & rocket slide PLUS pool.		**Occupied Times:** June to August – 7 days/wk from 8am – 9pm.

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: ▪ 2' x 6' walls – R20 ▪ Metal clad drywall interior.
Roof Type/R-value: ▪ Attic space with 6" blown in fibreglass @ R20.
Door Type/weather stripping: ▪ Good doors & weather-stripping.
Window type/caulking: No windows.
Other:
MECHANICAL
Heating System: 1-geothermal heat pump for heating and cooling. 3 ton fed from Arena – heated to 68ºF all winter.
Cooling System: See above.
Ventilation System: None – exhaust fan in chemical room – no intake.
HVAC Controls: Standard heat/cool stat – no setback.
HVAC Maintenance/Training: All pool heat pumps set @ 82ºF – should stage them.
Water Supply System: Water meter off town.
Domestic Hot Water System: None.
Water Fixtures: None.

ELECTRICAL
Indoor Lighting: ▪ 6 – (8' x 2) T12s @ 60W.
Outdoor Lighting: None –designed required.
Exit Signs:
Motors:
Parking Lot Plugs:
OTHER BUILDING SYSTEMS
Back up propane boiler – Teledyne Laars 400 MBH for pool heating. Geothermal good to 78ºF pool water. Boiler required to get to 82ºF on season start. Geothermal can maintain 82ºF most times. Heat saver pool chemical used 12 oz/day to save water loss.
PROCESS SYSTEMS
3 – 10 ton Heat Pump (HP) Pool pumps: 7.5 HP, 10HP, 3 HP –waterslides*, 15 HP pool circulates 24/7, 1 HP booster pump for HPs 24/7. Standard efficiency in 2003. * Run during occupancy only.
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
NOTES

BUILDING INSPECTION INVENTORY
Revision 2

Municipality: Manitou	**Date:** October 25, 2005
Toured By: Tibor Takach & Bob Barrett	**Construction Date:** 1963
Building: Water Treatment Plant	**Renovations:** Some mechanical upgrades in 2003. No other upgrades completed otherwise
Address: 126 Ellis	
L x W x H: 47' x 38' x 24' — **Area:** 1786 SF	
Building Capacity:	
Building Floor Plan: Open main area; small enclosed office area; small enclosed washroom and shower area	**Occupied Times:** Occupied throughout the day from 6:30 am to 11:00 pm. Equivalent to 6-7 hours occupied daily.

ARCHITECHTURAL/STRUCTURAL

Wall type/R-value:

- Concrete block external wall construction. No information regarding insulation provided. Assumed that blown in insulation incorporated into the wall.

Roof Type/R-value:

- Concrete, built up roof; 4 ½ " insulation; tar and gravel

Door Type/weather stripping:

- 1 – glass; double side by side entry door; double pane; each door is 36" wide x 6'8" tall; aluminium framing
- 2 – 36", exterior metal insulated doors, weather stripping present but damaged. Both entrances have double door assembly consisting of interior/exterior door with same specs.

Window type/caulking:

- 2 – 64" x 42", double pane windows framing main entrance doors; aluminium framing; caulked
- 12' high section of wall containing window previously framed with 2x6 wood framing and exterior sheeting; insulated with fiberglass insulation (see photo's)

Other:

MECHANICAL

Heating System:

- SXH 120 heat pump; 3 hp fan motor; 197/254 V; total unit FLA 43.8
- 3 – Chromolox Type VUB-1D Vertical blower units heaters; rated capacity of the units could not be observed due to location. O&M Manual indicates three possible ratings 5 kW @ 17060 BTU/hr; 7.5 kW @ 25590 BTU/hr; or 10 kW @ 34120 BTU/hr.

Cooling System: Same unit as heating system

Ventilation System:

- Exhaust air fan and vent; 24" x 46" opening
- Make-up air vent; 38" x 46" opening; motorized air damper
- Ventilation openings blocked and insulated during winter months

HVAC Controls: Thermostat

HVAC Maintenance/Training:

Water Supply System: Distribution system.

Domestic Hot Water System: John Wood; 6000W, 2 element electric heater, 30 US gal capacity

Water Fixtures: Sample sink and fixture, shower and fixture, standard flush toilet, hand sink and fixture.

ELECTRICAL
Indoor Lighting: • 8 – 300W incandescent suspended unit in main process area • 1 double lamp fluorescent fixtures in sample room; do not appear to be high efficiency units • 1 – 300 W incandescent fixture in bathroom area
Outdoor Lighting: • 4 – 150 W incandescent fixtures at main entrance; 2 located at main entrance; 1 unit located at each of the other two exterior entrances.
Exit Signs:
Motors:
Parking Lot Plugs: • 3 – exterior electrical outlets; 2-located in fenced in area; 1 located on NE side of building
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
Raw Water Pumps: • 2 – 5 hp, submersible pumps at raw water pumping station. **Backup Pump:** • Motor: Petroleum fired; 65 hp; Model V-465D; 4 cyl; Teledyne Wisconsin Motor; 177 cubic inch. • Pump: Monarch model E776GV Type C; 6” suction/discharge **Distribution Pump #1:** • Motor: 15 hp; 575 V; 13.5 A; 2450 rpm; Frame 215T; 3 phase; 60 hz; S.Fact 1.15; Code M; Class A; Design F; Nom. Eff. 90.2%; Peak Eff. 91% • Pump: Peerless End suction centrifugal; Type 820A; design DB; Impeller# V3289B; diam. 6 ¾”
Distribution Pump #2: • Goulds, 7.5 hp; Model 150L; 3 stage; 6” sub; 208V, 3phase; rated at 50 gpm @ 200’ TDH **Backwash Pump:** • Goulds, 7.5 hp; Model 150L; 3 stage; 6” sub; 208V, 3phase; rated at 50 gpm @ 200’ TDH
Sludge Blowdown Pump: • Goulds, 3 hp, Model WS3037D3, 575V; 3 phase **Lime/Soda Ash Pump:** • Monarch; 1/3 hp; 115 V; Model 3J720KS22
Chemical feed Pumps: • 5 – 115V; LMI positive displacement chemical feed pumps
Air Compressor: • Sanborn; 3 hp; Model 33-15-60H; 60 gal capacity
Lime Slurry Tank Mixer: • Lightnin Mixer; 1 ½ hp; 1745 rpm; 3 phase; 220 V

Lime Slaker Motor:

- Manufacturer Brooks Electrical; 1 hp; 3 phase.

Lime Vent Fan:

- Manufacturer, GEC Machines; ½ hp; 1 phase; 60 hz; 3.7 A; 1725 rpm

Clarifier Motor:

- Baldor; ½ hp; 3 phase; 1725 rpm; 1.25 service factor.

Carbon Tank Mixer:

- ½ hp motor

Backwash Flowmeter:

- 3” Rockwell International water meter

Distribution Water Meter:

- 4” Neptune Trident water meter

Coin Operated Truck Fill Water Meter:

- 2” Neptune Style G

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

- 200A, 3 phase, 575 V main service

NOTES

- Pump operation is on/off. No soft start/stop or VFD’s have been provided
- Town water pressure provided by Tower. Distribution pumps fill tower. Max elevation of tower is approximately 120 ft.

APPENDIX B

TABLES TO CALCULATE ENERGY SAVINGS

TABLE OF CONTENTS – APPENDIX B

Table B.1.1- Annual Energy Consumption for Arena

	Energy Consumption (kWh)	% of Total Energy Consumption
HVAC	97,161	30%
Ice Plant	145,742	45%
Lighting	22,680	7%
Domestic Hot Water	17,376	5%
Zamboni Hot Water	39,760	12%
Total	**322,720**	

Table B.1.2 (a) - Electricity Usage for the Arena

	Consumption Data			Calculated Costs		
Month (2004-2005)	Maximum KVA	Billed KVA	Energy (kWh)	Demand Charge	Energy Charge	Total Charge
September	0	0	22,800	$0	$1,052	$1,217
October	0	0	13,200	$0	$731	$851
November	0	0	27,840	$0	$1,170	$1,352
December	0	0	20,160	$0	$990	$1,147
January	0	0	21,960	$0	$1,033	$1,195
February	0	0	18,720	$0	$8,280	$9,457
March	0	0	23,640	$0	$1,072	$1,240
April	0	0	7,440	$0	$447	$527
May	0	0	6,840	$0	$411	$486
June	0	0	40,560	$0	$1,515	$1,745
July	0	0	40,680	$0	$1,518	$1,748
August	0	0	39,120	$0	$1,480	$1,705
TOTAL		**0**	**282,960**	**$0**	**$19,698**	**$22,672**

Table B.1.2 (b) - Propane Consumption for the Arena

Month (2004-2005)	Propane in (L)	Propane in gallons (US)	BTU	Propane (kWh)	Propane Costs ($)	Fuel Tax	Transportation Fee	Total Charge
September	0	0	0	0	$0	$0	$0	$0
October	0	0	0	0	$0	$0	$0	$0
November	0	0	0	0	$0	$0	$0	$0
December	1772	468	42921277	12,579	$948	$53	$3	$1,074
January	880	232	21315307	6,247	$471	$26	$3	$535
February	1445	382	35000703	10,258	$773	$43	$3	$877
March	1504	397	36429798	10,677	$805	$45	$3	$912
April	0	0	0	0	$0	$0	$0	$0
May	0	0	0	0	$0	$0	$0	$0
June	0	0	0	0	$0	$0	$0	$0
July	0	0	0	0	$0	$0	$0	$0
August	0	0	0	0	$0	$0	$0	$0
TOTAL	**5,601**	**1,480**		**39,760**	**$2,997**			**$3,399**

Table B.1.3 - Lighting Analysis Summary for the Arena

Description	Quantity	Current Conditions		After Improvements		Savings	
		Annual Energy Consumption (kWh)	Annual Cost ($)	Annual Energy Consumption (kWh)	Annual Cost ($)	Energy (kWh)	Annual Cost ($)
Fluorescents - Convert 4' T12s to 4' T8s (4' x2)	26	996	$60	190	$11	806	$48
Fluorerscents - Convert 8' T12s to 8' T8s (8'x2)	24	2,539	$152	1,182	$71	1,357	$81
Incandescents - Convert to compact fluorescents	39	3,557	$214	996	$60	2,561	$154
Metal Halide (400 W) - rink lights	24	8,755	$526	8,755	$526	0	$0
Outdoor incandescents - convert to high pressure sodium bulbs with photocell	4	5,256	$316	1,314	$79	3,942	$237
EXIT signs - Convert to LED modules	6	1,577	$95	158	$9	1,419	$85
TOTALS		**22,680**	**$1,362**	**12,594**	**$756**	**10,085**	**$606**

Annual Energy Savings (KWH)	**10,085**
Annual Cost Savings	**$606**
Percent Annual Energy Savings	**44%**

Notes:
These calculations are based on an occupancy rate of 912 hours/year.
The metal halide lights do not need an upgrade, therefore no improvements were made to them.
Assume exit signs are on for 24 hours a day, 365 days of the year.

Table B.1.4 (a) Window and Door Replacement Calculations for the 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 double pane 6'x5' windows -lobby to rink (11)	330	2.000	3,763	$226	6.25	1,204	$72	2,559	$154
TOTALS			**3,763**	**$226**		**1,204**	**$72**	**2,559**	**$154**

Table B.1.4 (b) Window and Door Infiltration Calculations for the 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 ($)
Pedestrian doors - 3'x7' (9)	45	0.05	125	154	12,918,133	3,786	$227
Windows- 11 of 6' x 5' size	61	0.025	50	83	6,947,085	2,036	$122
TOTALS						**5,822**	**$350**

Notes:
Efficiency is 300% because geothermal heat pumps used.

Table B.1.5 - Water Usage for the 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	8	3.4	25,080	1.60	40,128	0.32	8,026	32,102	1,203	$72
Toilets	6	2.1	11,400	13.25	151,050	6.00	68,400	82,650	NA	NA
Urinals	4	1.3	4,560	9.50	43,320	3.80	17,328	25,992	NA	NA
Showers	8	0.5	3,420	66.25	226,558	47.30	161,766	64,792	2,428	$146
Total					**461,056**		**255,520**	**205,536**	**3,631**	**$218**

Frequency at Which Fixtures are Used			
	Females	**Males**	**Totals**
Number of People	20	40	
Number of Toilet Uses/day	3	1	
Number of Toilets	6	6	
Toilet Uses/hour/fixture	1.25	0.833333	2.083333
Number of Sinks	8	8	
Number of Sink Uses/day	3	4	
Sink Uses/hr/fixture	0.9375	2.5	3.4375
Number of Urinals	0	4	
Number of Urinal Uses/day	0	1	
Urinal Uses/hr/fixture	0	1.25	1.25
Number of Showers	8	8	
Number of Shower Uses/day	1	1	
Shower Uses/hr/fixture	0.15625	0.3125	0.46875

Current Hot Water Usage (kWh)		
Fixture	**L/Yr**	**kWh**
Sinks	40,128	1,504
Showers	226,558	8,490
Total	**266,686**	**9,994**

Notes:

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 toilets use 1.5 gallons per flush

Table B.1.6 Energy Savings with Heating, Ventilation and Air Conditioning for Arena

Description	% of Time Unoccupied	HDD below 70 F	HDD below 59 F	Current Energy Used to Heat (kWh)	Heat Savings (kWh)
Setback Thermostats to 15C (59 F)	89.59%	9727.7	8,219	242,904	23,621

Description	Quantity	Current Efficiency	New Efficiency	Energy Savings (kWh)
Upgrade propane boiler with a high efficiency propane boiler	1	0.6	0.93	13,121

Table B.2.1 - Energy Breakdown for the Manitou Opera House

	Energy Consumption (kWh)	% of Total Energy Consumption
Heating Pumps	43,210	67%
Hot Water	15,186	24%
Lighting	5,803	9%
Total	**64,200**	

Table B.2.2 - Electricity Usage for the Manitou Opera House

	Consumption Data			Calculated Costs		
Month (2004-2005)	**Maximum KVA**	**Billed KVA**	**Energy (kWh)**	**Demand Charge**	**Energy Charge**	**Total Charge**
September	0	0	1,860	$0	$109	$142
October	0	0	3,540	$0	$207	$254
November	0	0	4,560	$0	$267	$323
December	0	0	8,340	$0	$489	$575
January	0	0	8,880	$0	$520	$611
February	0	0	15,120	$0	$805	$936
March	0	0	6,300	$0	$369	$439
April	0	0	6,540	$0	$393	$466
May	0	0	3,480	$0	$209	$256
June	0	0	2,100	$0	$126	$162
July	0	0	1,980	$0	$119	$154
August	0	0	1,500	$0	$90	$121
TOTAL		**0**	**64,200**	**$0**	**$3,704**	**$4,438**

Notes:
The electricity consumption for the Manitou Opera House is charged based on the General Service Small, Single Phase Manitoba Hydro rates.

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 the Manitou Opera House

Description	Quantity	Current Conditions		After Improvements		Savings ($)	
		Annual Energy Consumption (kWh)	Annual Cost ($)	Annual Energy Consumption (kWh)	Annual Cost ($)	Energy (kWh)	Annual Cost ($)
Incandescents indoors - 60W	22	3,300	$198	880	$53	2,420	$145
Fluorescents - Convert 4' T12s to 4' T8s (4'x2)	14	1,715	$103	1,050	$63	665	$40
Outdoor incandescents - convert to high pressure sodium lamps	3	788	$47	394	$24	394	$24
TOTALS		**5,803**	**$348**	**2,324**	**$140**	**3,479**	**$209**

Annual Energy Savings (KWH)	**3,479**
Annual Cost Savings	**$209**
Percent Annual Energy Savings	**60%**

Notes:
These calculations are based on an occupancy of 2500 hours/year.
Assume that outdoor incandescent lamps are on 12 hours a day, 365 days of the year.

