ASSOCIATION OF MANITOBA MUNICIPALITIES
MANITOBA MUNICIPAL ENERGY, WATER AND WASTE
WATER EFFICIENCY PROJECT
TOWN OF CARMAN
FINAL REPORT
MAY 2006

KGS GROUP

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

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May 3, 2006 File No. 05-1285-01-1000.3

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 Carman– 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 Carman 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 12, and Appendix A to G.

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

Yours Truly,

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

RBB/af

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EXECUTIVE SUMMARY

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

An energy and water audit was conducted on nine buildings in the Town of Carman. 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 plants.
- Water – Replacing high flow water fixtures with water efficient fixtures.

Table E1 shows the energy consumption for each of the buildings for the period from September 2004 to September 2005. This year was chosen as it represents a base year for energy and water consumption. In addition, the most recent year was selected since the conditions of the buildings throughout this time most closely resemble the buildings' current conditions. With the exception of the Golden Prairie Arts Council, which only uses electricity, and the Carman Aquatic Centre, which only uses gas, the rest of the buildings included in this audit use both electricity and natural gas. The "Energy Density" column in this table is the total energy consumed in the building divided by the area of the building. This is useful in comparing the energy consumption among the different buildings in Carman. The pie chart corresponding to Table E1 displays the percentage of total energy density for each building. Values range from a high of 19.2% for the Water Treatment Plant to a low of 1.6% for the Museum.

Tables E2 (a) and (b) show overall energy and water saving opportunities for all nine buildings in the Town of Carman. These tables include approximate product and installation prices for each measure both with and without incentives (refer to Appendix D for 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 for all nine buildings is 831,289 kWh, or 31% of the current energy consumption.

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

- The buildings have little or no ventilation (e.g. Fire Hall).
- Some of the buildings have unheated areas (e.g. Carman and Dufferin Arena).

- Some of the buildings are infrequently used (e.g. Fire Hall, Carman Municipal Landfill and Museum).

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 was taken as $0.4111 per cubic metre. This value is a weighted average of the proportion of water from the water treatment plant and the amount bought from the Pembina Valley Water Cooperative.

The results and recommendations from the water and wastewater system audit are shown in Chapter 14 of this report. From the water system audit, it was determined that Carman's Water Treatment Plant produced a total of 319,073 m^3 of water from January 1, 2004 to December 31, 2004. In addition, the Town purchased 94,250 m^3 of water from the Pembina Valley Water Cooperative during this period. The total amount of water that was distributed to the Town was 333,679 m^3 , of which 277,289 m^3 was consumed. Of the remaining 56,390 m^3 of water, 41,906 m^3 is unaccounted for water loss and the remaining 14,225m^3 is considered water losses due to inaccurate water meters or unauthorized water use. 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.

Carman's sewer system is composed of an older and newer section. The older sewage collection system is a combined system for both sewer and storm water flow, whereas the newer section is made up of a separate system that only collects sewer flow. It was determined that approximately 40% of the flow through the sewer system is due to infiltration of storm water. Reducing this infiltration would reduce pumping costs and extend the lifespan of the lagoon. For these reasons, it is recommended that the Town of Carman take the following measures to reduce the amount of infiltration into the sewage system: sealing manholes; lining pipes; and disconnecting rain leaders, sump pumps and weeping tiles from the sanitary sewer system. In addition, it is recommended that the Town conduct a study to determine feasible alternatives to deal with extraneous storm water sources.

In addition to energy, water, and cost savings, the implementation of the measures identified in the audits would result in additional benefits:

- 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 September 2004 – September 2005.

Site	Energy Density (kWh/m^2)	Area (m^2)	Electricity		Natural Gas		TOTAL ENERGY	
			kWh	Cost ($)	kWh	Cost ($)	kWh	Cost ($)
Carman and Dufferin Arena	261	4,153	585,520	$22,644	497,262	$18,598	1,082,782	$41,242
Fire Hall	465	203	18,453	$1,449	76,029	$3,211	94,482	$4,660
Golden Prairie Arts Council	271	252	68,400	$4,764	0	$0	68,400	$4,764
Boyne Regional Library	387	447	42,880	$3,108	130,075	$5,396	172,955	$8,504
Municipal Garage	464	465	65,880	$4,409	150,029	$6,198	215,909	$10,607
Carman Municipal Landfill	831	123	4,110	$492	97,680	$4,084	101,790	$4,576
Museum	67	401	5,090	$556	21,931	$1,033	27,021	$1,589
Carman Aquatic Centre	750	528	0	$0	396,104	$17,257	396,104	$17,257
Water Treatment Plant	830	608	244,260	$14,046	260,678	$10,554	504,938	$24,600
Totals	**4,328**	**7,179**	**1,034,593**	**$51,468**	**1,629,788**	**$66,331**	**2,664,381**	**$117,799**

Percentage of Total Energy Density for Buildings in Carman

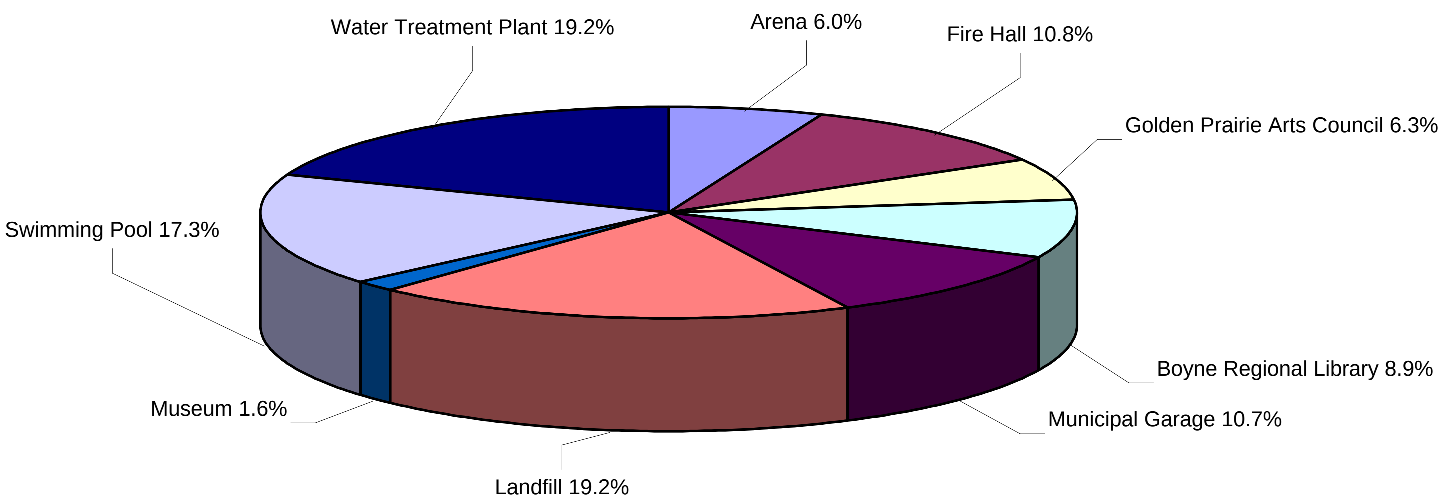

Table E2 (a): Summary of Energy Saving Opportunities for all 9 Buildings in the Town of Carman **Page 1 of 5**

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											
Replace EXIT incandescent lamps with LED modules.	30	$50	$5	$80	$4,446	$2,907	6,693	$402	11.1	7.2	Golden Prairie Arts Council, Boyne Regional Library, Museum & Water Treatment Plant
Retrofit 2' x4 T12 fluorescents with T8 ballast and tubes.	1	$55	$35	$60	$131	$108	92	$5	23.9	19.7	Boyne Regional Library
Retrofit 4' x1 T12 fluorescents with T8 ballast and tubes.	32	$55	$35	$60	$4,195	$3,466	1,730	$104	40.4	33.4	Arena, Golden Prairie Arts Council & Municipal Garage
Retrofit 4' x2 T12 fluorescents with T8 ballast and tubes.	142	$55	$35	$60	$18,616	$15,379	14,466	$917	20.3	16.8	Arena, Golden Prairie Arts Council, Boyne Regional Library, Municipal Garage & Water Treatment Plant
Retrofit 4'x3 T12 fluorescents with T8 ballast and tubes	12	$58	$38	$63	$1,655	$1,382	681	$41	40.5	33.8	Water Treatment Plant
Retrofit 4' x4 T12 fluorescents with T8 ballast and tubes.	59	$55	$35	$60	$7,735	$6,390	18,469	$1,109	7.0	5.8	Arena & Boyne Regional Library
Retrofit 8' x2 T12 fluorescents with T8 ballast and tubes.	52	$75	$40	$75	$8,892	$6,817	19,475	$1,169	7.6	5.8	Arena, Golden Prairie Arts Council, Boyne Regional Library & Municipal Garage
Replace exterior incandescents with high pressure sodium incandescents	3	$125	$100	$125	$855	$770	657	$39	21.7	19.5	Landfill

Table E2 (a): Summary of Energy Saving Opportunities for all 9 Buildings in the Town of Carman

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											
Replace interior incandescents with compact fluorescents.	106	$15	$10	$13	$3,384	$2,779	12,499	$750	4.5	3.7	Arena, Golden Prairie Arts Council, Boyne Regional Library, Municipal Garage, Landfill, Museum & Swimming Pool.
Replace EXIT sign to LED module.	1	$50	$5	$80	$148	$97	237	$14	10.4	6.8	Water Treatment Plant
Lighting Subtotal					**$50,057**	**$40,094**	**74,998**	**$4,552**			
ENVELOPE											
Replace & weather strip pedestrian doors.	16	$350	$350	$100	$8,208	$8,208	64,318	$2,965	2.8	2.8	Arena, Golden Prairie Arts Council, Boyne Regional Library, Municipal Garage, Landfill & Museum.
Weather strip pedestrian doors.	7	$30	$30	$100	$1,037	$1,037	11,604	$530	2.0	2.0	Fire Hall, Boyne Regional Library, Landfill & Water Treatment Plant.
Replace & weather strip overhead doors.	2	$1,000	$1,000	$400	$3,192	$3,192	22,765	$1,040	3.1	3.1	Landfill
Weather strip overhead doors.	4	$60	$60	$100	$730	$730	24,984	$1,142	0.6	0.6	Fire Hall and Municipal Garage
Seal Windows	41	$5	$5	$25	$1,402	$1,402	13,032	$692	2.0	2.0	Golden Prairie Arts Council, Boyne Regional Library, Municipal Garage & Landfill