Table B.2.4 (a) Window and Door Replacement Calculations for the Manitou Opera House.

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 old 7'x3' wooden door with insulated wood door (5)	105	1.578	4,553	$273	6.67	1,077	$65	3,476	$209
Replace double pane windows - 28"x 52" (12) - main floor	121	2.000	4,151	$249	6.25	1,328	$80	2,823	$169
Replace double pane windows - 28"x94" (14) - main floor	256	2.000	8,754	$526	6.25	2,801	$168	5,953	$357
Replace double pane windows - 32"x44' (2) - main floor	20	2.000	669	$40	6.25	214	$13	455	$27
Replace double pane windows - 26"x12" (2) - basement	4	2.000	148	$9	6.25	47	$3	101	$6
Replace double pane windows - 28"x38"(2) - basement	15	2.000	506	$30	6.25	162	$10	344	$21
Replace double pane windows - 26"x40" (5) - basement	36	2.000	1,235	$74	6.25	395	$24	840	$50
TOTALS			**17,458**	**$1,048**		**5,207**	**$313**	**12,251**	**$736**

Table B.2.4 (b) Window and Door Infiltration Calculations for the Manitou Opera House.

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 ($)
Five 3' x 7' wooden doors	25	0.05	125	85	21,530,222	6,310	$379
Main floor 12 double pane windows (28"x 52")	40	0.025	50	55	13,779,342	4,038	$242
Main floor 14 double pane windows (28"x 94")	71	0.025	50	97	24,515,746	7,185	$431
Main floor 2 double pane windows (32" x 44")	6	0.025	50	9	2,181,729	639	$38

Basement 2 double pane windows (26" x 12")	3	0.025	50	4	1,090,865	320	$19
Basement 2 double pane windows (28" x 38")	6	0.025	50	8	1,894,660	555	$33
Basement 5 double pane windows (26" x 40")	14	0.025	50	19	4,736,649	1,388	$83
TOTALS						**20,436**	**$1,227**

Notes:

Crack lengths for doors and windows are 1/4 of their respective perimeters.

The Manitou Opera House is assumed to be kept at a constant temperature of 70F.

The cost of electricity to heat the Manitou Opera House is $0.06004/kWh as pf April 2005.

Table B.2.5 - Water Usage for the Fire Hall

	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										
Faucets	2	42.5	212,500	1.60	340,000	0.32	68,000	272,000	10,193	$612
Toilets	3	18.3	137,500	18.00	2,475,000	6.00	825,000	1,650,000	NA	NA
Urinal	2	10.0	50,000	9.50	475,000	3.80	190,000	285,000	NA	NA
Total					**3,290,000**		**1,083,000**	**2,207,000**	**10,193**	**$612**

Frequency at Which Fixtures are Used			
	Females	**Males**	**Totals**
Number of People	120	80	
Number of Toilet Uses/Day	3	1	
Number of Toilets	3	3	
Toilet Uses/Hour/Fixture	15.00	3.33	18.33
Number of Urinal Uses/Day	0	2	
Number of Urinals	0	2	
Urinal Uses/Hour/Fixture	0	10	10
Number of Faucets	2	2	
Number of Faucet Uses/Day	3	4	
Faucet Uses/Hr/Fixture	22.50	20.00	42.50

Current Hot Water Usage (kWh)		
Fixture	**L/Yr**	**kWh**
Faucets	340,000	12,741
Total		**12,741**

Notes:

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 4.75 gallons per flush and the new toilets use 1.5 gallons per flush.
The current urinals consume 2.5 gpm and the new urinals are 1 gpm.
As of November 1, 2005 the cost of electricity is 0.06004 $/kWh.

Table B.2.6 Heating,Ventilation & Airconditioning Usage for the Opera House

Description	% of Time Unoccupied	HDD below 70 F	HDD below 59 F	Current Energy Used to Heat (kWh)	Heat Savings (kWh)
Setback Thermostats to 15C (59 F)	71.46%	9727.7	8,219	19,444.67	1,508

Table B.3.1 - Annual Energy Consumption for the Campground Changeroom & 26 Serviced Sites

	Energy Consumption (kWh)	% of Total Energy Consumption
Hot Water	6,412	100%
Total	**6,410**	

Table B.3.2 - Electricity Usage for Campground Changeroom & 26 Serviced Sites

	Consumption Data			Calculated Costs		
Month (2004-2005)	**Maximum KVA**	**Billed KVA**	**Energy (kWh)**	**Demand Charge**	**Energy Charge**	**Total Charge**
September	0	0	0	$0	$0	$0
October	0	0	6,410	$0	$376	$446
November	0	0	0	$0	$0	$0
December	0	0	0	$0	$0	$0
January	0	0	0	$0	$0	$0
February	0	0	0	$0	$0	$0
March	0	0	0	$0	$0	$0
April	0	0	0	$0	$0	$0
May	0	0	0	$0	$0	$0
June	0	0	0	$0	$0	$0
July	0	0	0	$0	$0	$0
August	0	0	0	$0	$0	$0
TOTAL		**0**	**6,410**	**$0**	**$376**	**$446**

Notes

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

The electricity consumption for the Fire Hall is charged based on the General Service Small, Single Phase Manitoba Hydro rates.

Table B.3.3 - Water Usage for the Campground Changeroom

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	1.1	12,519	1.60	20,031	0.32	4,006	16,025	601	$36
Toilets	2	0.6	3,402	13.25	45,077	6.00	20,412	24,665	NA	NA
Showers	2	0.2	1,748	66.25	115,813	47.30	82,692	33,121	1,241	$75
Total					**180,920**		**107,110**	**73,810**	**1,842**	**$111**

Frequency at Which Fixtures are Used			
	Females	Males	Totals
Number of People	2	3	
Number of Toilet Uses/day	3	1	
Number of Toilets	2	2	
Toilet Uses/hour/fixture	0.375	0.1875	0.5625
Number of Sinks	2	2	
Number of Sink Uses/day	3	4	
Sink Uses/hr/fixture	0.375	0.75	1.125
Number of Showers	2	2	
Number of Shower Uses/day	1	1	
Shower Uses/hr/fixture	0.0625	0.09375	0.15625

Current Hot Water Usage (kWh)		
Fixture	L/Yr	kWh
Sinks	20,031	751
Showers	115,813	4,340
Total	**135,844**	**5,091**

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 toilets use 1.5 gallons per flush

Table B.4.1 - Annual Energy Consumption for the Child Care Centre

	Energy Consumption (kWh)	% of Total Energy Consumption
HVAC	32,429	75%
Hot Water	4,117	10%
Lighting	6,524	15%
Total	**43,070**	

Table B.4.2 - Electricity Usage for the Childcare Centre

	Consumption Data			Calculated Costs		
Month (2004-2005)	Maximum KVA	Billed KVA	Energy (kWh)	Demand Charge	Energy Charge	Total Charge
September	0	0	750	$0	$44	$68
October	0	0	2,980	$0	$175	$217
November	0	0	3,160	$0	$185	$229
December	0	0	5,740	$0	$336	$401
January	0	0	6,920	$0	$406	$480
February	0	0	6,550	$0	$384	$456
March	0	0	4,750	$0	$278	$335
April	0	0	3,580	$0	$215	$263
May	0	0	2,190	$0	$131	$168
June	0	0	2,590	$0	$156	$195
July	0	0	770	$0	$46	$71
August	0	0	3,090	$0	$186	$230
TOTAL		**0**	**43,070**	**$0**	**$2,541**	**$3,113**

Table B.4.3 - Lighting Analysis & Parking Lot Controller Summary for the Childcare Centre

Description	Quantity	Current Conditions		After Improvements		Savings ($)	
		Annual Energy Consumption (kWh)	Annual Cost ($)	Annual Energy Consumption (kWh)	Annual Cost ($)	Energy (kWh)	Annual Cost ($)
Main floor - fluorescents - convert 4' T12s to 4' T8 (4' x 2)	10	1,682	$101	1,012	$61	669	$40
Main floor -indoor incandescents - convert to compact fluorescents	9	1,853	$111	494	$30	1,359	$82
Second floor - fluorescents -convert 4' T12 to 4' T8	1	168	$10	101	$6	67	$4
Second floor -indoor incandescents- convert to compact fluorescents	3	1,030	$62	288	$17	741	$45
Basement - convert 4' T12 to 4' T8 (4' x 2)	8	1,345	$81	810	$49	535	$32
Basement - convert indoor incandescents to compact fluorescents	1	206	$12	55	$3	151	$9
Install Parking Lot Controller	1	240	$14	120	$7	120	$7
TOTALS		**6,524**	**$392**	**2,881**	**$173**	**3,643**	**$219**

Annual Energy Savings (KWH)	**3,643**
Annual Cost Savings	**$219**
Percent Annual Energy Savings	**56%**

Notes:
These calculations are based on an occupancy of 3432 hour/year.

Table B.4.4 (a) Window and Door Replacement Calculations for the Child Care Centre

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 old 7'x3' wooden door with insulated wood door	21	1.578	911	$55	6.67	215	$13	695	$42
Replace broken window in basement - 30" x 12"	3	2.000	86	$5	6.25	27	$2	58	$3
TOTALS			**996**	**$60**		**243**	**$15**	**753**	**$45**

Table B.4.4 (b) Window and Door Infiltration Calculations for the Child Care Centre

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 ($)
Two 3' x 7' wooden doors	10	0.05	125	34	8,612,089	2,524	$152
Two windows - 30" x 12"	4	0.025	50	5	1,205,692	353	$21
TOTALS						**2,877**	**$173**

Table B.4.4 (c) Wall/Roof Insulation Upgrade for the Child Care Centre

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 the main play area (formerly the garage) - roof	716	16.000	3,062	$184	60.000	816	$49	2,245	$135
TOTALS			**3,062**	**$184**		**816**	**$49**	**2,245**	**$135**

Notes:

Crack lengths for doors and windows are 1/4 of their respective perimeters.

The Childcare Centre is kept at a constant temperature of 70F.

The cost of electricity to heat the Childcare Centre is $0.06004/kWh.

Table B.4.5 - Water Usage for the Childcare Centre

	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										
Faucets	1	8.1	27,885	1.60	44,616	0.32	8,923	35,693	1,338	$80
Toilets	3	2.1	21,450	13.25	284,213	6.00	128,700	155,513	NA	NA
Total					**328,829**		**137,623**	**191,205**	**1,338**	**$80**

Frequency at Which Fixtures are Used			
	Females	**Males**	**Totals**
Number of People	15	5	
Number of Toilet Uses/Day	3	1	
Number of Toilets	3	3	
Toilet Uses/Hour/Fixture	1.88	0.21	2.08
Number of Faucets	1	1	
Number of Faucet Uses/Day	3	4	
Faucet Uses/Hr/Fixture	5.63	2.50	8.13

Current Hot Water Usage (kWh)		
Fixture	**L/Yr**	**kWh**
Faucets	44,616	1,672
Total		**1,672**

Notes:

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 toilets use 1.5 gallons per flush.

As of November 1, 2005 the cost of electricity is 0.06004 $/kWh.

Table B.4.6 Energy Savings with Heating, Ventilation and Air Conditioning for Child Care Centre

Description	% of Time Unoccupied	HDD below 70 F	HDD below 59 F	Current Energy Used to Heat (kWh)	Heat Savings (kWh)
Setback Thermostats to 15C (59 F)	60.82%	9727.7	8,219	32,429	2,141

Table B.5.1 - Annual Energy Consumption for Fire Hall & Municipal Garage

	Energy Consumption (kWh)	% of Total Energy Consumption
HVAC	76,321	94%
Hot Water	1,079	1%
Lighting	3,908	5%
Total	**81,309**	

Table B.5.2 (a) - Electricity Usage for the Fire Hall & Municipal Garage

	Consumption Data			Calculated Costs		
Month (2004-2005)	Maximum KVA	Billed KVA	Energy (kWh)	Demand Charge	Energy Charge	Total Charge
September	0	0	720	$0	$42	$66
October	0	0	1,380	$0	$81	$110
November	0	0	950	$0	$56	$81
December	0	0	3,120	$0	$183	$226
January	0	0	2,620	$0	$154	$193
February	0	0	2,640	$0	$155	$194
March	0	0	2,750	$0	$161	$202
April	0	0	1,520	$0	$91	$122
May	0	0	2,080	$0	$125	$160
June	0	0	510	$0	$31	$53
July	0	0	730	$0	$44	$68
August	0	0	530	$0	$32	$54
TOTAL		**0**	**19,550**	**$0**	**$1,153**	**$1,531**

Table B.5.2 (b) - Propane Consumption for the Fire Hall & Municipal Garage

Month (2004-2005)	Propane in (L)	Propane in gallons (US)	BTU	Propane (kWh)	Propane Costs ($)	Fuel Tax	Transportation Fee	Total Charge
September	0	0	0	0	$0	$0	$0	$0
October	850	225	20588649	6,034	$455	$26	$3	$517
November	900	238	21799746	6,389	$482	$27	$3	$547
December	1000	264	24221940	7,099	$535	$30	$3	$608
January	1100	291	26644134	7,809	$589	$33	$3	$668
February	950	251	23010843	6,744	$508	$29	$3	$578
March	800	211	19377552	5,679	$428	$24	$3	$487
April	700	185	16,955,358	4,969	$375	$21	$3	$426
May	650	172	15,744,261	4,614	$348	$20	$3	$396
June	600	159	14,533,164	4,259	$321	$18	$3	$366
July	550	145	13,322,067	3,904	$294	$17	$3	$336
August	600	159	14,533,164	4,259	$321	$18	$3	$366
TOTAL	**8700**	**2,298**		**61,759**	**$4,655**			**$5,295**

Table B.5.3 - Lighting Analysis Summary for the Fire Hall & Muncipal Garage

Description	Quantity	Current Conditions		After Improvements		Savings	
		Annual Energy Consumption (kWh)	Annual Cost ($)	Annual Energy Consumption (kWh)	Annual Cost ($)	Energy (kWh)	Annual Cost ($)
FH: Convert 8' T12s to 8' T8 lamps - (2x4) 75W	8	790	$47	449	$27	341	$20
FH: - Convert 4' T12s to 4' T8 lamps (2x5)	10	510	$31	307	$18	203	$12
FH: Convert indoor incandescent lamp to compact fluorescent.	1	104	$6	29	$2	75	$4
MG Office: Convert 8' T12s to 8' T8 lamps - (2x1) 75W	2	346	$21	197	$12	149	$9
MG Office: Convert 4' T12 to 4' T8 lamps - (2x1)	2	178	$11	107	$6	71	$4
MG: Convert 8' T12s to 8' T8 lamps (2x2)	4	844	$51	393	$24	451	$27
MG Workshop: Convert 8' T12s to 8' T8 lamps (2x1)	2	422	$25	197	$12	226	$14
MG Workshop: Convert 4' T12s to 4' T8 lamps (4x2)	8	713	$43	430	$26	284	$17
TOTALS		**3,908**	**$235**	**2,108**	**$127**	**1,800**	**$108**

Annual Energy Savings (KWH)	**1,800**
Annual Cost Savings	**$108**
Percent Annual Energy Savings	**46%**

Notes:
The Municipal Garage is occupied for 1820 hours/year.
The Fire Hall is occupied for 1040 hours/year.

MG: Municipal Garage
FH: Fire Hall

Table B.5.4 (a) Window and Door Replacement Calculations for the Fire Hall & Municipal Garage

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
FH: Upgrade double pane windows with triple pane units - 2'x6' size (4)	48	2.000	1,642	$12	6.5	505	$4	1,137	$9
MG: Replace old wooden pedestrian door 3'x7' with an efficient unit	21	1.578	911	$7	6.67	215	$2	695	$5
TOTALS			**2,553**	$19		**721**	$5	**1,832**	$14

Table B.5.4 (b) Window and Door Infiltration Calculations for the Fire Hall & Municipal Garage

Description	Crack Length (ft)	Crack Width (in)	Leakage on typical door (cfm)	Leakage on these doors	Annual Heat Loss (BTU)	Annual Heat Loss (kWh)	Cost
FH: Vehicle door (14'x12')	26	0.05	125	89	22,391,431	6,562	$564
FH: Pedestrian doors 3'x7' (2)	10	0.05	125	34	8,612,089	2,524	$217
FH: Windows 2'x6' (4)	16	0.025	50	22	5,511,737	1,615	$139
MG: Vehicle door (12'x9')	10.5	0.05	125	36	9,042,693	2,650	$228
MG: Pedestrian door 3'x7' (1)	10	0.05	125	34	8,612,089	2,524	$217
TOTALS						**15,876**	**$1,365**

Notes:

Crack length around doors is 1/4 of the door perimeter except for the vehicle door where 1/2 of the perimeter was used to account for the leakage caused by the cracks in the concrete.

Table B.5.5 - Water Usage for the Fire Hall & Municipal Garage

	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										
Faucets	1	1.2	1,668	1.60	2,669	0.32	534	2,135	80	$5
Toilets	1	0.9	6	13.25	81	6.00	37	44	NA	NA
Total					**2,750**		**571**	**2,180**	**80**	**$5**

Frequency at Which Fixtures are Used			
	Females	**Males**	**Totals**
Number of People	0	7	
Number of Toilet Uses/Day	3	1	
Number of Toilets	1	1	
Toilet Uses/Hour/Fixture	0.00	0.88	0.88
Number of Faucets	3	3	
Number of Faucet Uses/Day	3	4	
Faucet Uses/Hr/Fixture	0.00	1.17	1.17

Current Hot Water Usage (kWh)		
Fixture	**L/Yr**	**kWh**
Faucets	2,669	100
Total		**100**

Notes:

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 toilets use 1.5 gallons per flush.
The current urinals consume 2.5 gpm and the new urinals are 1 gpm.
As of November 1, 2005 the cost of electricity is 0.06004 $/kWh.

Water fixtures are located in the Fire Hall & shared with the Municipal Garage
An average between the Fire Hall & Municipal Garage hours/occupancy were used.

Table B.5.6 Energy Savings with Heating, Ventilation and Air Conditioning for Fire Hall & Municipal Garage

Description	% of Time Unoccupied	HDD below 70 F	HDD below 59 F	Current Energy Used to Heat (kWh)	Heat Savings (kWh) - Propane
MG: Setback Thermostats to 15C (59 F)	79.22%	9727.7	8,219	61,759	5,311
FH: Setback Thermostats to 15C (59F)	88.13%	9727.7	8,219	61,759	5,908

Description	% of Time Unoccupied	HDD below 70 F	HDD below 59 F	Current Energy Used to Heat (kWh)	Heat Savings (kWh) - Electrical
MG: Setback Thermostats to 15C (59 F)	79.22%	9727.7	8,219	14,562	1,252
FH: Setback Thermostats to 15C (59F)	88.13%	9727.7	8,219	14,562	1,393

Description	Quantity	Current Efficiency	New Efficiency	Energy Savings (kWh)
Replace radiant heater with a high efficiency furnace (100,000 BTU)	1	0.8	0.941	8,708

Table B.6.1- Annual Energy Consumption for the Heritage Building

	Energy Consumption (kWh)	% of Total Energy Consumption
Lighting	847	100%
Total	**920**	

Table B.6.2 - Electricity Usage for the Heritage Building

	Consumption Data			Calculated Costs		
Month (2004-2005)	Maximum KVA	Billed KVA	Energy (kWh)	Demand Charge	Energy Charge	Total Charge
September	0	0	0	$0	$0	$18
October	0	0	200	$0	$12	$31
November	0	0	0	$0	$0	$18
December	0	0	110	$0	$6	$25
January	0	0	0	$0	$0	$18
February	0	0	120	$0	$7	$26
March	0	0	0	$0	$0	$18
April	0	0	90	$0	$5	$24
May	0	0	0	$0	$0	$18
June	0	0	50	$0	$3	$22
July	0	0	0	$0	$0	$18
August	0	0	350	$0	$21	$42
TOTAL		**0**	**920**	**$0**	**$55**	**$278**

Notes

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

The electricity consumption for the Fire Hall is charged based on the General Service Small, Single Phase Manitoba Hydro rates.

Table B.6.3 - Lighting Analysis Summary for the Heritage Building

Description	Quantity	Current Conditions		After Improvements		Savings ($)	
		Annual Energy Consumption (kWh)	Annual Cost	Annual Energy Consumption (kWh)	Annual Cost	Energy (kWh)	Annual Cost ($)
Outdoor incandescents - convert to high pressure sodium bulbs with photocell	2	151	$9	76	$5	76	$5
Replace indoor incandescent flood lights with compact fluorescent lamps	3	454	$27	118	$7	336	$20
Indoor Incandescents - Convert to compact fluorescents	4	242	$15	65	$4	177	$11
TOTALS		**847**	**$51**	**258**	**$15**	**589**	**$35**

Annual Energy Savings (KWH)	**589**
Annual Cost Savings	**$35**
Percent Annual Energy Savings	**70%**

Notes:
These calculations are based on an occupancy of 1008 hours/year.
Outdoor lights are assumed to be on 12 hours/day.
The flood lights are incandescent lamps of 150W.

Table B.7.1 - Annual Energy Consumption for the Library

	Energy Consumption (kWh)	% of Total Energy Consumption
HVAC	19,002	81%
Lighting	3,286	14%
Hot Water	1,302	6%
Total	**23,590**	

Table B.7.2 - Electricity Usage for the Library

	Consumption Data			Calculated Costs		
Month (2004-2005)	Maximum KVA	Billed KVA	Energy (kWh)	Demand Charge	Energy Charge	Total Charge
September	0	0	1,600	$0	$94	$125
October	0	0	1,430	$0	$84	$113
November	0	0	1,930	$0	$113	$147
December	0	0	3,140	$0	$184	$228
January	0	0	4,270	$0	$250	$303
February	0	0	3,070	$0	$180	$223
March	0	0	2,740	$0	$161	$201
April	0	0	1,710	$0	$103	$135
May	0	0	1,240	$0	$74	$103
June	0	0	510	$0	$31	$53
July	0	0	1,420	$0	$85	$115
August	0	0	530	$0	$32	$54
TOTAL		**0**	**23,590**	**$0**	**$1,390**	**$1,801**

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

The electricity consumption for the Library is charged based on the General Service Small, Single Phase Manitoba Hydro rates.

Table B.7.3 - Lighting Analysis Summary for the Library

Description	Quantity	Current Conditions		After Improvements		Savings ($)	
		Annual Energy Consumption (kWh)	Annual Cost	Annual Energy Consumption (kWh)	Annual Cost	Energy (kWh)	Annual Cost ($)
Basement incandescents -100W - convert to compact fluorescents	10	884	$53	248	$15	636	$38
Main floor - 60W incandescents convert to compact fluorescents	4	212	$13	57	$3	156	$9
Outdoor 100W incandescents - replace with high pressure sodium	5	2,190	$131	1,095	$66	1,095	$66
TOTALS		**3,286**	**$197**	**1,399**	**$84**	**1,887**	**$113**

Annual Energy Savings (KWH)	**1,887**
Annual Cost Savings	**$113**
Percent Annual Energy Savings	**57%**

Notes:
These calculations are based on an occupancy rate of 884 hours/year.

Table B.7.4 (a) Window and Door Replacement Calculations for the Library

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 unused 3'x7' glass door with wall panel	21	2.000	607	$36	20	61	$4	546	$33
TOTALS			**607**	**$36**		**61**	**$4**	**546**	**$33**

Table B.7.4 (b) Window and Door Infiltration Calculations for the Library

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
Pedestrian doors 3'x7' (4)	20	0.05	125	34	7,276,678	2,133	$128
Windows -2'x6' size (6)	24	0.025	50	16	3,492,805	1,024	$61
TOTALS						**3,156**	**$189**

Table B.7.4 (c) Wall/Roof Insulation Upgrade for the Library

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 -basment-below ground	1280	11.300	5,816	$349	31.300	2,100	$126	3,716	$223
TOTALS			**5,816**	**$349**		**2,100**	**$126**	**3,716**	**$223**

Table B.7.5 - Water Usage for the Library

	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										
Faucets	2	0.7	1,289	1.60	2,063	0.32	413	1,650	62	$4
Toilets	2	0.7	1,216	13.25	16,105	6.00	7,293	8,812	NA	NA
Total					**18,168**		**7,706**	**10,463**	**62**	**$4**

Frequency at Which Fixtures are Used			
	Females	**Males**	**Totals**
Number of People	3	1	
Number of Toilet Uses/Day	3	1	
Number of Toilets	2	1	
Toilet Uses/Hour/Fixture	0.56	0.13	0.69
Number of Faucets	2	3	
Number of Faucet Uses/Day	3	4	
Faucet Uses/Hr/Fixture	0.56	0.17	0.73

Current Hot Water Usage (kWh)		
Fixture	**L/Yr**	**kWh**
Faucets	2,063	77
Total		**77**

Notes:
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 toilets use 1.5 gallons per flush.
The current urinals consume 2.5 gpm and the new urinals are 1 gpm.
As of April 1, 2005 the cost of electricity is $0.06004/kWh.

Table B.7.6 Energy Savings with Heating, Ventilation and Air Conditioning for the Library

Description	Quantity	Efficiency Savings	Energy Savings (kWh)
Replace airconditioner with a high efficiency unit	1	42%	6,947

Description	% of Time Unoccupied	HDD below 59 F	HDD below 50F	Current Energy Used to Heat (kWh)	Heat Savings (kWh)
Setback Thermostats to 15C (59 F)	89.91%	8219.3	6,075	19,002	3,120

Table B.8.1 - Annual Energy Consumption for Sewage Lift Station

	Energy Consumption (kWh)	% of Total Energy Consumption
HVAC	7,785	29%
Lighting	182	1%
Hot Water	1,025	4%
Motors	18,255	67%
Total	**27,246**	

Table B.8.2 - Electricity Usage for the Sewage Lift Station

	Consumption Data			Calculated Costs		
Month (2004-2005)	**Maximum KVA**	**Billed KVA**	**Energy (kWh)**	**Demand Charge**	**Energy Charge**	**Total Charge**
September	0	0	1,669	$0	$98	$120
October	0	0	1,902	$0	$111	$133
November	0	0	1,561	$0	$91	$113
December	0	0	2,666	$0	$156	$178
January	0	0	2,400	$0	$141	$163
February	0	0	2,588	$0	$152	$174
March	0	0	2,178	$0	$128	$150
April	0	0	2,251	$0	$135	$156
May	0	0	1,111	$0	$67	$89
June	0	0	1,563	$0	$94	$156
July	0	0	5,740	$0	$345	$367
August	0	0	1,617	$0	$97	$119
TOTAL		**0**	**27,246**	**$0**	**$1,614**	**$1,917**

Table B.8.3 - Lighting Analysis Summary for the Sewage Lift Station

Description	Quantity	Current Conditions		After Improvements		Savings	
		Annual Energy Consumption (kWh)	Annual Cost ($)	Annual Energy Consumption (kWh)	Annual Cost ($)	Energy (kWh)	Annual Cost ($)
Convert 100W wetwell light fixture to compact fluorescent.	1	18	$1	5	$0.3	13	$1
Convert indoor incandescent lamps (300W) to compact fluorescents.	2	109	$7	28	$2	81	$5
Metal Halide (300W)	1	55	$3	55	$3	0	$0
TOTALS		**182**	**$11**	**88**	**$5**	**94**	**$6**

Annual Energy Savings (KWH)	**94**
Annual Cost Savings	**$6**
Percent Annual Energy Savings	**52%**

Notes:
These calculations are based on an occupancy rate of 182 hours/year.
Metal halide lamp is energy efficient and does not require upgrade.

Table B.8.4 (a) Window and Door Replacement Calculations for the Sewage Lift Station

Description	Existing				New			Savings	
	Area (ft^2)	R-Value ($^oF\ ft^2 hr/BTU$)	Annual Heat Loss (kWh)	Cost ($)	R-Value ($^oF\ ft^2 hr/BTU$)	Annual Heat Loss (kWh)	Cost ($)	Energy (kWh)	Cost ($)
Replace single pane windows - 18"x30" (2)	7.5	1.000	513	$31	6.25	82	$5	431	$26
Replace single pane window - 53"x28" (1)	10.356	1.000	709	$43	6.25	113	$7	595	$36
TOTALS			**709**	**$43**		**113**	**$7**	**595**	**$36**

Table B.8.4 (b) Window Infiltration Calculations for the Sewage Lift Station

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 ($)
Windows - single pane	7	0.025	50	10	2,540,566	745	$45
TOTALS						**745**	**$45**

Table B.8.5 - Water Usage for the Sewage Lift Station

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	1.5	273	1.60	437	0.32	87	349	13	$1
Total					**437**		**87**	**349**	**13**	**$1**

Frequency at Which Fixtures are Used			
	Females	**Males**	**Totals**
Number of People	0	3	
Number of Toilet Uses/day	3	1	
Number of Toilets	0	0	
Toilet Uses/hour/fixture	0	0	0
Number of Sinks	1	1	
Number of Sink Uses/day	3	4	
Sink Uses/hr/fixture	0	1.5	1.5
Number of Urinals	0	0	
Number of Urinal Uses/day	0	1	
Urinal Uses/hr/fixture	0	0	0
Number of Showers	0	0	
Number of Shower Uses/day	1	1	
Shower Uses/hr/fixture	0	0	0

Current Hot Water Usage (kWh)		
Fixture	**L/Yr**	**kWh**
Sinks	437	16
Total	**437**	**16**

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 toilets use 1.5 gallons per flush

Table B.8.6 Energy Savings with Heating, Ventilation and Air Conditioning for Sewage Lift Station

Description	% of Time Unoccupied	HDD below 70 F	HDD below 59 F	Current Energy Used to Heat (kWh)	Heat Savings (kWh)
Setback Thermostats to 15C (59 F)	97.92%	9727.7	8,219	7,785	827

Table B.8.7 Energy Consumption and Savings Calculations for Motors in the Sewage Lift Station

Description	Rated HP	Required HP	# of hours	Current Motors				Energy Savings of Premium Efficiency Versus Standard Efficiency Motor		
				Eff.	Actual HP	kW	kWh	Actual HP	kW	kWh
Pump - main lift station	20.0	16	750	63%	16.3	12.17	9,127	0.48	0.36	268
Pump - main lift station	20.0	16	750	63%	16.3	12.17	9,127	0.48	0.36	268
TOTAL							**18,255**			**537**

Table B.9.1 - Annual Energy Consumption for the Municipal Admin Building & Recycling Depot

	Energy Consumption (kWh)	% of Total Energy Consumption
HVAC	16,531	45%
Lighting	14,048	38%
Hot Water	2,630	7%
Motors	3,322	9%
Total	**36,531**	

Table B.9.2 - Electricity Usage for the Municipal Admin Building & Recycling Depot

	Consumption Data			Calculated Costs		
Month (2004-2005)	**Maximum KVA**	**Billed KVA**	**Energy (kWh)**	**Demand Charge**	**Energy Charge**	**Total Charge**
September	0	0	2,720	$0	$159	$200
October	0	0	2,300	$0	$135	$172
November	0	0	2,900	$0	$170	$212
December	0	0	411	$0	$24	$45
January	0	0	4,180	$0	$245	$297
February	0	0	4,650	$0	$272	$329
March	0	0	3,290	$0	$193	$238
April	0	0	4,260	$0	$256	$310
May	0	0	2,620	$0	$157	$197
June	0	0	3,410	$0	$205	$251
July	0	0	2,410	$0	$145	$183
August	0	0	3,380	$0	$203	$249
TOTAL		**0**	**36,531**	**$0**	**$2,164**	**$2,683**

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

The electricity consumption for the Fire Hall is charged based on the General Service Small, Single Phase Manitoba Hydro rates.