Table E2 (a): Summary of Energy Saving Opportunities for all 9 Buildings in the Town of Carman

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											
Replace Windows ****	55	$556	$486	$100	$41,131	$36,742	45,311	$2,206	18.6	16.7	Arena, Golden Prairie Arts Council, Boyne Regional Library, Municipal Garage, Landfill & Water Treatment Plant.
Upgrade wall insulation	6	$7,407	$6,980	$1,200	$58,872	$55,951	50,653	$2,461	23.9	22.7	Arena, Golden Prairie Arts Council, Boyne Regional Library, Landfill & Museum.
Upgrade roof insulation	4	$6,606	$6,515	$1,605	$37,442	$37,027	16,931	$832	45.0	44.5	Golden Prairie Arts Council, Boyne Regional Library, Landfill & Museum.
Envelope Subtotal					**$152,014**	**$144,290**	**249,599**	**$11,868**			
HVAC											
Install programmable thermostat; Setback temp to 15 °C (59 °F)	4	$300	$300	$300	$2,736	$2,736	35,123	$2,109	1.3	1.3	Municipal Garage & Water Treatment Plant.
Install liquid pool covers	21	$20	$20	$0	$479	$479	79,221	$3,620	0.1	0.1	Carman Aquatic Centre
Replace 120 MBH unit heater with a high efficiency gas furnace.	1	$3,200	$3,200	$1,000	$4,788	$4,788	13,967	$638	7.5	7.5	Water Treatment Plant
Replace 200 MBH unit heater with a high efficiency gas furnace.	1	$4,865	$4,865	$1,000	$6,686	$6,686	22,605	$1,033	6.5	6.5	Water Treatment Plant
Replace furnace with 95% efficient furnace	2	$2,000	$2,000	$800	$6,384	$6,384	26,015	$1,189	5.4	5.4	Boyne Regional Library
Replace NG unit heater with a high efficiency radiant heater	1	$1,200	$900	$1,000	$2,508	$2,166	15,206	$695	3.6	3.1	Fire Hall

Table E2 (a): Summary of Energy Saving Opportunities for all 9 Buildings in the Town of Carman **Page 4 of 5**

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 200 cfm HRVs	3	$950	$950	$1,000	$6,669	$6,669	11,847	$598	11.2	11.2	Golden Prairie Arts Council & Boyne Regional Library
Replace BDD with motorized dampers	1	$300	$300	$300	$684	$684	975	$45	15.3	15.3	Arena
Replace boiler with high efficiency boiler.	4	$10,500	$5,250	$2,000	$57,000	$33,060	234,694	$10,726	5.3	3.1	Arena, Boyne Regional Library, Municipal Garage & Swimming Pool
Install geothermal heating system.	1	$31,140	$26,126	$0	$35,500	$29,784	34,220	$2,055	17.3	14.5	Golden Prairie Arts Council.
Install outdoor thermostat to control ventilation in arena.	1	$600	$600	$600	$1,368	$1,368	22,915	$1,047	1.3	1.3	Arena.
HVAC Subtotal					**$124,802**	**$94,804**	**496,788**	**$23,754**			
HOT WATER											
Install water efficient metering faucets.	27	$309	$309	$150	$14,119	$14,119	13,250	$606	23.3	23.3	Arena, Fire Hall, Golden Prairie Arts Council, Boyne Regional Library, Municipal Garage & Museum.
Replace water heater with instantaneous water heater.	5	$300	$300	$900	$6,840	$6,840	5,819	$333	20.6	20.6	Fire Hall, Golden Prairie Arts Council, Boyne Regional Library, Municipal Garage & Water Treatment Plant.
Water Subtotal					**$20,959**	**$20,959**	**19,069**	**$938**			

Table E2 (a): Summary of Energy Saving Opportunities for all 9 Buildings in the Town of Carman

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*	
MOTORS *****											
When replacing motor, replace with a premium efficient motor.	4	$526	$526	$0	$2,398	$2,399	3,165	$190	12.6	12.6	Water Treatment Plant.
Motors Subtotal					**$2,398**	**$2,399**	**3,165**	**$190**			

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	2,664,381	$117,799	323
Estimated Annual Savings	831,289	$38,648	121
Percent Savings	31%	33%	38%

* 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) and the cost of natural gas is 0.0457 $/kWh (as of November 1, 2005).
**** Average values were used for the unit capital cost and installation costs for replacing windows.
***** Average values were used for the unit capital cost difference and installation costs for replacing motors with premium efficiency motors.

Table E2 (b): Summary of Water Saving Opportunities for all 9 Buildings in the Town of Carman.

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.	27	$309	$150	$14,128	80%	959,065	$394	Arena, Fire Hall, Golden Prairie Arts Council, Boyne Regional Library, Municipal Garage & Museum.
Install water efficient toilets.	25	$284	$150	$12,369	55%	823,483	$339	Arena, Fire Hall, Golden Prairie Arts Council, Boyne Regional Library, Municipal Garage & Museum.
Install water efficient urinals	9	$344	$200	$5,581	60%	1,899,327	$781	Arena & Fire Hall.

* The total cost column includes 14% taxes.

MMEP AUDITORS

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

FUNDING

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

This Study has been produced with the assistance of the Green Municipal Enabling Fund, a Fund financed by the Government of Canada and administered by the Federation of Canadian Municipalities. Notwithstanding this support, the views expressed are the personal views of the author(s), and the Government of Canada and the Federation of Canadian Municipalities accept no responsibility for them.

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

ACKNOWLEDGEMENTS

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

- Tara Brennan (Carman & Dufferin Arena and Carman Aquatic Centre)
- Ed Vandersluis (Fire Hall)
- Jane MacDonald (Golden Prairie Arts Council)
- Helen Stewart (Boyne Regional Library)
- Jim Dunn (Municipal Garage)
- Dave Bourgeois (Carman Municipal Landfill)
- Shirley Snider (Museum)

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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 nine buildings in the Town of Carman 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 Carman to reduce operating costs, conserve resources and reduce greenhouse gas emissions. All nine buildings were analyzed independently and the results are presented in separate sections throughout the report.

1.3 METHODOLOGY

The buildings were toured on October 5 2005 by Mr. Joel Lambert and October 25,2005 by Mr. Tibor Takach, both of KGS Group. Mr. Takach toured the Water Treatment Plant to study the water and wastewater systems, and Mr. Lambert toured the other eight buildings to perform the water and energy efficiency audits. The water and energy efficiency audits involved a walk-through 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 a number of the building representatives to discuss the study objectives for identifying energy, water, and wastewater saving opportunities, and to provide information on existing incentive programs. While auditing the buildings, whenever possible, on-site training was done to inform the staff on energy and/or water saving opportunities in specific buildings and to point out maintenance issues where applicable.

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

Energy Saving Opportunities (ESOs) were developed for each building and are presented in tables throughout this report showing energy savings, cost savings, installation costs and simple payback periods. Simple Payback periods are calculated as the total installation cost divided by the annual cost savings. The installation costs include the material costs, both with and without incentives (see Appendix D for list of Manitoba Hydro incentives), and the labour costs for the installation using standard contractor rates. The total energy savings, the percent energy savings and the associated costs are presented at the end of each ESO table. It should be noted that the energy savings and capital cost estimates are preliminary. For complex measures such as installing wall panels, 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. Categorized as a greenhouse gas, carbon dioxide is known to contribute to global warming. Therefore, by decreasing the consumption of natural gas and electrical energy, CO_2 emissions are reduced. At the bottom of each building's ESO table, the total CO_2 reduction resulting from the proposed energy savings is displayed. This value 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 five years. Once the implementation phase begins these ESOs are the most attractive measures. Nevertheless, in order to maximize long-term savings and efficiencies for the buildings, implementation of the more capital-intensive measures with the longer payback periods is essential. As energy costs increase in the future these measures will have a greater attraction. It is recommended that the savings associated with the short payback ESOs be reinvested annually to assist financing the more expensive options.

In addition to ESOs, water saving opportunities (WSOs) are also presented in this report. These include installing water efficient metering faucets, toilets, urinals and showerheads. Based on estimates of the building's occupancy, the water savings are shown as percentages of the current fixtures water consumption and in litres per year. Cost savings were also calculated and are shown for the individual buildings throughout the report.

Section 14 of this report provides an overview of the water distribution and wastewater collection systems for the Town of Carman. In additions, recommendations are made to help the Town monitor its water consumption and losses and reduce operating costs.

2.0 CARMAN AND DUFFERIN ARENA

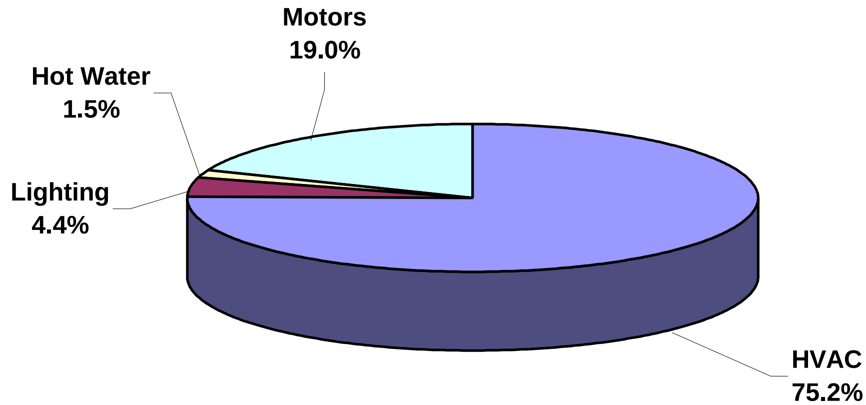
2.1 BACKGROUND

Constructed earlier than 1960, the Carman and Dufferin Arena is a 44,700 square foot structure with metal cladding on the exterior walls. On the main level, the arena consists of two unheated rinks, a hallway, and a lounge with windows facing one of the rinks, an ice plant room, a tractor/zamboni room, a concession area, bleachers, an open office area and five washrooms. The second floor consists of eight dressing rooms that include showers and washrooms. The rinks are used from the middle of October until the end of March, while the offices and hall/lounge are used year round.