Table B.9.3 - Lighting Analysis Summary for the Municipal Admin Building & Recycling Depot

Description	Quantity	Current Conditions		After Improvements		Savings ($)	
		Annual Energy Consumption (kWh)	Annual Cost	Annual Energy Consumption (kWh)	Annual Cost	Energy (kWh)	Annual Cost ($)
MAB: Basement - 4' T12s (2x14) - no upgrade	28	2,752	$165	2,752	$165	0	$0
MAB: Main floor - incandescent lamps - no upgrades	5	702	$42	702	$42	0	$0
MAB: Main floor - convert 4' T12s to 4' T8 lamps (2x28)	56	5,504	$330	1,048	$63	4,455	$267
MAB: Install Parking Lot Controllers	4	1,152	$69	576	$35	576	$35
RD: Convert indoor incandescent lamps to outdoor high pressure sodium lamps	8	1,310	$79	655	$39	655	$39
RD: Convert indoor incandescent lamp to outdoor high pressure sodium lamps (300W).	1	1,314	$79	657	$39	657	$39
RD: Upgrade outdoor incandescents to high pressure sodium lamps	2	1,314	$79	657	$39	657	$39
TOTALS		**14,048**	**$843**	**7,047**	**$423**	**7,001**	**$420**

Annual Energy Savings (KWH)	**7,001**
Annual Cost Savings	**$420**
Percent Annual Energy Savings	**50%**

Table B.9.4 (a) Window and Door Infiltration Calculations for the Municipal Admin Building & Recycling Depot

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
MAB: Pedestrian doors 3'x7' (2)	10	0.05	125	34	2,870,696	841	$51
MAB: Windows -4'x5' (5)	22.5	0.025	50	31	2,583,627	757	$45
MAB: Windows - 4'x6' (2)	10	0.025	50	14	1,148,278	337	$20
TOTALS						**1,935**	**$116**

Table B.9.4(b) Wall/Roof Insulation Upgrade for the Municipal Admin Building & Recycling Depot

Description	Existing				New			Savings	
	Area (ft^2)	R-Value ($^oF\ ft^2 hr/BTU$)	Annual Heat Loss (kWh)	Cost	R-Value ($^oF\ ft^2 hr/BTU$)	Annual Heat Loss (kWh)	Cost	Energy (kWh)	Cost
MAB: Upgrade roof insulation	2500	24.000	2,376	$143	40.000	1,425	$86	950	$57
TOTALS			**2,376**	**$143**		**1,425**	**$86**	**950**	**$57**

Notes:

Crack lengths around the doors and windows are 1/4 of their respective perimeters.
As of April 1, 2005, the cost of electricity is $0.06004/kWh.
MAB: Municipal Admin Building
RD: Recycling Depot

Table B.9.5 - Water Usage for the Municipal Admin Building & Recycling Depot

	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										
Faucets - no upgrade needed	2	1.0	4,680	0.32	1,498	0.32	1,498	0	0	$0
Toilets	2	1.9	8,775	13.25	116,269	6.00	52,650	63,619	NA	NA
Total					**117,766**		**54,148**	**63,619**	**0**	**$0**

Frequency at Which Fixtures are Used			
	Females	**Males**	**Totals**
Number of People	4	3	
Number of Toilet Uses/Day	3	1	
Number of Toilets	1	1	
Toilet Uses/Hour/Fixture	1.50	0.38	1.88
Number of Faucets	3	3	
Number of Faucet Uses/Day	3	4	
Faucet Uses/Hr/Fixture	0.50	0.50	1.00

Current Hot Water Usage (kWh)		
Fixture	**L/Yr**	**kWh**
Faucets	1,498	56
Total		**56**

Notes:
The current sinks are of low flow type at 0.5 gpm, therefore upgrades were not needed for these fixtures.
The current toilets are assumed to use 3.5 gallons per flush and the new toilets use 1.5 gallons per flush.
As of April 1, 2005, the rate of electricity was $0.06004/kWh.

Table B.9.6 Energy Savings with Heating, Ventilation and Air Conditioning for Municipal Admin Building & Recycling Depot

Description	% of Time Unoccupied	HDD below 70 F	HDD below 59 F	Current Energy Used to Heat (kWh)	Heat Savings (kWh)
Setback Thermostats to 15C (59 F)	73.29%	9727.7	8,219	16,531	1,315

Description	% of Time Unoccupied	HDD below 70 F	HDD below 59 F	Current Energy (kWh)	Energy Savings (kWh)
Timer for HRV	73.29%	9727.7	8,219	3,694	2,707

Table B.9.7 Energy Consumption and Savings Calculations for Motors in Municipal Admin Building & Recycling Depot

Description	Rated HP	Required HP	# of hours	Current Motors				Energy Savings of Premium Efficiency Versus Standard Efficiency Motor		
				Eff.	Actual HP	kW	kWh	Actual HP	kW	kWh
RD: Boiler motor	5.0	4	1,092	85%	4.1	3.04	3,322	0.12	0.09	98
TOTAL							**3,322**			**98**

Notes:
RD = Recycling Depot

Table B.10.1 - Annual Energy Consumption for Swimming Pool Outdoors

	Energy Consumption (kWh)	% of Total Energy Consumption
HVAC	9,180	20%
Lighting	1,212	3%
Pool Heating & Motors	36,655	78%
Total	**47,047**	

Table B.10.2 (a) - Electricity Usage for the Swimming Pool Outdoors

	Consumption Data			Calculated Costs		
Month (2004-2005)	Maximum KVA	Billed KVA	Energy (kWh)	Demand Charge	Energy Charge	Total Charge
September	0	0	720	$0	$42	$66
October	0	0	895	$0	$52	$78
November	0	0	1,776	$0	$104	$137
December	0	0	2,225	$0	$130	$167
January	0	0	2,045	$0	$120	$155
February	0	0	2,344	$0	$137	$175
March	0	0	2,109	$0	$124	$159
April	0	0	1,860	$0	$109	$142
May	0	0	2,382	$0	$140	$177
June	0	0	439	$0	$26	$47
July	0	0	1,205	$0	$71	$99
August	0	0	453	$0	$27	$48
TOTAL		**0**	**18,453**	**$0**	**$1,081**	**$1,449**

Table B.10.2 (b) - Propane Usage for the Swimming Pool Outdoors

Month (2004-2005)	Propane in (L)	Propane in gallons (US)	BTU	Propane (kWh)	Propane Costs ($)	Fuel Tax	Transportation Fee	Total Charge
September	0	0	0	0	$0	$0	$0	$0
October	0	0	0	0	$0	$0	$0	$0
November	0	0	0	0	$0	$0	$0	$0
December	0	0	0	0	$0	$0	$0	$0
January	0	0	0	0	$0	$0	$0	$0
February	0	0	0	0	$0	$0	$0	$0
March	0	0	0	0	$0	$0	$0	$0
April	1,266	334	30,664,976	8,987	$666	$38	$3	$756
May	0	0	0	0	$0	$0	$0	$0
June	635	168	15,380,932	4,508	$330	$19	$3	$376
July	0	0	0	0	$0	$0	$0	$0
August	2,127	562	51,520,066	15,099	$1,166	$64	$6	$1,323
TOTAL	**4028**	**1,064**		**28,594**	**$2,162**			**$2,455**

Table B.10.3 - Lighting Analysis for the Swimming Pool Outdoors

Description	Quantity	Current Conditions		After Improvements		Savings ($)	
		Annual Energy Consumption (kWh)	Annual Cost	Annual Energy Consumption (kWh)	Annual Cost	Energy (kWh)	Annual Cost ($)
Fluorescents - convert 8' T12s to 8' T8s (2x8')	12	1,212	$73	721	$43	491	$30
TOTALS		**1,212**	**$73**	**721**	**$43**	**491**	**$30**

Annual Energy Savings (KWH)	**491**
Annual Cost Savings	**$30**
Percent Annual Energy Savings	**41%**

Notes:
The outdoor pool operates from June until the end of August for 7days/week, 13 hours/day for a total of 1365 hours/year.

Table B.10.4 Wall/Roof Insulation Upgrade for the Swimming Pool Outdoors

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	800	20.000	912	$55	40.000	456	$27	456	$27
TOTALS			**912**	**$55**		**456**	**$27**	**456**	**$27**

Table B.10.5 Energy Savings with Heating, Ventilation and Air Conditioning for Swimming Pool Outdoors

Description	% of Time Unoccupied	HDD below 70 F	HDD below 41 F	Current Energy Used to Heat (kWh)	Heat Savings (kWh)
Setback Thermostats to 15C (59 F) in summer & 5C (41F) in winter.	84.42%	9727.7	4,299	9,180	3,028

Table B.10.6 Energy Consumption and Savings Calculations for Motors in Swimming Pool Outdoors

Description	Rated HP	Required HP	# of hours	Current Motors				Energy Savings of Premium Efficiency Versus Standard Efficiency Motor		
				Eff.	Actual HP	kW	kWh	Actual HP	kW	kWh
Pool Pump - circulation	15.0	12	2,016	85%	12.2	9.13	18,401	0.36	0.27	541
Pool Pump -waterslide	10.0	8	1,365	85%	8.2	6.08	8,306	0.24	0.18	244
Pool Pump - waterslide	7.5	6	1,365	85%	6.1	4.56	6,229	0.18	0.13	183
Pool Pump -waterslide	3.0	2	1,365	85%	2.4	1.83	2,492	0.07	0.05	73
Pool Pump -booster pump	1.0	0.8	2,016	85%	0.8	0.61	1,227	0.02	0.02	36
TOTAL							**36,655**			**1,078**

APPENDIX C

WATER EFFICIENCY

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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.

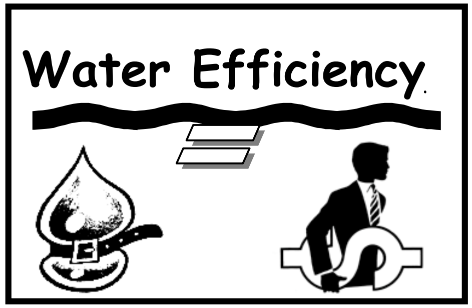
For More Information, Please Contact:

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

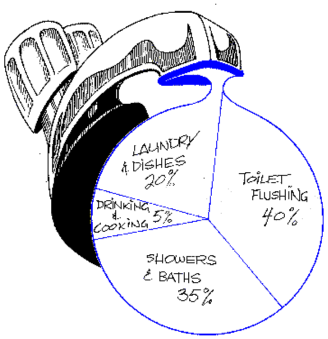
Pollution Prevention
Manitoba Conservation



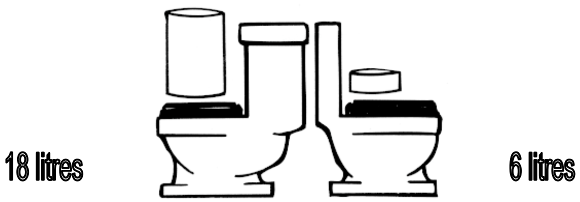
Water Use

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.

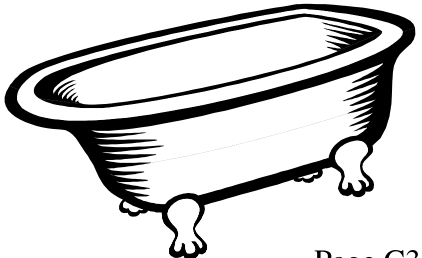
Kitchen & Laundry

- 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

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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

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Table F.1 - Energy Consumption Monitoring Data for the Arena

	2004-2005					2005-2006					2006-2007				
Month	**Billed Elect Energy (kWh)**	**Billed Propane Energy (L)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Propane Energy (L)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Propane Energy (L)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
September	22,800	0	22,800	108.8	22,800			0	108.8	0			0		#DIV/0!
October	13,200	0	13,200	347.4	13,200			0	347.4	0			0		#DIV/0!
November	27,840	0	27,840	498.2	27,840			0	498.2	0			0		#DIV/0!
December	20,160	12000	28,670	912	28,670			0	912	0			0		#DIV/0!
January	21,960	5950	26,180	1072	26,180			0	1072.4	0			0		#DIV/0!
February	18,720	9775	25,652	800	25,652			0	800	0			0		#DIV/0!
March	23,640	10175	30,856	736.9	30,856			0	736.9	0			0		#DIV/0!
April	7,440	0	7,440	299.9	7,440			0	299.9	0			0		#DIV/0!
May	6,840	0	6,840	230.1	6,840			0	230.1	0			0		#DIV/0!
June	40,560	0	40,560	43.7	40,560			0	43.7	0			0		#DIV/0!
July	40,680	0	40,680	21.9	40,680			0	21.9	0			0		#DIV/0!
August	39,120	0	39,120	32	39,120			0	32	0			0		#DIV/0!
TOTAL	282,960	37,900	309,838	5103	309,838	0	0	0	5,103	0	0	0	0	0	#DIV/0!

	2007-2008					2008-2009					2009-2010				
Month	**Billed Elect Energy (kWh)**	**Billed Propane Energy (L)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Propane Energy (L)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Propane Energy (L)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
September			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
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!
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 Winnipeg, Manitoba: http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=XX&StationID=29593&Year=2004&Month=1
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 Arena

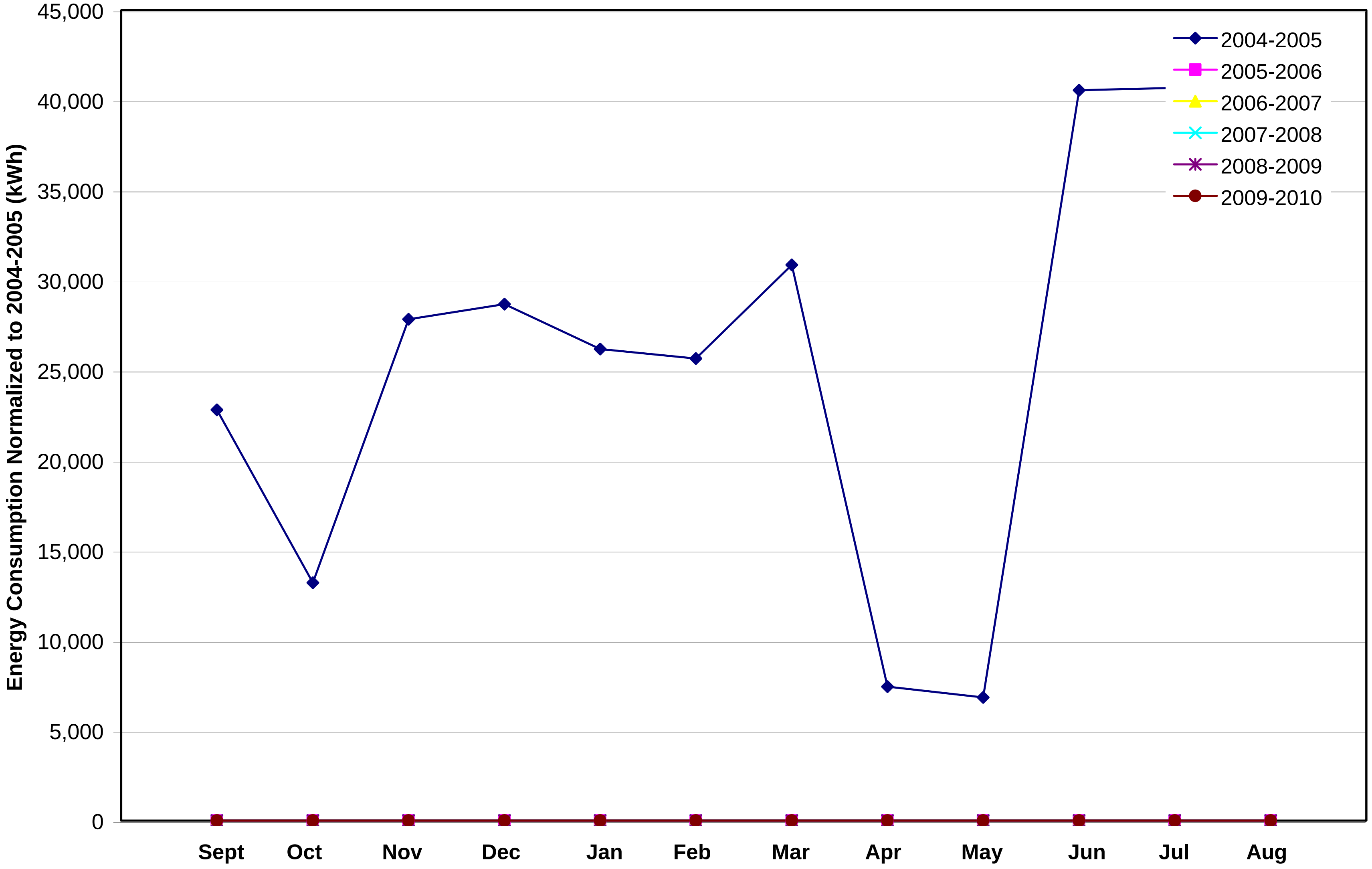


Table F.2 - Energy Consumption Monitoring Data for the Manitou Opera House

	2004-2005				2005-2006				2006-2007			
Month	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**
September	1,860	1,860	108.8	1,860		0		#DIV/0!		0		#DIV/0!
October	3,540	3,540	347.4	3,540		0		#DIV/0!		0		#DIV/0!
November	4,560	4,560	498.2	4,560		0		#DIV/0!		0		#DIV/0!
December	8,340	8,340	912	8,340		0		#DIV/0!		0		#DIV/0!
January	8,880	8,880	1072.4	8,880		0		#DIV/0!		0		#DIV/0!
February	15,120	15,120	800	15,120		0		#DIV/0!		0		#DIV/0!
March	6,300	6,300	736.9	6,300		0		#DIV/0!		0		#DIV/0!
April	6,540	6,540	299.9	6,540		0		#DIV/0!		0		#DIV/0!
May	3,480	3,480	230.1	3,480		0		#DIV/0!		0		#DIV/0!
June	2,100	2,100	43.7	2,100		0		#DIV/0!		0		#DIV/0!
July	1,980	1,980	21.9	1,980		0		#DIV/0!		0		#DIV/0!
August	1,500	1,500	32	1,500		0		#DIV/0!		0		#DIV/0!
TOTAL	64,200	64,200	5103.3	64,200	0	0	0	#DIV/0!	0	0	0	#DIV/0!

	2007-2008				2008-2009				2009-2010			
Month	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**
September		0		#DIV/0!		0		#DIV/0!		0		#DIV/0!
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!
TOTAL	0	0	0	#DIV/0!	0	0	0	#DIV/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) taken from the electricity bills, next to the appropriate month.
3. Go to the following website to collect information on the Heating Degree Days for Winnipeg, Manitoba: http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=XX&StationID=29593&Year=2004&Month=12&Day=1
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 Manitou Opera House

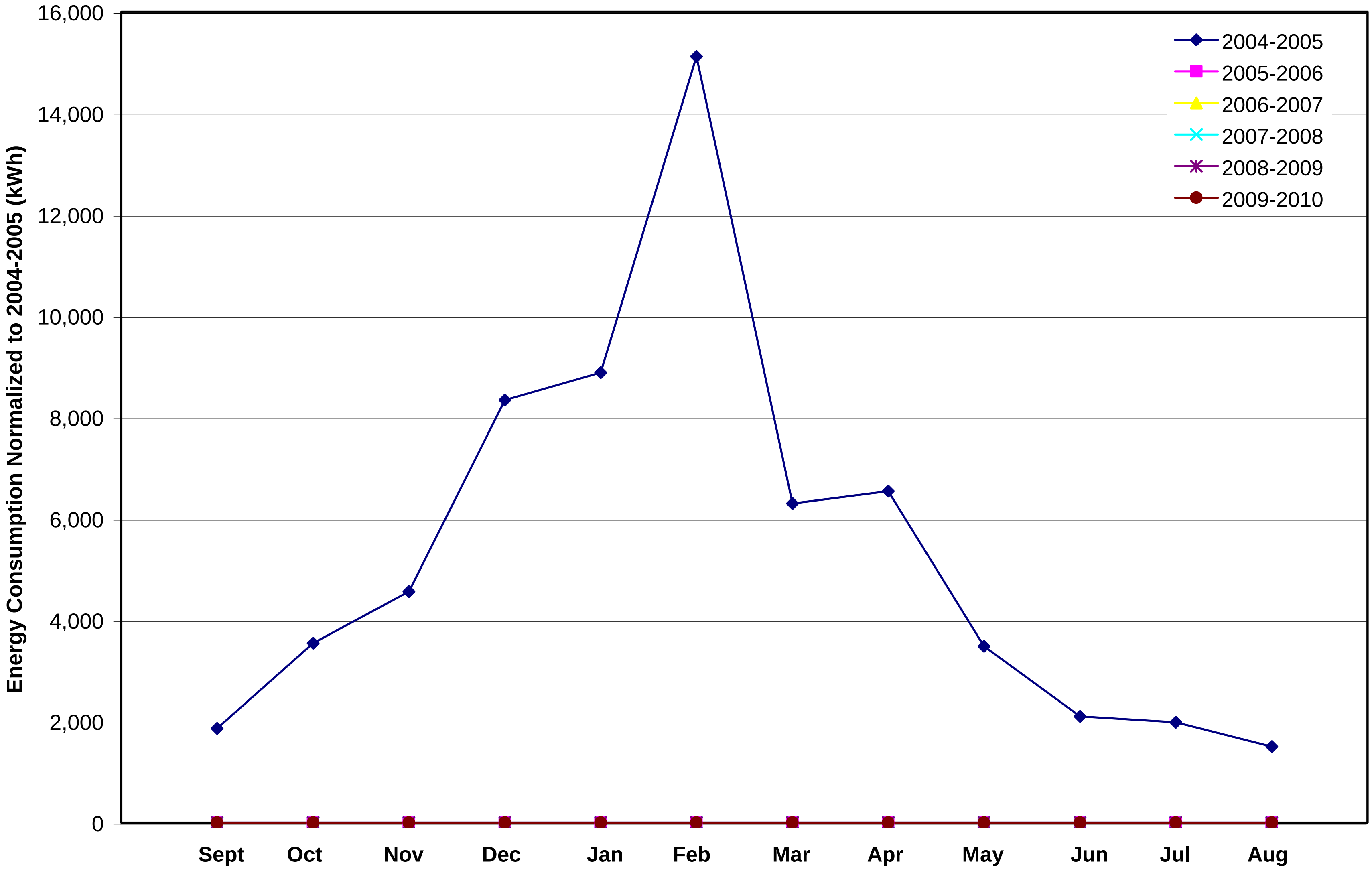


Table F.3 - Energy Consumption Monitoring Data for the Campground Changeroom

	2004-2005				2005-2006				2006-2007			
Month	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^oC days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^oC days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^oC days/mo)**	**Energy Normalized to 2004-2005 (kWh)**
September	0	0	108.8	0		0		0		0		0
October	6,410	6,410	347.4	6,410		0		0		0		0
November	0	0	498.2	0		0		0		0		0
December	0	0	912	0		0		0		0		0
January	0	0	1072.4	0		0		0		0		0
February	0	0	800	0		0		0		0		0
March	0	0	736.9	0		0		0		0		0
April	0	0	299.9	0		0		0		0		0
May	0	0	230.1	0		0		0		0		0
June	0	0	43.7	0		0		0		0		0
July	0	0	21.9	0		0		0		0		0
August	0	0	32	0		0		0		0		0
TOTAL	6,410	6,410	5103.3	6,410	0	0	0	0	0	0	0	0

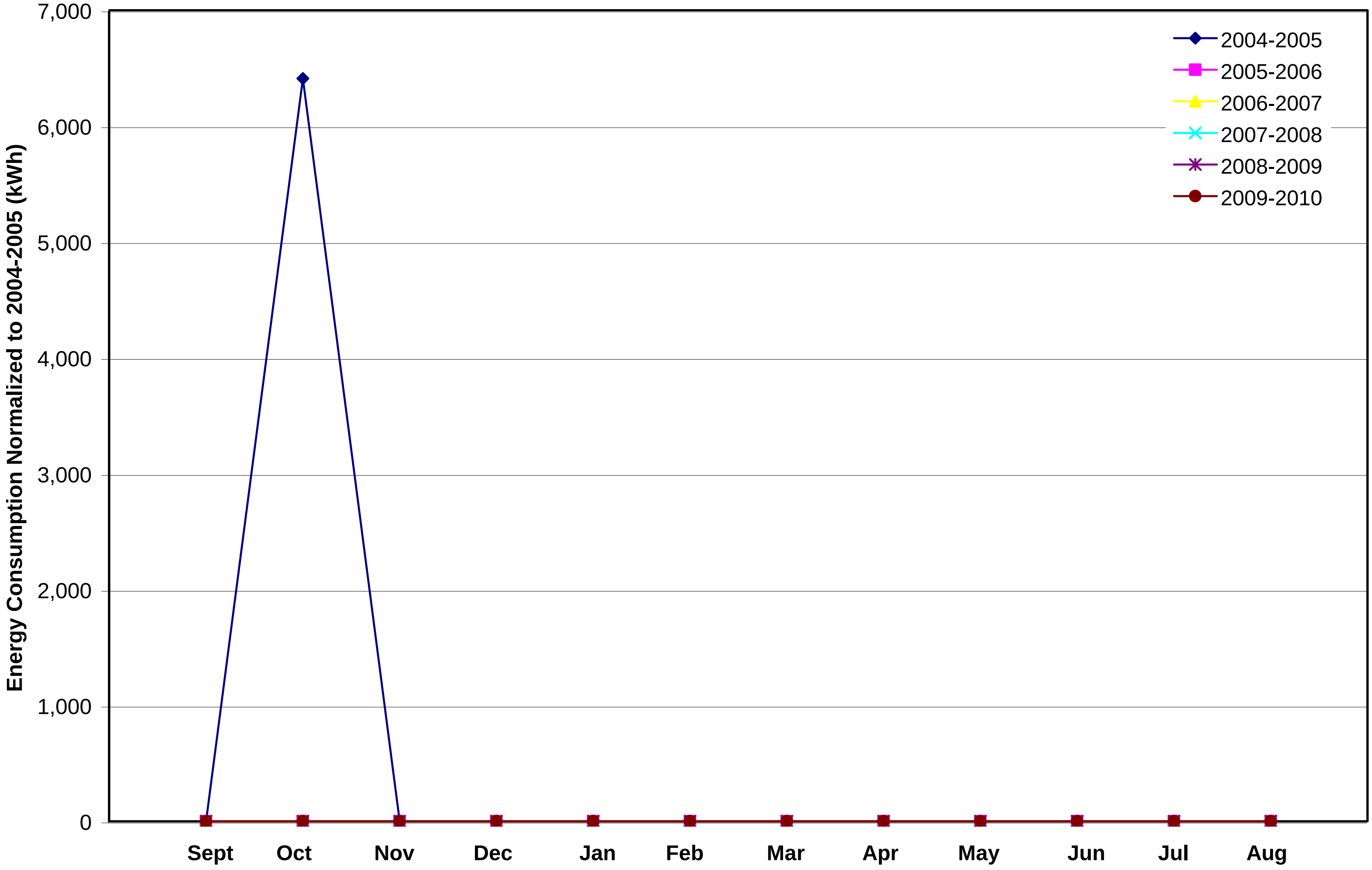
	2007-2008				2008-2009				2009-2010			
Month	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^oC days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^oC days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^oC days/mo)**	**Energy Normalized to 2004-2005 (kWh)**
September		0		0		0		0		0		0
October		0		0		0		0		0		0
November		0		0		0		0		0		0
December		0		0		0		0		0		0
January		0		0		0		0		0		0
February		0		0		0		0		0		0
March		0		0		0		0		0		0
April		0		0		0		0		0		0
May		0		0		0		0		0		0
June		0		0		0		0		0		0
July		0		0		0		0		0		0
August		0		0		0		0		0		0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	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) taken from the electricity bills, next to the appropriate month.
3. Go to the following website to collect information on the Heating Degree Days for Winnipeg, Manitoba http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=XX&StationID=29593&Year=2004&Month=12&Day=1
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 Campground Changeroom



Campground Changeroom

Table F.4 - Energy Consumption Monitoring Data for the Child Care Centre

	2004-2005				2005-2006				2006-2007			
Month	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**
September	750	750	108.8	750		0		#DIV/0!		0		#DIV/0!
October	2,980	2,980	347.4	2,980		0		#DIV/0!		0		#DIV/0!
November	3,160	3,160	498.2	3,160		0		#DIV/0!		0		#DIV/0!
December	5,740	5,740	912	5,740		0		#DIV/0!		0		#DIV/0!
January	6,920	6,920	1072.4	6,920		0		#DIV/0!		0		#DIV/0!
February	6,550	6,550	800	6,550		0		#DIV/0!		0		#DIV/0!
March	4,750	4,750	736.9	4,750		0		#DIV/0!		0		#DIV/0!
April	3,580	3,580	299.9	3,580		0		#DIV/0!		0		#DIV/0!
May	2,190	2,190	230.1	2,190		0		#DIV/0!		0		#DIV/0!
June	2,590	2,590	43.7	2,590		0		#DIV/0!		0		#DIV/0!
July	770	770	21.9	770		0		#DIV/0!		0		#DIV/0!
August	3,090	3,090	32	3,090		0		#DIV/0!		0		#DIV/0!
TOTAL	43,070	43,070	5103.3	43,070	0	0	0	#DIV/0!	0	0	0	#DIV/0!