Photo 1: Carman and Dufferin Arena

The Carman and Dufferin Arena use both natural gas and electric energy. Natural gas is used to heat the building and its water, and electricity is used for lighting and powering the arena's mechanical equipment. In the previous year, the Carman and Dufferin Arena consumed 497,262 kWh of natural gas and 585,520 kWh of electric energy. As shown in the following pie chart, the largest consumption of energy for the building is the heating sector (HVAC) at 75.2%.

Energy Breakdown (% of Total kWh) for the Carman and Dufferin Arena.



The arena contains thirteen sinks, thirteen toilets and eight urinals. By estimating the occupancy of the building and frequency of use, the hot water consumed by these water fixtures was determined. From these values, total annual hot water consumption was then established. In addition to the water consumed by these fixtures, a large portion of the annual water consumption is used to flood the rink.

There are no water meters in this facility to measure the actual water usage. However, based on the current water fixtures, calculations were made to determine the percent reduction in water consumption when replacing them with new water efficient fixtures.

2.2 ENERGY AND WATER SAVING OPPORTUNITIES

The energy and water saving opportunities for the Carman and Dufferin Arena are summarized in Tables 1 and 2. In determining the annual savings the following assumptions were made:

- The hockey rink (larger rink) is occupied from the middle of October until the end of March for approximately 92 hours per week.
- The offices and hall are occupied for the same hours as the hockey rink plus approximately 56 hours per week from May until the middle of October.
- The curling rink (smaller rink) is occupied for 3 hours per week during the summer season; May until mid-October.
- The temperature of the heated portions (hall, offices, concession stand and lobby) is maintained at 21°C (70°F).
- Rink areas, including the bleachers are unheated.

- For calculating water consumption and lighting usage, the typical occupancy of the arena is taken as 150 people.
- The motor on the brine pump for the ice plant runs at 80% utilization.
- The motor for the ice plant's compressor runs at 80% utilization.

Table 1 Energy Saving Opportunities for the Carman and Dufferin 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										
Replace incandescent lamps with compact fluorescents	17	$15	$10	$13	$533	$436	4,436	$266	2.0	1.6
Retrofit 4' x 1 T12 fluorescents with T8 ballast and tubes	8	$55	$35	$60	$1,049	$866	565	$34	30.9	25.5
Retrofit 4' x 2 T12 fluorescents with T8 ballast and tubes	70	$55	$35	$60	$9,177	$7,581	10,655	$640	14.3	11.9
Retrofit 4' x 4 T12 fluorescents with T8 ballast and tubes	17	$55	$35	$60	$2,229	$1,841	11,655	$700	3.2	2.6
Retrofit 8' x 2 T12 fluorescents with T8 ballast and tubes	24	$75	$40	$75	$4,104	$3,146	10,785	$648	6.3	4.9
Lighting Subtotal					**$17,091**	**$13,871**	**38,095**	**$2,287**		
ENVELOPE										
Replace and weather-strip doors	10	$350	$350	$100	$5,130	$5,130	42,904	$1,961	2.6	2.6
Replace windows	10	$820	$646	$160	$11,172	$9,188	24,252	$1,108	10.1	8.3
Upgrade wall insulation	1	$27,504	$25,395	$27,504	$62,709	$60,305	27,598	$1,261	49.7	47.8
Envelope Subtotal					**$79,011**	**$74,624**	**94,753**	**$4,330**		
HVAC										
Change current NG 800 MBH boiler to a high efficiency one	1	$10,500	$5,250	$2,500	$14,820	$8,835	99,452	$4,545	3.3	1.9
Install outdoor thermostat to control rink(s) ventilation	1	$600	$600	$600	$1,368	$1,368	22,915	$1,047	1.3	1.3
Install motorized dampers on exhaust fan	1	$300	$300	$300	$684	$684	975	$45	15.3	15.3
HVAC Subtotal					**$16,872**	**$10,887**	**123,343**	**$5,637**		

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	1,082,782	$41,242	106.7
Estimated Annual Savings	256,192	$12,254	40.3
Percent Savings	24%	30%	38%

* 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 $/kWh (rate taken from Manitoba Hydro's website) and the cost of natural gas is taken as 0.0457$/kWh (as of November 1, 2005).

Table 2 Water Saving Opportunities for the Carman and Dufferin Arena

Description	Qty	Installed Cost/Unit ($)		Total Cost* ($)	Annual Water Savings (%)	Annual Water Savings (L)	Annual Water Savings ($)
		Material	Labour				
Install water efficient metering faucets.	13	$309	$150	$6,802	80%	313,114	$129
Install water efficient toilets.	13	$284	$150	$6,432	55%	886,748	$365
Install water efficient urinal.	8	$344	$200	$4,961	60%	697,167	$287

* The total cost column includes 14% taxes.

2.3 GENERAL RECOMMENDATIONS

Lighting

The energy savings opportunities (ESOs) with the shortest payback periods include replacing all indoor incandescent bulbs with compact fluorescents and upgrading 4'x4 and 8'x2 T12s with T8 lights. All of these ESOs have payback periods of less than 7 years. The lighting analysis summary for the Carman and Dufferin Arena is found in Appendix B, Table B.1.3.

Envelope

The current windows in the arena are plexiglass in material and are primarily found between the viewing area and rinks. It was assumed that these windows are similar to single pane glass windows. The energy savings from replacing these plexiglass windows are shown in Table B.1.4. Upgrading and weather-stripping all ten doors is an ESO with a short payback period. Heat loss through cracks would be eliminated with the addition of weather stripping to the higher energy efficient door type. The wall insulation for the heated portions of the arena is approximately R-12. Upgrading this to R-20 would produce an approximate 28,000 kWh energy saving opportunity.

HVAC

Significant opportunities for ESOs in terms of the heating and ventilation system are available for the Carman and Dufferin Arena. Installing an outdoor thermostat to control the rink areas ventilation would result in substantial energy savings with a very short payback period. These thermostats monitor the outside temperatures. When temperatures are between –5ºC and -15ºC, ventilation fans within the arena are turned on, taking in cool air from the outside into the rink area. This air will maintain the ice rinks at the desired temperatures, placing a lower burden on the ventilation and refrigeration systems, reducing energy consumption. Payback periods and installation and material costs associated with this type of a thermostat are minimal.

Replacing the current natural gas boiler with a high efficiency one would ensure very large energy savings, both in dollars and kilowatt-hours. Capital costs associated with such a boiler are high, however payback times are low, signifying how much energy would be saved with its installation. In addition, replacing the back draft damper on the exhaust in the senior team change room with a motorized damper would eliminate any cold air leakage into the area.

Motors

Since the ice plant is approximately four years old, it is assumed that the compressor, brine pump and condenser fan are of similar age. In addition, since the current efficiency of the compressor is 94.5% it is assumed that the condenser fan and brine pump operate at a comparable efficiency. Therefore, ESOs were not applied to these units.

Water

Water savings opportunities are shown above in Table 2. Table B.1.5 located in Appendix B shows the estimated water consumption results that were calculated based on standard water fixtures and occupancy estimates for the Carman and Dufferin Arena. Replacing all existing plumbing fixtures with water efficient models would produce 55% water saving opportunity for the toilets, 80% for the sinks and 60% for the urinals.

Other

The following is a list of ESOs for the ice plant that would help lower the annual costs associated with ice production:

- Ensure that the water used for flooding is pure. Salts lower the freezing point of water and air in water acts like insulation, making it difficult for the brine in the slab to freeze the uppermost layer of the ice.
- Maintain the ice at a 1" thickness since excessive thickness increases the load on the compressor. Shaving of the ice helps in reducing its thickness and removes impurities. The ice shavings are deposited outside. This is a good practice that should be maintained.
- Keep the ice temperature as high as possible.
- Retain the brine at a specific gravity of 1.2 to 1.22 for optimum energy use and at as high of temperature as possible.
- Examine cycling the brine pump rather then running it 24 hours a day. This would require installing an ice slab thermostat approximately 3 to 6 feet from the edge of the concrete slab. This thermostat would allow the brine pump to turn on only when the ice temperature rises above a certain set point, reducing the operating time to 10 to 12 hours per day.
- Significant amounts of energy may be saved by recovering heat from the refrigeration equipment and using it for flood water heating, space heating, domestic water heating or ice melting.

2.4 OPERATION AND MAINTENANCE

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

- Clean ice plant condenser coils seasonally.
- Clean filters on heat pumps.
- Clean heating units.

3.0 FIRE HALL

3.1 BACKGROUND

Moved from its original location to the current site, the Fire Hall is a 2,224 square foot building that was built in the mid 1950s. In recent years, an office and meeting space have been added. With an average building occupancy of two hours per week, insulation upgrade for the roof or walls was determined to be economically impractical with low energy savings.

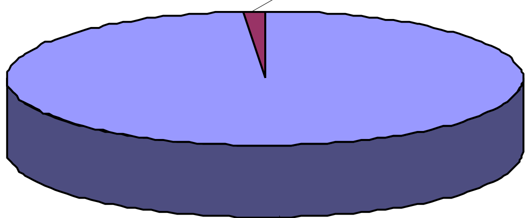
Photo 2: Carman Fire Hall

For the previous year (September 2004- September 2005), the annual electric and natural gas energy consumption for the Carman Fire Hall was 18,453 kWh and 76,029 kWh respectively.

The following pie chart clearly illustrates the percent portions of total energy consumption for the Fire Hall. Since the Fire Hall is occupied for only 2 hours per week or 1.2% of the time, the energy consumption for the hot water is quite low.

Dues to the low occupancy rate, lighting ESOs were not deemed feasible in cost or energy savings and were not included in the overall energy saving analysis for this building.

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



The following high flow water fixtures are found within the Fire Hall: three faucets, one toilet and one urinal. In addition, a shower is located within the building. However, since it is used as a storage space, ESOs and WSOs were not considered for the shower. There are no water meters in this facility to measure the actual water usage; however based on the current water fixtures, calculations were made to determine the percentage of water savings that would result from replacing these fixtures. In order to determine the energy used to heat the water, estimations were made on the frequency at which the water fixtures were used.