	2007-2008				2008-2009				2009-2010			
Month	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**
September		0		#DIV/0!		0		#DIV/0!		0		#DIV/0!
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!
TOTAL	0	0	0	#DIV/0!	0	0	0	#DIV/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) taken from the electricity bills, next to the appropriate month.
3. Go to the following website to collect information on the Heating Degree Days for Winnipeg, Manitoba http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=XX&StationID=29593&Year=2004&Month=12&Day=1
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 Child Care Centre

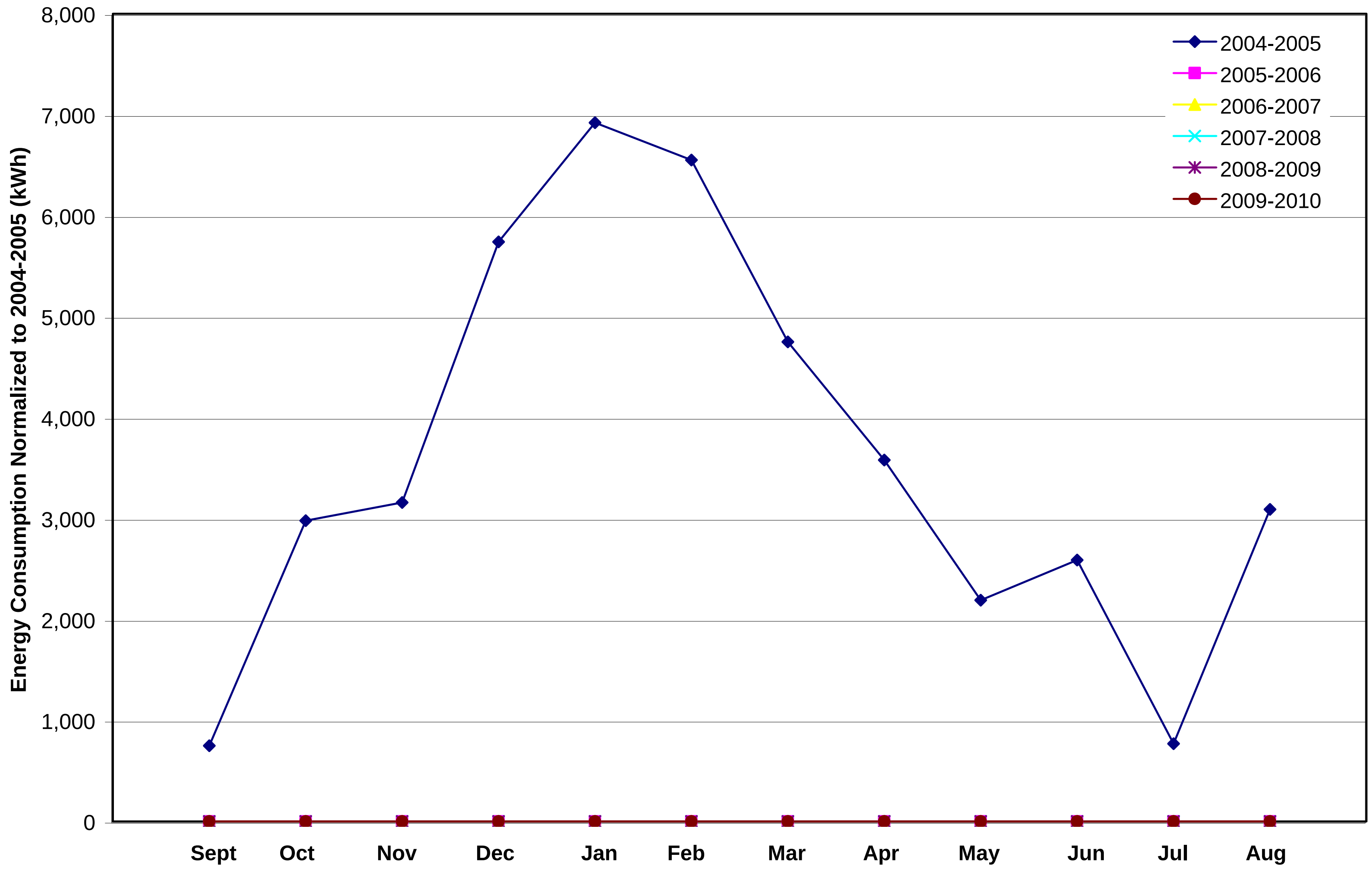


Table F.5 - Energy Consumption Monitoring Data for the Fire Hall & Municipal Garage

	2004-2005					2005-2006					2006-2007				
Month	Billed Elect Energy (kWh)	Billed Propane Energy (L)	Total Energy Consumption (kWh)	HDD (°C days/ mo)	Energy Normalized to 2004-2005 (kWh)	Billed Elect Energy (kWh)	Billed Propane Energy (L)	Total Energy Consumption (kWh)	HDD (°C days/ mo)	Energy Normalized to 2004-2005 (kWh)	Billed Elect Energy (kWh)	Billed Propane Energy (L)	Total Energy Consumption (kWh)	HDD (°C days/ mo)	Energy Normalized to 2004-2005 (kWh)
September	720	0	720	108.8	720			0		#DIV/0!			0		#DIV/0!
October	1,380	850	1,983	347.4	1,983			0		#DIV/0!			0		#DIV/0!
November	950	900	1,588	498.2	1,588			0		#DIV/0!			0		#DIV/0!
December	3,120	1000	3,829	912	3,829			0		#DIV/0!			0		#DIV/0!
January	2,620	1100	3,400	1072	3,400			0		#DIV/0!			0		#DIV/0!
February	2,640	950	3,314	800	3,314			0		#DIV/0!			0		#DIV/0!
March	2,750	800	3,317	736.9	3,317			0		#DIV/0!			0		#DIV/0!
April	1,520	700	2,016	299.9	2,016			0		#DIV/0!			0		#DIV/0!
May	2,080	650	2,541	230.1	2,541			0		#DIV/0!			0		#DIV/0!
June	510	600	936	43.7	936			0		#DIV/0!			0		#DIV/0!
July	730	550	1,120	21.9	1,120			0		#DIV/0!			0		#DIV/0!
August	530	600	956	32	956			0		#DIV/0!			0		#DIV/0!
TOTAL	19,550	8,700	25,720	5103	25,720	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

	2007-2008					2008-2009					2009-2010				
Month	Billed Elect Energy (kWh)	Billed Propane Energy (L)	Total Energy Consumption (kWh)	HDD (°C days/ mo)	Energy Normalized to 2004-2005 (kWh)	Billed Elect Energy (kWh)	Billed Propane Energy (L)	Total Energy Consumption (kWh)	HDD (°C days/ mo)	Energy Normalized to 2004-2005 (kWh)	Billed Elect Energy (kWh)	Billed Propane Energy (L)	Total Energy Consumption (kWh)	HDD (°C days/ mo)	Energy Normalized to 2004-2005 (kWh)
September			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
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!
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 Winnipeg, Manitoba: http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=XX&StationID=29593&Year=2004&Month=1
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 Fire Hall & Municipal Garage

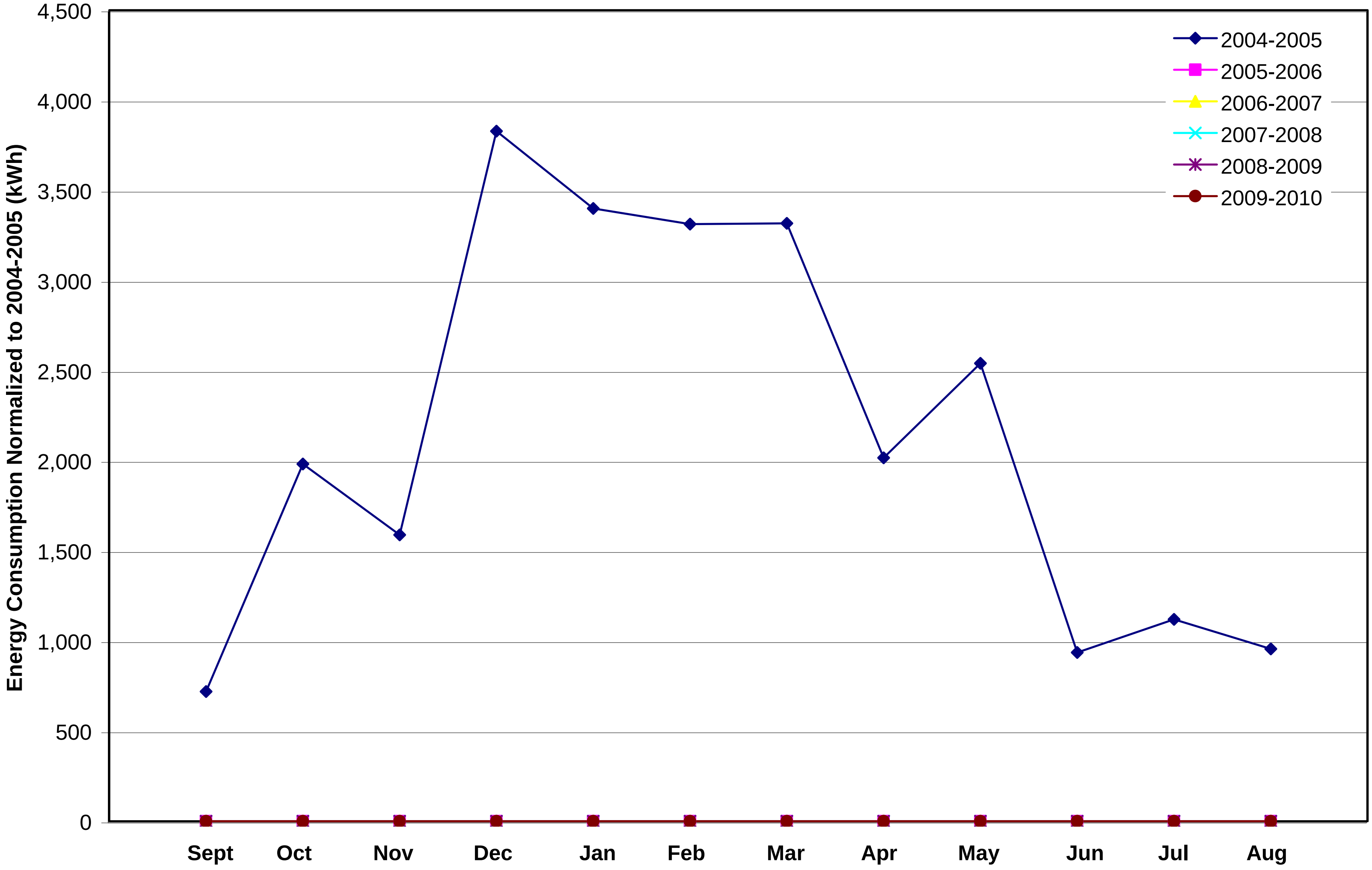


Table F.6 - Energy Consumption Monitoring Data for the Heritage Building (Visitors Centre)

	2004-2005				2005-2006				2006-2007			
Month	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**
September	0	0	108.8	0		0		0		0		0
October	200	200	347.4	200		0		0		0		0
November	0	0	498.2	0		0		0		0		0
December	110	110	912	110		0		0		0		0
January	0	0	1072.4	0		0		0		0		0
February	120	120	800	120		0		0		0		0
March	0	0	736.9	0		0		0		0		0
April	90	90	299.9	90		0		0		0		0
May	0	0	230.1	0		0		0		0		0
June	50	50	43.7	50		0		0		0		0
July	0	0	21.9	0		0		0		0		0
August	350	350	32	350		0		0		0		0
TOTAL	920	920	5103.3	920	0	0	0	0	0	0	0	0

	2007-2008				2008-2009				2009-2010			
Month	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**
September		0		0		0		0		0		0
October		0		0		0		0		0		0
November		0		0		0		0		0		0
December		0		0		0		0		0		0
January		0		0		0		0		0		0
February		0		0		0		0		0		0
March		0		0		0		0		0		0
April		0		0		0		0		0		0
May		0		0		0		0		0		0
June		0		0		0		0		0		0
July		0		0		0		0		0		0
August		0		0		0		0		0		0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	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) taken from the electricity bills, next to the appropriate month.
3. Go to the following website to collect information on the Heating Degree Days for Winnipeg, Manitoba: http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=XX&StationID=29593&Year=2004&Month=12&Day=1
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 Heritage Building

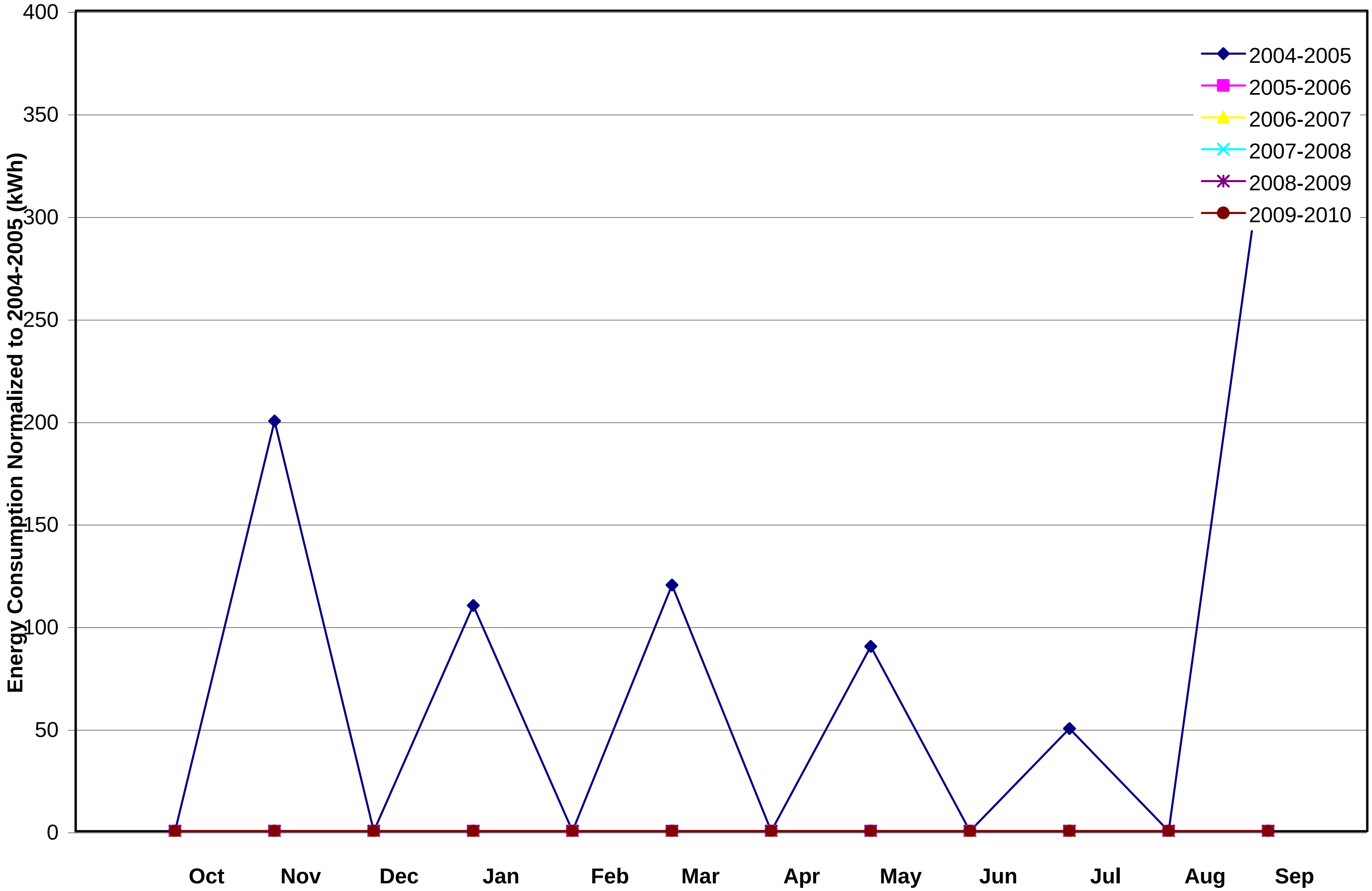


Table F.7 - Energy Consumption Monitoring Data for the Library

	2004-2005				2005-2006				2006-2007			
Month	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^oC days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^oC days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^oC days/mo)**	**Energy Normalized to 2004-2005 (kWh)**
September	1,600	1,600	108.8	1,600		0		#DIV/0!		0		#DIV/0!
October	1,430	1,430	347.4	1,430		0		#DIV/0!		0		#DIV/0!
November	1,930	1,930	498.2	1,930		0		#DIV/0!		0		#DIV/0!
December	3,140	3,140	912	3,140		0		#DIV/0!		0		#DIV/0!
January	4,270	4,270	1072.4	4,270		0		#DIV/0!		0		#DIV/0!
February	3,070	3,070	800	3,070		0		#DIV/0!		0		#DIV/0!
March	2,740	2,740	736.9	2,740		0		#DIV/0!		0		#DIV/0!
April	1,710	1,710	299.9	1,710		0		#DIV/0!		0		#DIV/0!
May	1,240	1,240	230.1	1,240		0		#DIV/0!		0		#DIV/0!
June	510	510	43.7	510		0		#DIV/0!		0		#DIV/0!
July	1,420	1,420	21.9	1,420		0		#DIV/0!		0		#DIV/0!
August	530	530	32	530		0		#DIV/0!		0		#DIV/0!
TOTAL	23,590	23,590	5103.3	23,590	0	0	0	#DIV/0!	0	0	0	#DIV/0!