3.2 ENERGY AND WATER SAVING OPPORTUNITIES

A summary of energy and water saving opportunities for the Fire Hall are shown in Tables 3 and 4. During this analysis the following assumptions were made:

- The Fire Hall is occupied for two hours per week, approximately 104 hours annually.
- During occupancy a temperature of 21 ^{o}C (70 ^{o}F) is maintained in the office area and 18 ^{o}C (65 ^{o}F) in the garage.
- Lights are only turned on during occupancy.
- For the purpose of estimating water consumption, typical occupancy of the Fire Hall is said to be 6 people.
- The natural gas unit heater located in the garage has a current efficiency of 75%.

Table 3 Energy Saving Opportunities for the Fire Hall

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years	
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
ENVELOPE										
Weather strip pedestrian doors.	3	$30	$30	$100	$445	$445	4,997	$228	1.9	1.9
Weather strip over head doors.	2	$60	$60	$100	$365	$365	7,662	$350	1.0	1.0
Envelope Subtotal					**$809**	**$809**	**12,659**	**$579**		
HVAC										
Replace NG unit heater in garage with a high efficiency radiant unit heater	1	$1,200	$900	$1,000	$2,508	$2,166	15,206	$695	3.6	3.1
HVAC Subtotal					**$2,508**	**$2,166**	**15,206**	**$695**		
WATER										
Install instantaneous hot water heater	1	$300	$300	$900	$1,368	$1,368	1,164	$70	19.6	19.6
Water Subtotal					**$1,368**	**$1,368**	**1,164**	**$70**		

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	94,482	$4,660	14.2
Estimated Annual Savings	29,028	$1,343	5.0
Percent Savings	31%	29%	35%

* 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) and the cost of natural gas is taken as 0.0457 $/kWh (as of November 1, 2005).

Table 4 Water Saving Opportunities for the Fire Hall **

Description	Qty	Installed Cost/Unit ($)		Total Cost* ($)	Annual Water Savings (%)	Annual Water Savings (L)	Annual Water Savings ($)
		Material	Labour				
Install water efficient metering faucets.	3	$309	$150	$1,570	80%	399	$0.16
Install water efficient toilets.	3	$284	$150	$495	55%	566	$0.23
Install water efficient urinal.	1	$344	$200	$620	60%	1,334	$0.55

* The total cost column includes 14% taxes.
** This does not include the water used to fill the fire trucks.

3.3 GENERAL RECOMMENDATIONS

Lighting

Since the Fire Hall is minimally occupied, upgrading the current T12 lighting would result is long simple payback periods and low energy cost savings. Therefore, lighting upgrades were not included nor recommended for this building. However, calculations for these upgrades are still included and are located in Appendix B, Table B.2.3: Lighting Analysis Summary for the Fire Hall.

Envelope

Upgrading all five doors in the Fire Hall with insulated fixtures would result in significant energy savings with a very short payback period. In addition, including weather stripping around the doors would reduce heat loss due to infiltration, increasing the energy saving opportunities. These upgrades would result in a 36% saving in energy cost ($) and 30% savings in energy consumption (kWh).

Due to the fact that the Fire Hall is rarely used, wall or roof insulation upgrade would be very expensive and have very long payback periods. Therefore, it they were included for this analysis.

HVAC

The natural gas unit heater in the garage is currently operating at 75% efficiency. Replacing the unit with a high efficiency radiant unit heater would result in a 15% energy saving, both in consumption and in energy cost.

Water

The water analysis summary for the Fire Hall is shown in Table B.2.5 in Appendix B.

Replacing the high flow fixtures with water efficient fixtures would save between 55 and 80% of their current water consumption.

4.0 GOLDEN PRAIRIE ARTS COUNCIL (FRIENDSHIP CENTRE)

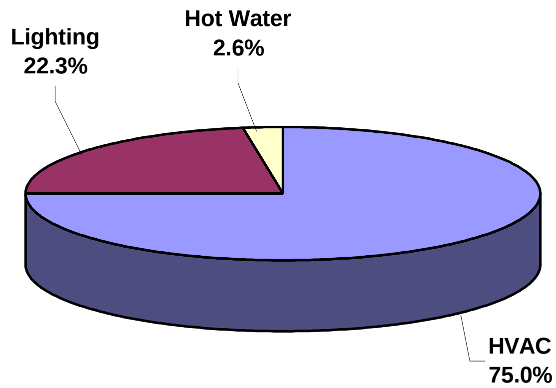
4.1 BACKGROUND

Formerly the Old CN Station, the Golden Prairie Arts Council was built in the early 1900s. It is considered a heritage building and any renovations or upgrades to it would require architectural and engineering consultants to ensure that the existing appearance is maintained. Until recently, the Golden Prairie Arts Council was the Friendship Centre. However, during the site investigation, our auditor was informed that the facility was now called the Golden Prairie Arts Council. It is 2,708 square feet in size and is occupied Monday to Friday for an average of 8 hours a day plus one Saturday per month for 7 hours.

Photo 3: Golden Prairie Arts Council

The Golden Prairie Arts Council only uses electric energy. For the previous year electric energy consumption for the building was 68,400 kWh. The total energy was used for water heating, lighting and heating. The energy breakdown in percentage is illustrated in the following pie chart.

Energy Breakdown (% of Total kWh) for the Golden Prairie Arts Council (Friendship Centre)



The building has four faucets and three toilets, all high flow water fixtures. For determining the energy used to heat the water for the fixtures, estimates were made on the frequency at which they are used.

4.2 ENERGY AND WATER SAVING OPPORTUNITIES

Summaries of the energy and water efficiency improvement opportunities for the Golden Prairie Arts Council are shown in Tables 5 and 6.

The following assumptions were made in the calculations:

- The building is occupied for approximately 207 hours a month.
- The temperature of the building is maintained at 15.5 ^{o}C (60F).
- For determining water consumption, the typical occupancy of the building was assumed to be 10 people.
- The exit lamps are on for 24 hours a day, year round.
- Main floor of the building has been renovated and has a R-12 insulation in the walls.
- Second floor wall insulation and roof insulation is R – 7.5.

Table 5 Energy Saving Opportunities for the Golden Prairie Arts Council

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 EXIT incandescent lamps with LED modules	1	$50	$5	$80	$148	$97	237	$14	10.4	6.8
Retrofit 4' x 2 T12 fluorescents with T8 ballast and tubes	2	$55	$35	$60	$262	$217	194	$12	22.5	18.6
Retrofit 4' x 1 T12 fluorescents with T8 ballast and tubes	23	$55	$35	$60	$3,015	$2,491	1,114	$67	45.1	37.2
Replace incandescents with compact fluorescents	24	$15	$10	$13	$752	$616	4,292	$258	2.9	2.4
Retrofit 8' x 2 T12 fluorescents with T8 ballast and tubes	10	$75	$40	$75	$1,710	$1,311	3,080	$185	9.2	7.1
Lighting Subtotal					**$5,888**	**$4,731**	**8,917**	**$535**		
ENVELOPE										
Replace and weather-strip door	1	$350	$350	$100	$513	$513	1,779	$107	4.8	4.8
Seal windows	24	$5	$5	$25	$821	$821	6,736	$404	2.0	2.0
Replace windows (2' x 3' single pane)	5	$426	$381	$100	$2,996	$2,740	2,714	$163	18.4	16.8
Replace windows (3' x 4.5' single pane)	2	$410	$310	$100	$1,163	$935	1,410	$85	13.7	11.0
Replace window (3' x 1.5' single pane)	1	$320	$286	$100	$479	$440	235	$14	33.9	31.2
Replace windows (32" x 5' double pane)	6	$600	$575	$100	$4,788	$4,617	1,691	$102	47.2	45.5
Replace windows (32" x 5' single pane)	3	$600	$500	$100	$2,394	$2,052	2,089	$125	19.1	16.4
Replace windows (32" x 12" single pane)	2	$400	$380	$100	$1,140	$1,094	279	$17	68.2	65.4
Replace windows (24" x 44" double pane)	3	$560	$546	$100	$2,257	$2,209	465	$28	80.8	79.1
Replace window (24" x 44" single pane)	1	$560	$505	$100	$752	$690	383	$23	32.7	30.0
Replace window (20" x 20")	1	$280	$250	$100	$433	$399	145	$9	49.7	45.8
Upgrade roof insulation	1	$900	$900	$2,500	$3,876	$3,876	4,042	$243	16.0	16.0
Upgrade wall insulation -main floor	1	$4,815	$4,446	$1,200	$6,857	$6,436	3,327	$200	34.3	32.2
Upgrade wall insulation - 2nd floor	1	$3,978	$3,673	$1,200	$5,903	$5,555	6,871	$413	14.3	13.5
Envelope Subtotal					**$34,373**	**$32,378**	**32,166**	**$1,931**		

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years	
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
HVAC										
Install heat pump (geothermal)	1	$31,140	$26,126	$0	$35,500	$29,784	34,220	$2,055	17.3	14.5
Install HRVs	1	$950	$950	$1,000	$2,223	$2,223	3,949	$237	9.4	9.4
HVAC Subtotal					**$37,723**	**$32,007**	**38,169**	**$2,292**		
WATER										
Install instantaneous hot water heater	1	$300	$300	$900	$1,368	$1,368	1,164	$70	19.6	19.6
Water Subtotal					**$1,368**	**$1,368**	**1,164**	**$70**		

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	68,400	$4,764	2.04
Estimated Annual Savings	80,415	$2,774	2.40
Percent Savings	118%	58%	118%

* 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) and the cost of natural gas is taken as 0.0457 $/kWh (as of November 1, 2005).

Table 6 Water Saving Opportunities for the Golden Prairie Arts Council

Description	Qty	Installed Cost/Unit ($)		Total Cost* ($)	Annual Water Savings (%)	Annual Water Savings (L)	Annual Water Savings ($)
		Material	Labour				
Install water efficient metering faucets.	4	$309	$150	$2,093	80%	13,513	$6
Install water efficient toilets.	3	$284	$150	$1,484	55%	49,525	$20

* The total cost column includes 14% taxes.