	2007-2008				2008-2009				2009-2010			
Month	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^oC days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^oC days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^oC days/mo)**	**Energy Normalized to 2004-2005 (kWh)**
September		0		#DIV/0!		0		#DIV/0!		0		#DIV/0!
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!
TOTAL	0	0	0	#DIV/0!	0	0	0	#DIV/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) taken from the electricity bills, next to the appropriate month.
3. Go to the following website to collect information on the Heating Degree Days for Winnipeg, Manitoba http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=XX&StationID=29593&Year=2004&Month=12&Day=1
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 Library

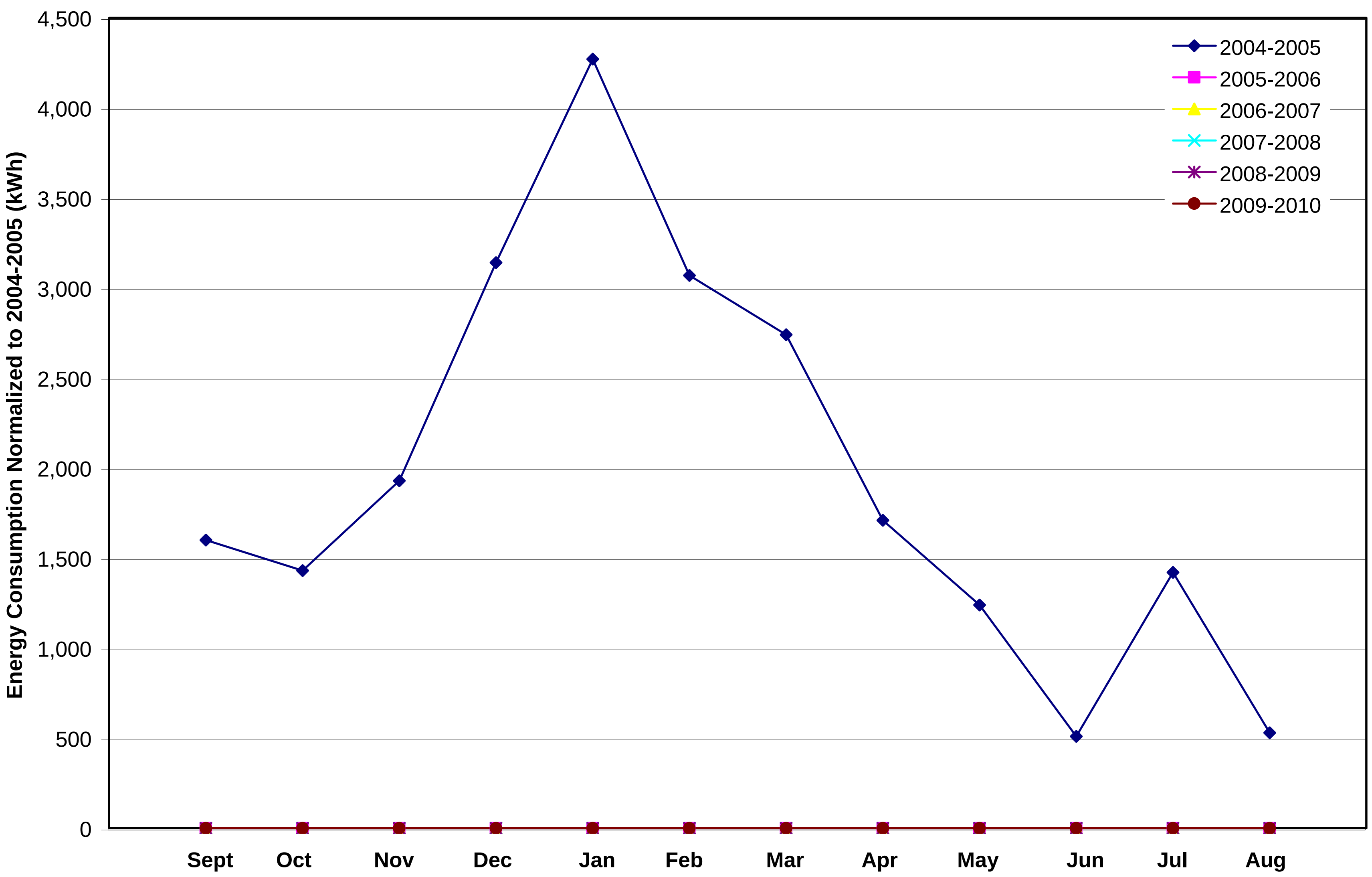


Table F.8 - Energy Consumption Monitoring Data for the Sewage Lift Station

	2004-2005				2005-2006				2006-2007			
Month	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**
September	1,669	1,669	108.8	1,669		0		#DIV/0!		0		#DIV/0!
October	1,902	1,902	347.4	1,902		0		#DIV/0!		0		#DIV/0!
November	1,561	1,561	498.2	1,561		0		#DIV/0!		0		#DIV/0!
December	2,666	2,666	912	2,666		0		#DIV/0!		0		#DIV/0!
January	2,400	2,400	1072.4	2,400		0		#DIV/0!		0		#DIV/0!
February	2,588	2,588	800	2,588		0		#DIV/0!		0		#DIV/0!
March	2,178	2,178	736.9	2,178		0		#DIV/0!		0		#DIV/0!
April	2,251	2,251	299.9	2,251		0		#DIV/0!		0		#DIV/0!
May	1,111	1,111	230.1	1,111		0		#DIV/0!		0		#DIV/0!
June	1,563	1,563	43.7	1,563		0		#DIV/0!		0		#DIV/0!
July	5,740	5,740	21.9	5,740		0		#DIV/0!		0		#DIV/0!
August	1,617	1,617	32	1,617		0		#DIV/0!		0		#DIV/0!
TOTAL	27,246	27,246	5103.3	27,246	0	0	0	#DIV/0!	0	0	0	#DIV/0!

	2007-2008				2008-2009				2009-2010			
Month	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^{o}C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**
September		0		#DIV/0!		0		#DIV/0!		0		#DIV/0!
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!
TOTAL	0	0	0	#DIV/0!	0	0	0	#DIV/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) taken from the electricity bills, next to the appropriate month.
3. Go to the following website to collect information on the Heating Degree Days for Winnipeg, Manitoba http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=XX&StationID=29593&Year=2004&Month=12&Day=1
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 Sewage Lift Station

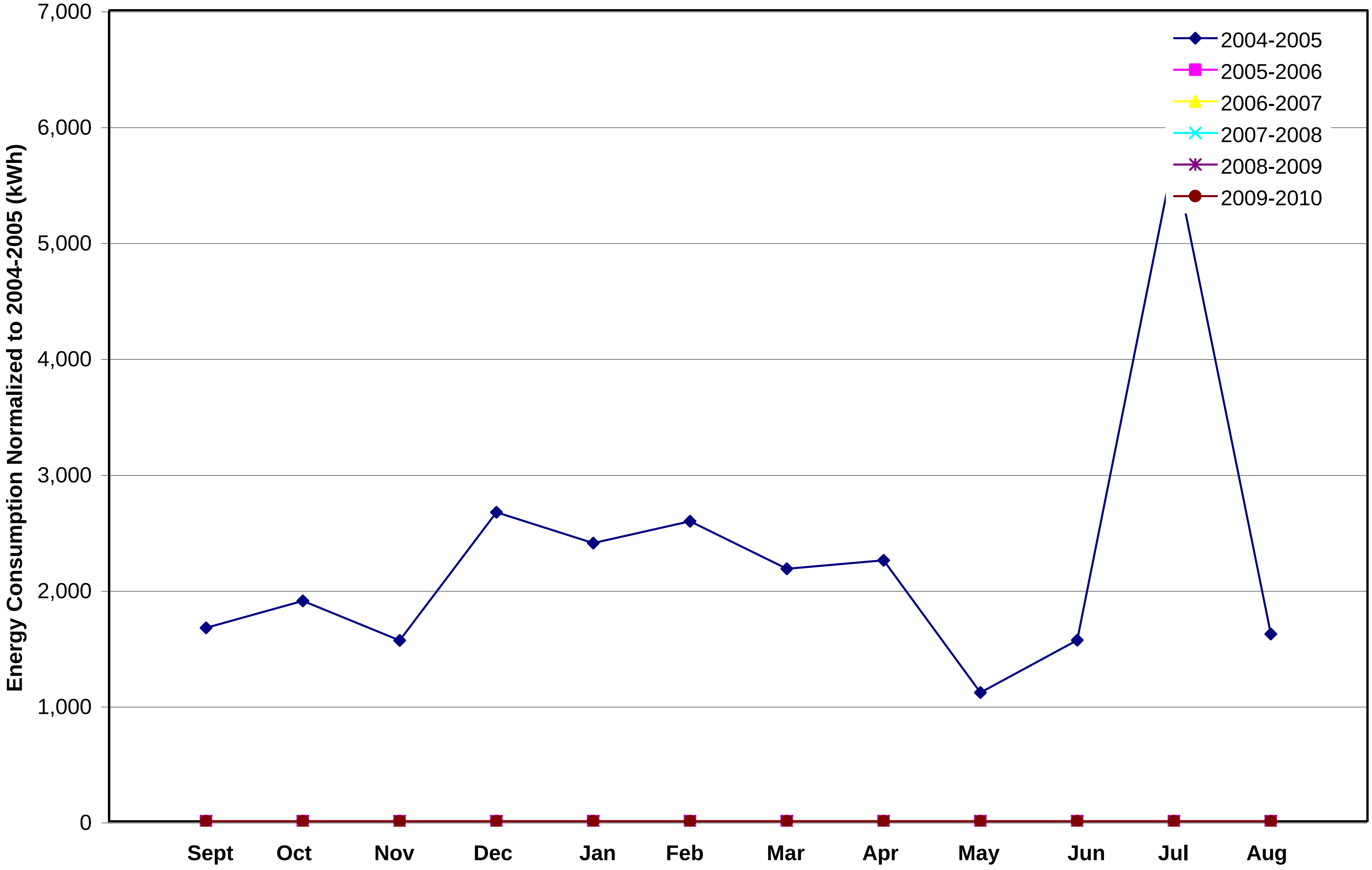


Table F.9 - Energy Consumption Monitoring Data for the Municipal Admin Building & Recycling Depot

	2004-2005				2005-2006				2006-2007			
Month	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^oC days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^oC days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^oC days/mo)**	**Energy Normalized to 2004-2005 (kWh)**
September	2,720	2,720	108.8	2,720		0		#DIV/0!		0		#DIV/0!
October	2,300	2,300	347.4	2,300		0		#DIV/0!		0		#DIV/0!
November	2,900	2,900	498.2	2,900		0		#DIV/0!		0		#DIV/0!
December	411	411	912	411		0		#DIV/0!		0		#DIV/0!
January	4,180	4,180	1072.4	4,180		0		#DIV/0!		0		#DIV/0!
February	4,650	4,650	800	4,650		0		#DIV/0!		0		#DIV/0!
March	3,290	3,290	736.9	3,290		0		#DIV/0!		0		#DIV/0!
April	4,260	4,260	299.9	4,260		0		#DIV/0!		0		#DIV/0!
May	2,620	2,620	230.1	2,620		0		#DIV/0!		0		#DIV/0!
June	3,410	3,410	43.7	3,410		0		#DIV/0!		0		#DIV/0!
July	2,410	2,410	21.9	2,410		0		#DIV/0!		0		#DIV/0!
August	3,380	3,380	32	3,380		0		#DIV/0!		0		#DIV/0!
TOTAL	36,531	36,531	5103.3	36,531	0	0	0	#DIV/0!	0	0	0	#DIV/0!

	2007-2008				2008-2009				2009-2010			
Month	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^oC days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^oC days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Total Energy Consumption (kWh)**	**HDD (^oC days/mo)**	**Energy Normalized to 2004-2005 (kWh)**
September		0		#DIV/0!		0		#DIV/0!		0		#DIV/0!
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!
TOTAL	0	0	0	#DIV/0!	0	0	0	#DIV/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) taken from the electricity bills, next to the appropriate month.
3. Go to the following website to collect information on the Heating Degree Days for Winnipeg, Manitoba http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=XX&StationID=29593&Year=2004&Month=12&Day=1
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 Municipal Admin Building & Recycling Depot

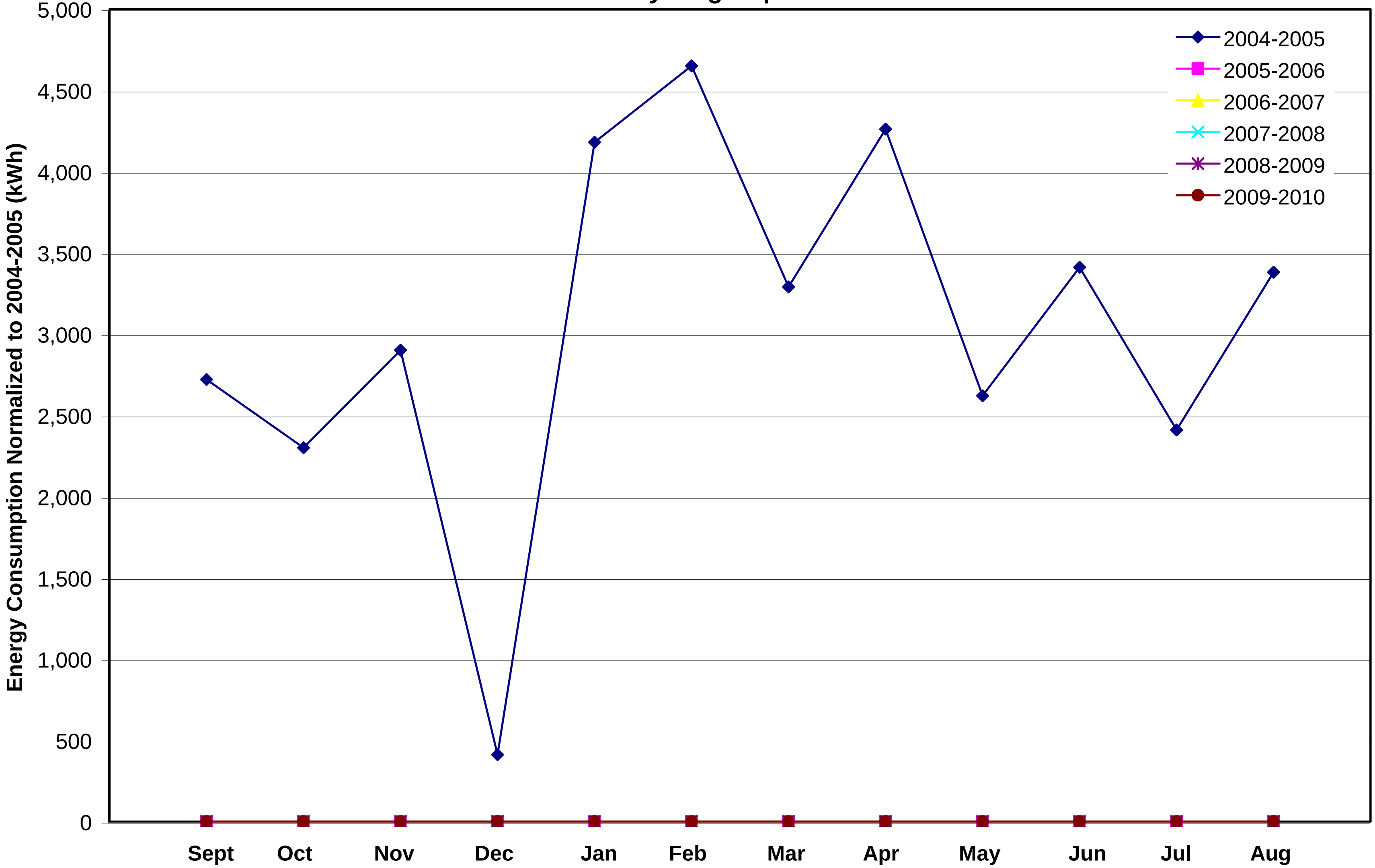


Table F.10 - Energy Consumption Monitoring Data for the Swimming Pool Outdoors

	2004-2005					2005-2006					2006-2007				
Month	**Billed Elect Energy (kWh)**	**Billed Propane Energy (L)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Propane Energy (L)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Propane Energy (L)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
September	720	0	720	108.8	720			0		#DIV/0!			0		#DIV/0!
October	895	0	895	347.4	895			0		#DIV/0!			0		#DIV/0!
November	1,776	0	1,776	498.2	1,776			0		#DIV/0!			0		#DIV/0!
December	2,225	0	2,225	912	2,225			0		#DIV/0!			0		#DIV/0!
January	2,045	0	2,045	1072	2,045			0		#DIV/0!			0		#DIV/0!
February	2,344	0	2,344	800	2,344			0		#DIV/0!			0		#DIV/0!
March	2,109	0	2,109	736.9	2,109			0		#DIV/0!			0		#DIV/0!
April	1,860	1,266	2,758	299.9	2,758			0		#DIV/0!			0		#DIV/0!
May	2,382	0	2,382	230.1	2,382			0		#DIV/0!			0		#DIV/0!
June	439	635	889	43.7	889			0		#DIV/0!			0		#DIV/0!
July	1,205	0	1,205	21.9	1,205			0		#DIV/0!			0		#DIV/0!
August	453	2,127	1,961	32	1,961			0		#DIV/0!			0		#DIV/0!
TOTAL	18,453	4,028	21,310	5103	21,310	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