4.3 GENERAL RECOMMENDATIONS

Lighting

The lighting analysis summary for the Golden Prairie Arts Council can be found in Appendix B, Table B.3.3. Energy saving opportunities with the shortest payback periods includes replacing the incandescent light bulbs with compact fluorescent bulbs, replacing incandescent exit signs with LED exit signs, and retrofitting 8' T12 lamps with T8 lamps. Upgrading 4' T12 lamps with

T8 ballasts and tubes have significantly higher payback period since they have a lower annual cost savings.

Envelope

A substantial amount of energy is currently being lost through the building's envelope. Replacing the old windows with new triple pane windows would reduce the heat loss through the windows and through the cracks around the windows. In addition, upgrading the basement door with an insulated wooden door would eliminate the high heat loss with a short payback period.

Current insulation in the walls of the main floor is of R-12 rating. Insulation in the roof and the walls of the second floor are R-7.5 rating. It is a mixture of fibreglass and wood-shavings. The energy savings and simple payback periods associated with upgrading the roof, main and second floor wall insulation from R-12 to R-40 and R-20 respectively is shown in Table 5. Payback periods for the wall insulation upgrade are significantly longer then for the roof insulation upgrade.

HVAC

Installing a heating recovery ventilator, HRV, to preheat the fresh air intake to the furnace would reduce the amount of energy required to heat this intake air to room temperature.

A geothermal heating system was also investigated for this facility. The existing gas furnace would be replaced with a water-to-air heat pump connected to a closed loop ground water system. A geothermal heat pump is one of the most energy efficient and environmentally friendly electric heating and cooling systems available. The cost of installing this system would be approximately $30,000, with over $2,000 savings in annual heating costs, which translates into an energy consumption savings of 34,000 kWh. This would result in a payback period of less than 15 years.

Water

The hot water tank is continuously losing heat to the surroundings. Since there are only four sinks and three toilets in this facility, an instantaneous water heater could be installed to replace the current hot water tank, thereby eliminating the heat loss from the tank.

Replacing the high flow water fixtures with water efficient fixtures would save from 55% to 80% of the current fixtures' water consumption. The water analysis summary for the Golden Prairie Arts Council is shown in Appendix B, Table B.3.5.

5.0 BOYNE REGIONAL LIBRARY

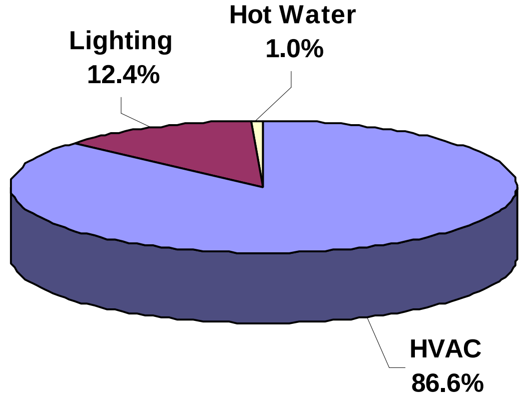
5.1 BACKGROUND

The Boyne Regional Library is a 4,802 square foot heritage building that was built in 1915. Additions to the original building occurred in 1985 and 1999. At present, the building consists of an un-insulated basement, a main floor and a second floor. Due to its heritage status, the library would need both architectural and engineering consultation for any renovations.

Photo 4: Boyne Regional Library

The building has two natural gas furnaces serving the main floor along with a hot water boiler that serves the second floor. In the previous year, the natural gas and electrical energy consumption were 130,075 kWh and 42,880 kWh respectively. The following pie chart shows the breakdown of energy consumption for the building.

Energy Breakdown (% of Total kWh) for the Boyne Regional Library



With over 200 light bulbs and lamps, the energy consumption for lighting is a significant portion of the library's total energy use. There are also four faucets and toilets in the building. There are no water meters at this facility. Therefore, for determining hot water consumption, assumptions were made regarding the frequency with which these water fixtures are used.

5.2 ENERGY AND WATER SAVING OPPORTUNITIES

Energy and water saving opportunities for the Boyne Regional Library are presented in Tables 7 and 8. The following assumptions were made for the calculations:

- The library operates for 40 hours per week year round.
- The temperature of the building is maintained at 21°C (70°F).
- For the purpose of calculating water consumption, typical occupancy of the building is assumed to be 10 people.
- The second floor window air-conditioning unit is removed during the winter months. For this reason it was not taken into account for ESOs.

Table 7 Energy Saving Opportunities for Boyne Regional 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										
Replace EXIT incandescent lamps with LED modules	11	$50	$5	$80	$1,630	$1,066	2,602	$156	10.4	6.8
Retrofit 4' x 2 T12 fluorescents with T8 ballast and tubes	4	$55	$35	$60	$524	$433	324	$19	26.9	22.2
Replace incandescents with compact fluorescents	12	$15	$10	$13	$383	$315	1,797	$108	3.5	2.9
Retrofit 4' x 4 T12 fluorescents with T8 ballast and tubes	42	$55	$35	$60	$5,506	$4,549	6,814	$409	13.5	11.1
Retrofit 2' x 4 T12 fluorescents with T8 ballast and tubes	1	$55	$35	$60	$131	$108	92	$5	23.9	19.7
Retrofit 8' x 2 T12 fluorescents with T8 ballast and tubes	1	$75	$40	$75	$171	$131	129	$8	22.1	16.9
Lighting Subtotal					**$8,346**	**$6,602**	**11,758**	**$706**		
ENVELOPE										
Replace and weather strip second floor storage room (3'x7').	1	$350	$350	$100	$513	$513	3,640	$166	3.1	3.1
Add weather-stripping to doors.	2	$30	$30	$100	$296	$296	3,331	$152	1.9	1.9
Seal windows	9	$5	$5	$25	$308	$308	4,375	$200	1.5	1.5
Replace single pane windows - 4' x 2'	5	$425	$365	$100	$2,993	$2,651	3,034	$139	21.6	19.1
Replace double pane window - 5' x 6'	1	$840	$785	$100	$1,072	$1,009	921	$42	25.5	24.0
Replace double pane window - 44" x 78"	1	$1,400	$1,355	$100	$1,710	$1,659	732	$33	51.1	49.6
Replace double pane window - 4' x 2'	1	$425	$410	$100	$599	$581	246	$11	53.3	51.8
Replace single pane window - 2.5' x 6'	1	$800	$690	$100	$1,026	$901	1,138	$52	19.7	17.3
Upgrade wall insulation - old portion of building	1	$8,250	$7,618	$2,500	$12,255	$11,534	8,278	$378	32.4	30.5
Upgrade roof insulation	1	$2,363	$1,200	$2,363	$5,387	$4,061	8,297	$379	14.2	10.7
Envelope Subtotal					**$26,157**	**$23,513**	**33,992**	**$1,553**		
HVAC										
Replace furnace with high efficiency furnace	2	$2,000	$2,000	$800	$6,384	$6,384	26,015	$1,189	5.4	5.4
Install high efficiency NG boiler	1	$10,500	$5,200	$2,000	$14,250	$8,208	26,015	$1,189	12.0	6.9
Install HRVs	2	$950	$950	$1,000	$4,446	$4,446	7,898	$361	12.3	12.3
HVAC Subtotal					**$25,080**	**$19,038**	**59,928**	**$2,739**		

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years	
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
WATER										
Install instantaneous hot water heater	1	$300	$300	$900	$1,368	$1,368	1,164	$70	19.6	19.6
Water Subtotal					**$1,368**	**$1,368**	**1,164**	**$70**		

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	172,955	$8,504	24.62
Estimated Annual Savings	106,841	$5,068	17.25
Percent Savings	62%	60%	70%

* 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) and the cost of natural gas is taken as 0.0457 $/kWh (as of November 1, 2005).

Table 8 Water Saving Opportunities for the Boyne Regional Library

Description	Qty	Installed Cost/Unit ($)		Total Cost* ($)	Annual Water Savings (%)	Annual Water Savings (L)	Annual Water Savings ($)
		Material	Labour				
Install water efficient metering faucets.	4	$309	$150	$2,093	80%	10,982	$5
Install water efficient toilets.	4	$284	$150	$1,979	55%	45,240	$19

* The total cost column includes 14% taxes

5.3 GENERAL RECOMMENDATIONS

Lighting

Energy saving opportunities for lighting includes replacing T12 fluorescent lamps (2', 4' and 8') with T8 lamps and ballasts. Other ESOs for lighting are to replace the exit incandescent lamps with LED modules and to change all incandescent bulbs to compact fluorescent bulbs. The simple payback periods for these ESOs are less than 12 years.

Envelope

The older portion of the building has high heat losses due to infiltration and low energy efficient doors and windows. The following upgrades have been proposed to reduce energy consumption and energy costs: replacing the second floor storage room un-insulated metal door with an insulated door complete with new weather stripping, and replacing the weather stripping for both the main floor metal door and front entrance door. Installing new weather stripping would reduce heat loss through the existing cracks and leaks.

Replacing the windows specified in Table B.4.4 (a) would also result in energy savings. However, the payback period for these upgrades is significantly longer. At the very least, the windows should be re-caulked or resealed to prevent cold air leakage into the building. Sealing of the windows is low in cost and has a very short payback period.

Upgrading the roof insulation in the older part of the library from R12 to R40 results in a significant energy savings opportunity, both in energy consumption and cost, and with a payback period of less than 13 years. Upgrading the wall insulation in this area to R20 has a much longer payback period despite the large annual energy savings.

HVAC

Within the heating, ventilation and air-conditioning (HVAC) system for the library, substantial energy saving opportunities are available with payback periods from 5.4 to 12.3 years.

The shortest payback period energy saving opportunity is to replace two current furnaces with high efficiency units. This option results in an approximate annual saving of 26,015 kWh or $1,189 in energy costs. In addition to its high savings, this option has low expenditure in capital cost and installation expense.

Other energy saving opportunities with longer payback periods include installing a high efficiency natural gas boiler and heating recovery ventilators.

Overall, if all of these proposed upgrades were implemented, 59,928 kWh and $2,739 would be saved on an annual basis. This translates into 35% energy savings.

Water

The reduction in water consumption that would result from replacing current water fixtures with water efficient fixtures is summarized in Table 8 for the Boyne Regional Library.

A detailed analysis of these results is found in Table B.4.5 in Appendix B.

6.0 MUNICIPAL GARAGE

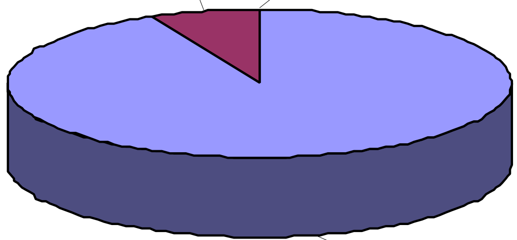
6.1 BACKGROUND

Built in 1985, the Municipal Garage is a 5,000 square foot building with blanket insulation. The building has a metal clad exterior. The interior has metal cladding on the bottom 8' of the wall. The blanket insulation is exposed above this point.

Photo 5: Municipal Garage

The garage uses electricity for its lighting. Natural gas is used for the building's heating and ventilation system and hot water. In the previous year, the total energy consumption was 65,880 kWh for electric energy and 150,029 kWh for natural gas. The garage is occupied from 6 a.m. until 4 p.m. Monday to Friday, for approximately 2600 hours per year. The following pie chart illustrates the energy breakdown for the Municipal Garage.

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



6.2 ENERGY SAVING OPPORTUNITIES

Energy and water saving opportunities for the Municipal Garage are presented in Tables 9 and 10. The following assumptions were made for these calculations:

- The building is occupied for 50 hours per week, year round.
- The temperature is maintained at 21°C (70°F).
- The occupancy of the garage is 3 individuals.
- Outdoor lights are on for 12 hours a day, 365 days of the year.

Table 9 Energy Saving Opportunities for the 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										
Retrofit main/lobby floor 4' x 2 T12 fluorescents with T8 ballast and tubes	8	$55	$35	$60	$1,049	$866	811	$49	21.5	17.8
Replace main floor incandescents with compact fluorescents	3	$15	$10	$13	$94	$77	562	$34	2.8	2.3
Retrofit garage 4' x 1 T12 fluorescents with T8 ballast and tubes	1	$55	$35	$60	$131	$108	51	$3	43.1	35.6
Retrofit garage 8' x 2 T12 fluorescents with T8 ballast and tubes	17	$75	$40	$75	$2,907	$2,229	5,481	$329	8.8	6.8
Lighting Subtotal					**$4,181**	**$3,280**	**6,904**	**$415**		

Description	Qty	Installed Cost/Unit ($)			Total Cost ** ($)		Estimated Annual Savings		Simple Payback Years	
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
ENVELOPE										
Replace & weather strip pedestrian door in garage.	1	$350	$350	$100	$513	$513	4,318	$197	2.6	2.6
Replace & weather strip front pedestrian door.	1	$350	$350	$100	$513	$513	7,650	$350	1.5	1.5
Replace weather stripping for overhead doors.	2	$60	$60	$100	$365	$365	17,322	$792	0.5	0.5
Seal windows	3	$5	$5	$25	$103	$103	1,499	$69	1.5	1.5
Replace windows -58" x 32" size	3	$410	$354	$100	$1,744	$1,553	1,187	$54	32.1	28.6
Envelope Subtotal					**$3,238**	**$3,046**	**31,977**	**$1,461**		
HVAC										
Install programmable thermostat; Setback temp to 15C (59F)	2	$300	$300	$300	$1,368	$1,368	8,891	$534	2.6	2.6
Replace natural gas boiler with high efficiency NG boiler	1	$10,500	$5,250	$2,000	$14,250	$8,265	30,006	$1,371	10.4	6.0
HVAC Subtotal					**$15,618**	**$9,633**	**38,897**	**$1,905**		
Water										
Install instantaneous hot water heater	1	$300	$300	$900	$1,368	$1,368	1,164	$53	25.7	25.7
Water Subtotal					**$1,368**	**$1,368**	**1,164**	**$53**		

TOTALS	Energy (kWh)	Cost ($)	CO2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	215,909	$10,606	28.89
Estimated Annual Savings	78,941	$3,834	12.56
Percent Savings	37%	36%	43%

* 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) and the cost of natural gas is taken as 0.0457 $/kWh (as of November 1, 2005).

Table 10 Water Saving Opportunities for the Municipal Garage

Description	Qty	Installed Cost/Unit ($)		Total Cost* ($)	Annual Water Savings (%)	Annual Water Savings (L)	Annual Water Savings ($)
		Material	Labour				
Install water efficient metering faucets.	1	$309	$150	$523	80%	4,992	$2
Install water efficient toilets.	1	$284	$150	$495	55%	7,069	$3

* The total cost column includes 14% taxes.

6.3 GENERAL RECOMMENDATIONS

Lighting

In terms of lighting, the energy saving opportunities with the lowest simple payback years include: replacing the incandescent light bulbs with compact fluorescent bulbs and replacing the 8' T12s with T8s ballasts and tubes. Other options are given, however, they have considerably longer payback periods and lower energy savings. A detailed lighting analysis for the Municipal Garage is found in Appendix B, Table B.5.3.

Envelope

As shown in Table 9, the greatest energy saving opportunities are within the building envelope. Replacing the pedestrian door in the garage and in the front entrance, complete with new weather-stripping would save nearly 12,000 kWh per year. In addition, replacing the existing damaged weather-stripping for the overhead doors would reduce heat loss from infiltration, saving over 17,000 kWh. Payback periods associated with these ESOs range from 0.5 to 2.6 years.

Other energy saving opportunities within the garage's envelope includes caulking all windows and upgrading them to higher efficiency units. However, replacement of the windows has a long payback period of nearly 30 years. Further details of these energy saving opportunities are shown in Appendix B, Table B.5.4.

HVAC

Replacing the current natural gas boiler with a high efficiency model would have a large capital cost, but this option has substantial energy savings of 30,006 kWh per year. At a simple payback period of 6.0 years, this option should be seriously considered for this building.

7.0 CARMAN MUNICIPAL LANDFILL

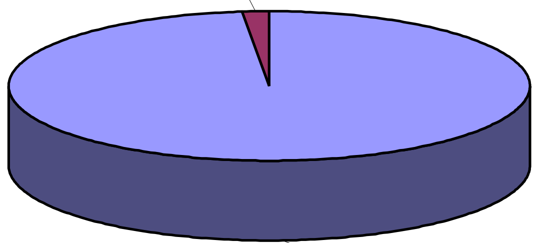
7.1 BACKGROUND

The Carman Municipal Landfill consists of two buildings; a shed and a green building. The buildings are 1,320 square feet in combined area. The landfill has no domestic hot water capabilities on site and is occupied for approximately 25 hours per week.

Photo 6: Carman Municipal Landfill

The natural gas and electrical energy consumption for this site in the previous year was 97,680 kWh and 4,110 kWh, respectively. The total energy for the landfill is split between lighting and heating as shown in the following pie chart.

Energy Breakdown (% of Total kWh) for the Carman Municipal Landfill



Water saving opportunities were not included for this site since there is no plumbing. Electric energy is used strictly for lighting purposes and natural gas is used for heating.

7.2 ENERGY AND WATER SAVING OPPORTUNITIES

A summary of the energy saving opportunities available for the Carman Municipal Landfill is shown in Table 11.

The following assumptions were made in the analysis:

- The Carman Municipal Landfill is occupied for 25 hours per week year round.
- Occupancy rates are for the green building. The shed is used for equipment storage only.
- The exterior lights are on for 12 hours a day year round.
- The shed is maintained at 18ºC (65°F) and the green building at 21ºC (70°F).

Table 11 Energy Saving Opportunities for the Carman Municipal Landfill

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 exterior incandescent lamps with high pressure sodium lights	3	$100	$100	$100	$684	$684	657	$39	17.3	17.3

Description	Qty	Installed Cost/Unit ($)			Total Cost ** ($)		Estimated Annual Savings		Simple Payback Years	
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
LIGHTING										
Replace incandescents with compact fluorescents	16	$15	$10	$13	$511	$420	300	$18	28.4	23.3
Lighting Subtotal					**$1,195**	**$1,104**	**957**	**$57**		
ENVELOPE										
Replace & weather strip door (32" x 7') in green bldg	1	$350	$350	$100	$513	$513	2,426	$111	4.6	4.6
Replace & weather strip over head door in green bldg (9'x9')	1	$1,000	$1,000	$400	$1,596	$1,596	9,536	$436	3.7	3.7
Replace & weather strip overhead door in shed (14'x14').	1	$1,000	$1,000	$400	$1,596	$1,596	13,229	$605	2.6	2.6
Weather strip pedestrian door in shed (3'x7').	1	$30	$30	$100	$148	$148	1,610	$74	2.0	2.0
Seal windows	5	$5	$5	$25	$171	$171	422	$19	8.9	8.9
Replace windows - 36" x 24"	1	$426	$415	$100	$599	$587	184	$8	71.2	69.7
Replace windows - 16" x 48"	1	$220	$180	$100	$365	$319	405	$18	19.7	17.3
Replace windows - 18" x 20"	2	$215	$197	$100	$718	$677	379	$17	41.4	39.1
Replace windows - 20" x 20"	1	$280	$250	$100	$433	$399	211	$10	45.0	41.4
Upgrade roof insulation - green building	1	$600	$508	$1,200	$2,052	$1,947	2,107	$96	21.3	20.2
Upgrade wall insulation - green building	1	$2,280	$2,105	$1,200	$3,967	$3,768	2,288	$105	37.9	36.0
Envelope Subtotal					**$12,159**	**$11,721**	**32,797**	**$1,499**		

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	101,790	$4,576	17.67
Estimated Annual Savings	33,754	$1,556	5.92
Percent Savings	33%	34%	34%

* 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) and the cost of natural gas is taken as 0.0457 $/kWh (as of November 1, 2005).

7.3 GENERAL RECOMMENDATIONS

Lighting

Energy saving opportunities for the lighting at the Carman Municipal Landfill includes replacing exterior incandescent lamps with high-pressure sodium lights and replacing incandescents with compact fluorescent lamps. However, since the landfill is occupied for a minimal number of hours, payback periods associated with lighting energy saving opportunities are quite long. In addition, the estimated annual savings associated with the proposed lighting upgrades are minor in terms of energy consumption and cost savings. The lighting analysis summary for the Carman Municipal Landfill is located in Appendix B, Table B.6.3.