	2007-2008					2008-2009					2009-2010				
Month	**Billed Elect Energy (kWh)**	**Billed Propane Energy (L)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Propane Energy (L)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Propane Energy (L)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
September			0		#DIV/0!			0		#DIV/0!			0		#DIV/0!
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!
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 Winnipeg, Manitoba: http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=XX&StationID=29593&Year=2004&Month=1
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 Swimming Pool Outdoors

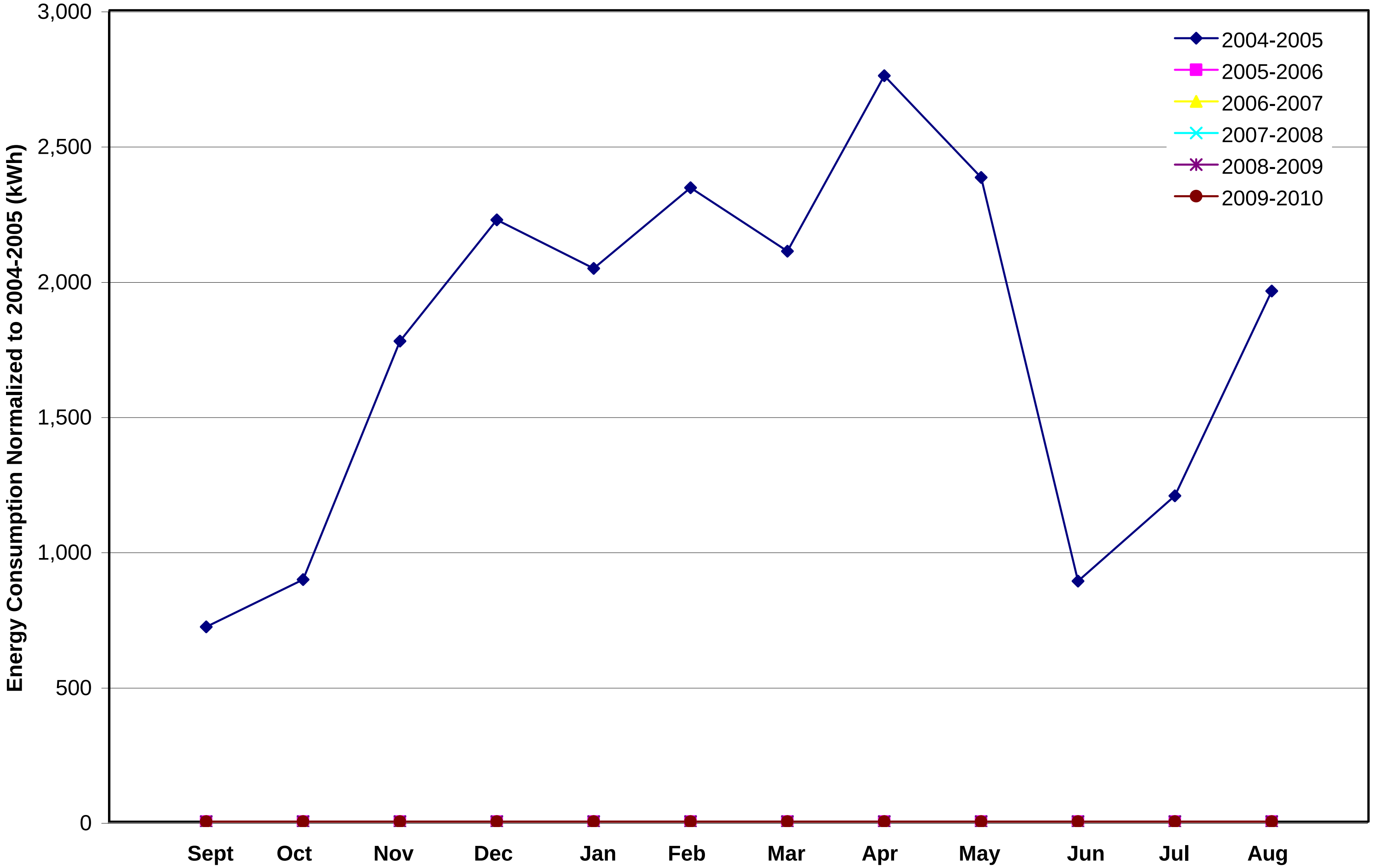


Table F.11 - Energy Consumption Monitoring Data for the Water Treatment Plant

	2004-2005				2005-2006				2006-2007			
Month	Billed Elect Energy (kWh)	Total Energy Consumption (kWh)	HDD (^oC days/mo)	Energy Normalized to 2004-2005 (kWh)	Billed Elect Energy (kWh)	Total Energy Consumption (kWh)	HDD (^oC days/mo)	Energy Normalized to 2004-2005 (kWh)	Billed Elect Energy (kWh)	Total Energy Consumption (kWh)	HDD (^oC days/mo)	Energy Normalized to 2004-2005 (kWh)
September	5,350	5,350	108.8	5,350		0		#DIV/0!		0		#DIV/0!
October	6,700	6,700	347.4	6,700		0		#DIV/0!		0		#DIV/0!
November	8,490	8,490	498.2	8,490		0		#DIV/0!		0		#DIV/0!
December	10,140	10,140	912	10,140		0		#DIV/0!		0		#DIV/0!
January	11,460	11,460	1072.4	11,460		0		#DIV/0!		0		#DIV/0!
February	12,907	12,907	800	12,907		0		#DIV/0!		0		#DIV/0!
March	8,782	8,782	736.9	8,782		0		#DIV/0!		0		#DIV/0!
April	7,945	7,945	299.9	7,945		0		#DIV/0!		0		#DIV/0!
May	8,267	8,267	230.1	8,267		0		#DIV/0!		0		#DIV/0!
June	5,077	5,077	43.7	5,077		0		#DIV/0!		0		#DIV/0!
July	6,346	6,346	21.9	6,346		0		#DIV/0!		0		#DIV/0!
August	5,252	5,252	32	5,252		0		#DIV/0!		0		#DIV/0!
TOTAL	96,716	96,716	5103.3	96,716	0	0	0	#DIV/0!	0	0	0	#DIV/0!

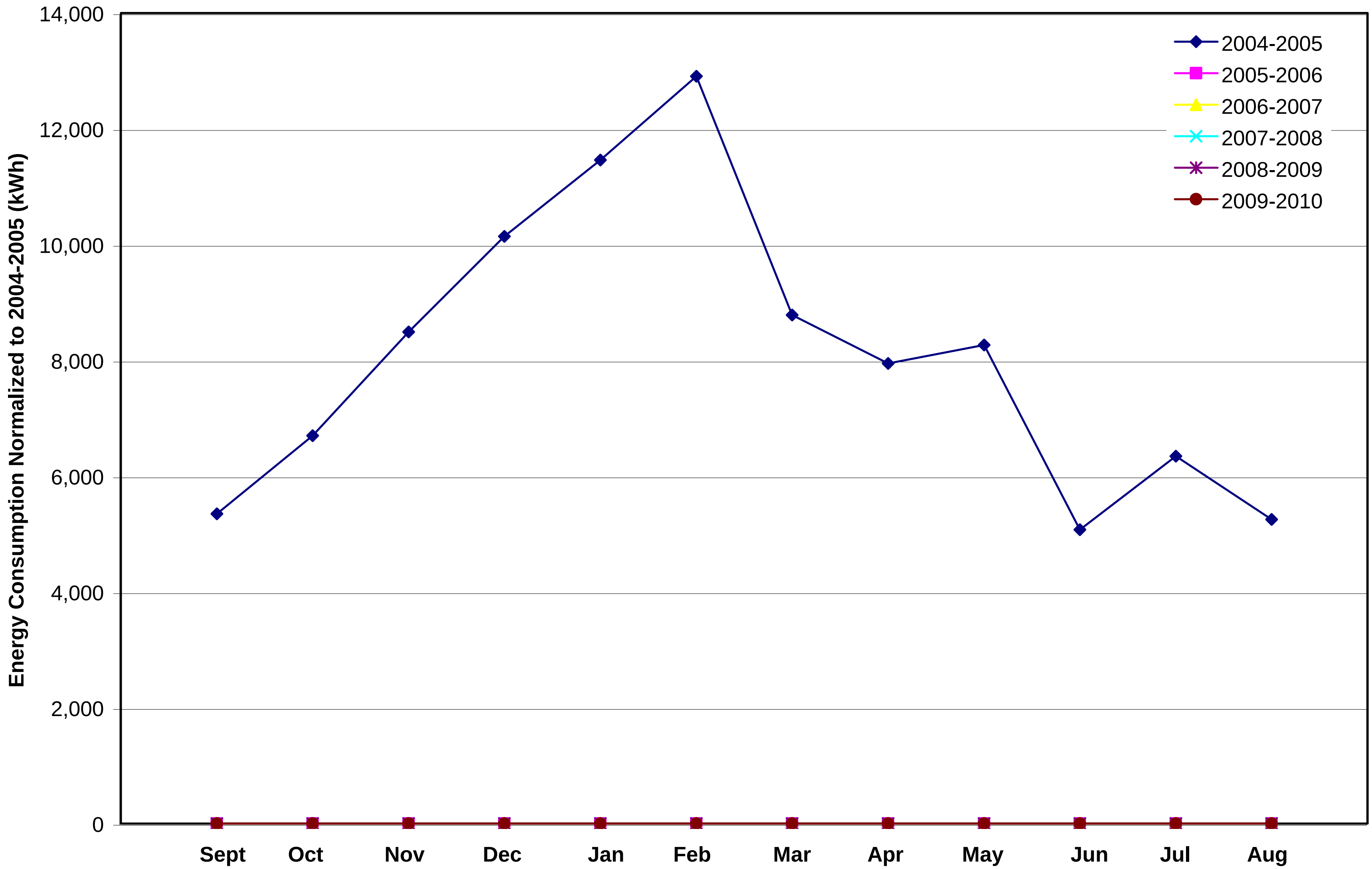
	2007-2008				2008-2009				2009-2010			
Month	Billed Elect Energy (kWh)	Total Energy Consumption (kWh)	HDD (^oC days/mo)	Energy Normalized to 2004-2005 (kWh)	Billed Elect Energy (kWh)	Total Energy Consumption (kWh)	HDD (^oC days/mo)	Energy Normalized to 2004-2005 (kWh)	Billed Elect Energy (kWh)	Total Energy Consumption (kWh)	HDD (^oC days/mo)	Energy Normalized to 2004-2005 (kWh)
September		0		#DIV/0!		0		#DIV/0!		0		#DIV/0!
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!
TOTAL	0	0	0	#DIV/0!	0	0	0	#DIV/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) taken from the electricity bills, next to the appropriate month.
3. Go to the following website to collect information on the Heating Degree Days for Winnipeg, Manitoba http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=XX&StationID=29593&Year=2004&Month=12&Day=1
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 Water Treatment Plant



Environment Canada Environnement Canada

[français] [Back]

Daily Data Report for December 2004

Notes on Data Quality.

MORDEN CDA CS
MANITOBA

Latitude: 49° 10' N Longitude: 98° 4' W Elevation: 297.50 m
Climate ID: 5021849 WMO ID: 71564 TC ID: XMD

Daily Data Report for December 2004

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	-12.0	-14.3	-13.2	31.2	0.0	0.0	0.7	0.7	M		
02	-6.5	-24.3	-15.4	33.4	0.0	0.0	2.6	2.6	M		
03	7.1	-7.4	-0.2	18.2	0.0	0.0	0.0	0.0	M		
04	5.6	-15.3	-4.9	22.9	0.0	0.0	0.0	0.0	M		
05	-8.7	-16.4	-12.6	30.6	0.0	0.0	2.7	2.7	1		
06	-1.4	-8.7	-5.1	23.1	0.0	0.0	11.0	6.9	M		
07	-3.1	-18.2	-10.7	28.7	0.0	0.0	0.0	0.0	5		
08	-7.2	-10.0	-8.6	26.6	0.0	0.0	0.0	0.0	4		
09	-8.1	-10.8	-9.5	27.5	0.0	0.0	0.0	0.0	4		
10	-4.8	-12.0	-8.4	26.4	0.0	0.0	0.0	0.0	M		
11	5.7	-7.8	-1.1	19.1	0.0	0.0	1.8	1.8	M		
12	-0.9	-14.5	-7.7	25.7	0.0	0.0	1.8	1.8	M		
13	-9.3	-18.8	-14.1	32.1	0.0	0.0	0.0	0.0	M		
14	3.4	-9.8	-3.2	21.2	0.0	0.0	0.0	0.0	M		
15	2.4	-7.6	-2.6	20.6	0.0	0.0	0.0	0.0	M		
16	-3.4	-15.2	-9.3	27.3	0.0	0.0	0.0	0.0	M		
17	6.7	-13.4	-3.4	21.4	0.0	0.0	0.0	0.0	M		
18	-10.1	-23.8	-17.0	35.0	0.0	0.0	0.0	0.0	M		
19	-6.9	-23.7	-15.3	33.3	0.0	0.0	0.6	0.6	M		
20	4.7	-20.1	-7.7	25.7	0.0	0.0	0.6	0.6	M		
21	-18.6	-24.0	-21.3	39.3	0.0	0.0	0.0	0.0	M		
22	-20.4	-24.9	-22.7	40.7	0.0	0.0	0.0	0.0	M		
23	-20.3	-27.1	-23.7	41.7	0.0	0.0	0.0	0.0	M		
24	-15.4	-25.7	-20.6	38.6	0.0	0.0	0.6	0.6	M		
25	-16.9	-24.3	-20.6	38.6	0.0	0.0	0.0	0.0	M		
26	-10.0	-26.2	-18.1	36.1	0.0	0.0	2.6	2.6	M		
27	-7.5	-15.6	-11.6	29.6	0.0	0.0	0.0	0.0	M		
28	-4.5	-17.9	-11.2	29.2	0.0	0.0	0.0	0.0	M		
29	-4.6	-16.8	-10.7	28.7	0.0	0.0	0.0	0.0	M		
30	-4.6	-11.3	-8.0	26.0	0.0	0.0	24.1	24.1	M		
31	-11.3	-19.6	-15.5	33.5	0.0	0.0	0.0	0.0	M		
Sum				912.0	**0.0**	**0.0**	**49.1**	**45.0**			
Avg	**-5.8**	**-17.0**	**-11.4**								
Xtrm	**7.1**	**-27.1**									

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

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.