Envelope

Upgrading the existing pedestrian and overhead doors in the green building with insulated doors, complete with new weather stripping results in an energy saving opportunity of 11,962 kWh a year. Similarly for the shed, installing weather stripping on the pedestrian door and replacing the existing overhead door with an insulated door, complete with new weather stripping produces an energy saving opportunity of approximately 15,000 kWh a year. The associated payback periods for these ESOs range from 2.0 to 4.7 years, with moderate capital and labour costs.

Other ESOs to the landfill's envelopes are replacing the windows with higher efficiency triple pane fixtures, adding sealant to all windows and upgrading both the roof and wall insulation in the green building. However, these ESOs have payback periods ranging from approximately 9 to 70 years with a total energy savings of less than 10,000 kWh per year.

HVAC

The green building contains an un-vented natural gas radiant heater. Fortunately, the doors and windows are of low efficiency and have provided significant infiltration. Nevertheless, this needs to be addressed immediately since safety of occupants is of paramount importance. This issue was brought to the occupant's attention during the building audit.

Water

Water savings do not apply to the Carman Municipal Landfill since there are no domestic hot water capabilities at present time.

8.0 MUSEUM

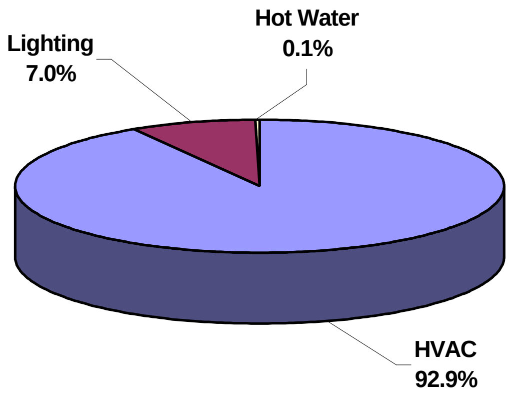
8.1 BACKGROUND

With a total area of 4,316 square feet, the Museum uses both electric energy and natural gas for its operation. In the previous year, the building consumed 5,090 kWh of electric energy and 21,931 kWh of natural gas.

Photo 7: Museum

The museum is only open during the summer months: from May long weekend until the end of August. Total energy breakdown for the Museum is shown in the following pie chart.

Energy Breakdown (% of Total kWh) for the Museum



There are three washrooms in the Museum with a total of 2 faucets and 3 toilets. 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.

8.2 ENERGY AND WATER SAVING OPPORTUNITIES

The energy and water saving opportunities, ESOs and WSOs, for the Museum are shown in Tables 12 and 13.

The following assumptions were made in the analysis:

- The Museum is kept at a constant temperature of 4.4ºC (40ºF).
- For the purpose of water consumption, the typical occupancy was assumed to be 6 people, for 409 hours per year.
- There are no windows within the building, therefore ESOs for these were not performed.
- Insulation in the building is primarily of R-12. There is an area in the rear of the building, newer portion that is of R-20 type.

Table 12 Energy Saving Opportunities for the Museum

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 EXIT incandescent lamps with LED modules	3	$50	$5	$80	$445	$291	710	$43	10.4	6.8
Replace incandescents with compact fluorescents	31	$15	$10	$13	$972	$795	913	$55	17.7	14.5
Lighting Subtotal					**$1,416**	**$1,086**	**1,622**	**$97**		
ENVELOPE										
Replace and weather-strip entrance doors	1	$350	$350	$100	$513	$513	1,602	$73	7.0	7.0
Upgrade wall insulation	1	$4,980	$4,598	$1,200	$7,045	$6,610	2,292	$105	67.3	63.1
Upgrade roof insulation	1	$3,600	$3,600	$1,200	$5,472	$5,472	2,485	$114	48.2	48.2
Envelope Subtotal					**$13,030**	**$12,595**	**6,378**	**$291**		

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	27,021	$1,589	4.09
Estimated Annual Savings	8,001	$389	1.19
Percent Savings	30%	24%	29%

* 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) and the cost of natural gas is 0.0457 $/kWh (as of November 1, 2005).

Table 13 Water Saving Opportunities for the Museum

Description	Qty	Installed Cost/Unit ($)		Total Cost* ($)	Annual Water Savings (%)	Annual Water Savings (L)	Annual Water Savings ($)
		Material	Labour				
Install water efficient metering faucets.	2	$309	$150	$1,047	80%	1,243	$0.51
Install water efficient toilets.	3	$284	$150	$1,484	55%	5,931	$2.44

* The total cost column includes 14% taxes.

8.3 GENERAL RECOMMENDATIONS

Lighting

Upgrading the museum's lighting with higher efficiency fixtures would result in a 6% energy saving in kWh. However, due to the low occupancy rate of 409 hours per year, the payback periods associated with these upgrades are from 10 to nearly 18 years.

Energy saving opportunities for lighting includes replacing the exit incandescent lamps with LED modules and replacing incandescent lamps with compact fluorescent bulbs. A detailed summary of lighting analysis for the Museum is located in Appendix B, Table B.7.3

Envelope

As shown in Table 7.4 and Table 13, significant energy saving opportunities for the museum's envelope is available.

Replacing the building's entrance door with an insulated fixture, complete with weather-stripping is a cost effective ESO, with a payback period of under 3.5 years. Upgrades to the wall and roof insulation have energy savings of 2,292 kWh and 2,485 kWh respectively, but they have considerably longer payback periods of 67 and 48 years. Despite their longer payback periods, upgrades to the building's insulation should be considered as a long-term energy saving opportunity.

Water

Water saving opportunities for the Museum is shown is above in Table 13. Installing water efficient metering toilets and faucets to replace current water fixtures would reduce water consumption from 55 to 80%.

9.0 CARMAN AQUATIC CENTRE

9.1 BACKGROUND

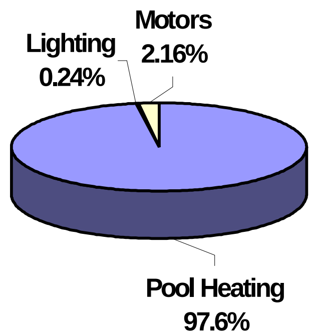
The Carman Aquatic Centre consists of a 5,680 square foot outdoor swimming pool that is in use from the middle of June until September long weekend.

Photo 8: Carman Aquatic Centre

The facility uses the same electrical service as the Carman and Dufferin Ice Plant. Energy saving opportunities for the electrical energy was calculated under the Arena and would also include the Carman Aquatic Centre.

For the previous year, this building used 396,104 kWh of natural gas energy. The site solely houses the outdoor pool. At the time of the site visit, the old change room, including existing plumbing fixtures were to be demolished and replaced with an energy efficient building. The following pie chart illustrates the total energy breakdown for the Carman Aquatic Centre.

Energy Breakdown (% of Total kWh) for the Carman Aquatic Centre



Due to the impending demolition, ESOs were not performed on the old change room facility. No other plumbing or water fixtures are on the site; therefore no WSOs were applied to this facility.

9.2 ENERGY AND WATER SAVING OPPORTUNITIES

A summary for the energy saving opportunities for the Carman Aquatic Centre is shown below in Table 14. For this analysis the following assumptions were made:

- The Centre is occupied for 11 weeks of the year from the middle of June until the end of August for approximately 924 hours per year.
- The pool is left uncovered during these months when the centre has closed for the day.
- The pool is drained in the winter.
- There is no plumbing (water consumption) available.
- There are no windows or doors on this site.

Table 14 Energy Saving Opportunities for the Carman Aquatic 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										
Retrofit 4' x 2 T12 fluorescents with T8 ballast and tubes	3	$55	$35	$60	$393	$325	108	$6	60.6	50.1
Replace incandescents with compact fluorescents	3	$15	$10	$13	$94	$77	200	$12	7.8	6.4
Lighting Subtotal					**$487**	**$402**	**308**	**$18**		
HVAC										
Install high efficiency boiler - natural gas	1	$10,500	$5,250	$2,000	$14,250	$8,265	79,221	$3,620	3.9	2.3
Install liquid pool covers	21	$20	$20	$0	$478	$478	79,221	$3,620	0.1	0.1
HVAC Subtotal					**$14,728**	**$8,743**	**158,441**	**$7,241**		

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	396,104	$17,257	71.11
Estimated Annual Savings	158,749	$7,259	28.45
Percent Savings	40%	42%	40%

* 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) and the cost of natural gas is taken as 0.0457 $/kWh (as of November 1, 2005).

9.3 GENERAL RECOMMENDATIONS

Lighting

Upgrades to the current lighting fixtures at the pool to higher efficiency lights would reduce the annual energy consumption. However, it is a minimal reduction with very long payback periods. The lighting analysis summary for the Carman Aquatic Centre is located in Appendix B, Table 8.3.

HVAC (Pool Heating)

The pool has a mid-efficiency natural gas boiler for its current HVAC system. In addition, it remains uncovered when not in use, contributing to significant energy losses due to evaporation. Replacing the current boiler with a high efficiency fixture would produce annual energy savings of nearly 80,000 kWh or $3,620. With a payback period of less than 2.5 years, this ESO is a very feasible upgrade.

Another ESO under the HVAC component is to install pool covers to reduce evaporation losses. The specific type that has been chosen for this building is a liquid solar cover. Similar to conventional solar blankets, the purpose of liquid pool covers is to reduce evaporation. Each unit will cover 800 square feet of area for approximately one month. The liquid pool covers sink to the bottom of the pool and as the pressure increases they secrete a non-toxic chemical that forms a thin barrier on surface of the water, slowing the evaporation from the pool's surface, reducing hourly evaporation. The chemical does not harm the pool's filtration system, chemical balance or human skin. For this particular pool, 7 liquid pool covers are needed per month for the 3 months the Centre is open. Unlike solar blankets, these units are inexpensive and require no installation expense.

Motors

One pool pump is used at the Carman Aquatic Centre. It was assumed that the pump is approximately 5 years in age therefore upgrades are not applicable.

Future Renovations

During the audit, upcoming building renovation projects were discussed with town officials. One project that was to commence in the near future was the addition of a change house for the Carman Aquatic Centre.

The drawings for the addition were reviewed to ensure that good energy saving features were incorporated into the design. From this review, it was determined that the following items should be considered prior to construction in order to reduce energy consumption:

- Insulated all hot water piping, as opposed to only the horizontal piping;
- Have a hot water recirculation pump work off an aquastat and a timer;
- Use low flow water fixtures such as toilets;
- Use energy efficient lighting fixtures.

9.4 OPERATION AND MAINTENANCE

During the site visit it was noted that the equipment in the pool house was badly corroded. This is likely due to the fact that the pool chemicals were stored there. It is highly recommended that pool chemicals be stored in a separate building, dedicated to pool chemical storage.

10.0 WATER TREATMENT PLANT

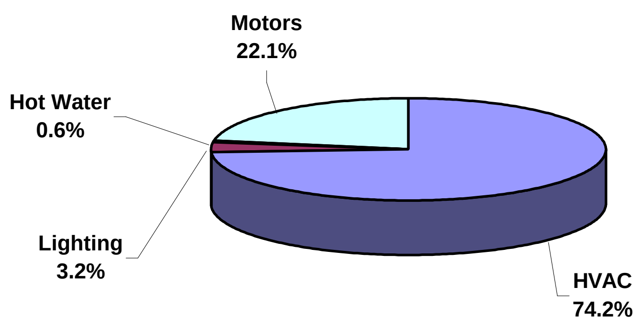
10.1 BACKGROUND

The Water Treatment Plant was originally constructed in 1960, with a plant addition and a new treatment system added in 1980 bringing the total area of the facility to 6,544 square feet. The building is composed of concrete block construction, complete with a brick exterior and an insulated roof. The plant is occupied for 8 hours on a daily basis and the equipment operates for approximately 18 hours a day, all year long.

Photo 9: Water Treatment Plant

The Water Treatment Plant uses both electric energy and natural gas. The former is used for operating the facility's process equipment (motors), lighting and water heating. Natural gas is used to heat the building. For the previous year, the Water Treatment Plant consumed 244,260 kWh of electric energy and 260,678 kWh of natural gas. The following pie chart illustrates the percent portions of total energy consumption for the Water Treatment Plant.

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



The facility has one high flow sink and a safety shower. For determining the energy used to heat the water for the sink, estimates were made on the frequency at which it is used. Upgrading the safety shower was not included in the table since it is used infrequently and should not be replaced with a low flow domestic shower.

10.2 ENERGY AND WATER SAVING OPPORTUNTIES

Summaries of the energy and water efficiency improvement opportunities for the Water Treatment Plant are shown in Tables 15 and 16.

The following assumptions were made in the calculations:

- The building is occupied for 8 hours per day, all year.
- The temperature of the building is maintained at 21.1ºC (70ºF).
- For determining water consumption, the typical occupancy of the building was assumed to be 3 people.
- The exit lamps are on for 24 hours a day, year round.

Table 15 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										
Pump and Meter Room incandescants - convert to compact fluorescents	6	$15	$10	$13	$188	$154	1,258	$76	2.5	2.0
Office Area/Lab - convert 4' T12s to 4' T8s (4x3)	12	$58	$38	$63	$1,655	$1,382	681	$41	40.5	33.8
Original WTP Area - convert incandescents to compact fluorescents	9	$15	$10	$13	$287	$236	1,887	$113	2.5	2.1
Original WTP Area fluorescents- convert 4' T12s to 4' T8s (6x2)	12	$55	$35	$60	$1,573	$1,300	681	$41	38.5	31.8
New Plant Area fluorescents- convert 4' T12s to 4' T8s (23x2)	46	$55	$35	$60	$6,031	$4,982	2,612	$157	38.5	31.8
New Plant Area EXIT sign - Convert to LED module	1	$50	$5	$80	$148	$97	237	$14	10.4	6.8
Lighting Subtotal					**$9,883**	**$8,150**	**7,356**	**$442**		
ENVELOPE										
Replace windows c/w new caulking and weather stripping.	4	$545	$500	$100	$2,941	$2,736	3,211	$147	20.0	18.6
Add new weather strip to pedestrian door.	1	$30	$30	$100	$148	$148	1,666	$76	1.9	1.9
Envelope Subtotal					**$3,089**	**$2,884**	**4,877**	**$223**		
HVAC										
Replace 120 MBH unit heater with a high efficiency gas furnace.	1	$3,200	$3,200	$1,000	$4,788	$4,788	13,967	$638	7.5	7.5
Replace 200 MBH unit heater with a high efficiency gas furnace.	1	$4,865	$4,865	$1,000	$6,686	$6,686	22,605	$1,033	6.5	6.5
Setback thermostats at 15C (59F)	2	$300	$300	$300	$1,368	$1,368	26,233	$1,575	0.9	0.9
HVAC Subtotal					**$12,842**	**$12,842**	**62,805**	**$3,246**		
MOTORS										
New Process Area:										
When replacing 7.5 hp air scour motor, replace with a premium efficiency motor.	1	$220	$220	$0	$251	$251	440	$26	9.5	9.5
When replacing 5 hp motor, replace with a premium efficiency motor.	1	$236	$236	$0	$269	$269	293	$18	15.3	15.3

Description	Qty	Installed Cost/Unit ($)			Total Cost ** ($)		Estimated Annual Savings		Simple Payback Years	
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
MOTORS										
Low Level Distribution Pump:										
When replacing 10 hp motor, replace with a premium efficiency motor.	1	$281	$281	$0	$320	$320	604	$36	8.8	8.8
High Level Pump:										
When replacing 30 hp motor, replace with a premium efficiency motor.	1	$678	$678	$0	$773	$773	1,829	$110	7.0	7.0
Motors Subtotal					**$1,613**	**$1,613**	**3,165**	**$190**		
HOT WATER										
Replace water heater with an instantaneous water heater.	1	$300	$300	$900	$1,368	$1,368	1,164	$70	19.6	19.6
Hot Water Subtotal					**$1,368**	**$1,368**	**1,164**	**$70**		

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	504,938	$24,600	54.1
Estimated Annual Savings	79,367	$4,171	8.3
Percent Savings	16%	17%	15%

* 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) and the cost of natural gas is taken as 0.0457 $/kWh (as of November 1, 2005).

Table 16 Water Saving Opportunities for the Water Treatment Plant

Description	Qty	Installed Cost/Unit ($)		Total Cost* ($)	Annual Water Savings (%)	Annual Water Savings (L)	Annual Water Savings ($)
		Material	Labour				
Install water efficient metering faucets.	1	$309	$150	$523	80%	5,591	$2

* The total cost column includes 14% taxes.

10.3 GENERAL RECOMMENDATIONS

Lighting

The lighting analysis for the Water Treatment Plant can be found in Appendix B, Table 9.3. The energy saving opportunity with the shortest payback periods are replacing all incandescent light bulbs, both in the pump and meter room and in the original plant area. Other energy saving opportunities include replacing all existing T12 fluorescent lamps with T8s and upgrading the EXIT incandescent lamp with an LED module.

Envelope

Minimal upgrades have been proposed to reduce energy consumption and energy costs associated with the Water Treatment Plant's building envelope. These are replacing four single pane windows located in the pump room with triple pane windows, complete with new caulking and weather-stripping and adding new weather stripping to the pedestrian door. Tables 9.4 (a) and (b) in Appendix B summarize these energy saving opportunities.

HVAC

Substantial energy saving opportunities are available within the heating, ventilation and air-conditioning (HVAC) system for the Water Treatment Plant. Payback periods range from 0.9 to 7.5 years.

The shortest payback period energy saving opportunity is to install setback thermostats. This option results in an approximate annual saving of 26,233 kWh with an associated payback of 0.9 years.

Other energy saving opportunities include replacing the existing unit heaters with high efficiency furnaces. Payback periods associated with these ESOs range from 6.5 to 7.5 years with over 36,000 kWh in cumulative annual savings available.

Motors

When replacement is required, upgrading the existing motors with premium efficiency motors would save 3,165 kWh. Details of the motors upgrade are shown in Appendix B, Table 9.7.

Water

Currently, less than one percent of the building' s energy consumption is for heating water. The following energy saving opportunities was proposed for the Water Treatment Plant: installing an instantaneous water heater would save 1,164 kWh per year.

11.0 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 10.1 to 10.4) and maintenance activities (Section 10.5) that will result in energy / water savings for all the buildings.

11.1 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. It should be noted that compact fluorescent light bulbs cannot be used on a dimmer switch.

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.

11.2 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.

11.3 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 metal 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.

11.4 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.

11.5 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

12.0 IMPLEMENTATION OF ENERGY AND WATER SAVING OPPORTUNITIES

12.1 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. For the saving opportunities that involve replacing the doors, some could be done in-house while for others, such as the vehicle doors, it is best to hire a contractor.

Contractor Implementations

The majority of the energy saving opportunities will require a contractor. In terms of lighting, replacing the T12s with T8s 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

For the Town of Carman the energy saving opportunity that requires a consultant to implement is the geothermal heating system. This system will require a detailed site investigation; bore hole testing and energy modelling of the building to properly size the geothermal system. In addition, consulting services should also be considered for any major upgrades to the building and services.

12.2 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.

12.3 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 Appendix D of this report. Manitoba has been a leader in energy efficiency and many municipalities have partnered with other levels of government and companies like Manitoba Hydro on innovative projects. We believe the MMEP project is an excellent example of an innovative project and believe all of the participating communities are receptive to innovative ideas because they have agreed to participate.

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

Political Environment in the Town of Carman

This study is the first energy and water efficiency study to take place in the Town of Carman. At the time of the site visit, a new change house for the Carman Aquatic Centre was in the plan for the immediate future. The knowledge gained from this study and from observing the energy and water savings that result from implementing the recommended upgrades will be valuable in the future when new buildings are developed.

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

13.0 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 electric energy consumption in kWh taken from the building's electricity bill should be recorded in the "Billed Elec. Energy " column and the monthly gas consumption in m^3 should be recorded in the "Billed Natural Gas" column. The monthly energy consumption for heating depends on the outdoor temperatures for that month. The "Billed Energy Consumption" is therefore normalized to the year 2004-2005 such that a fair comparison can be made.

The normalized energy consumption is determined as follows:

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

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. This data can be found for the City of Winnipeg, which was used for the Town of Carman, on the following website:

http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=CA&StationID=28051&Year=2005&Month=11&Day=18

Once the “Billed Energy Consumption” 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.

14.0 WATER DISTRIBUTION AND WASTEWATER COLLECTION SYSTEM AUDITS

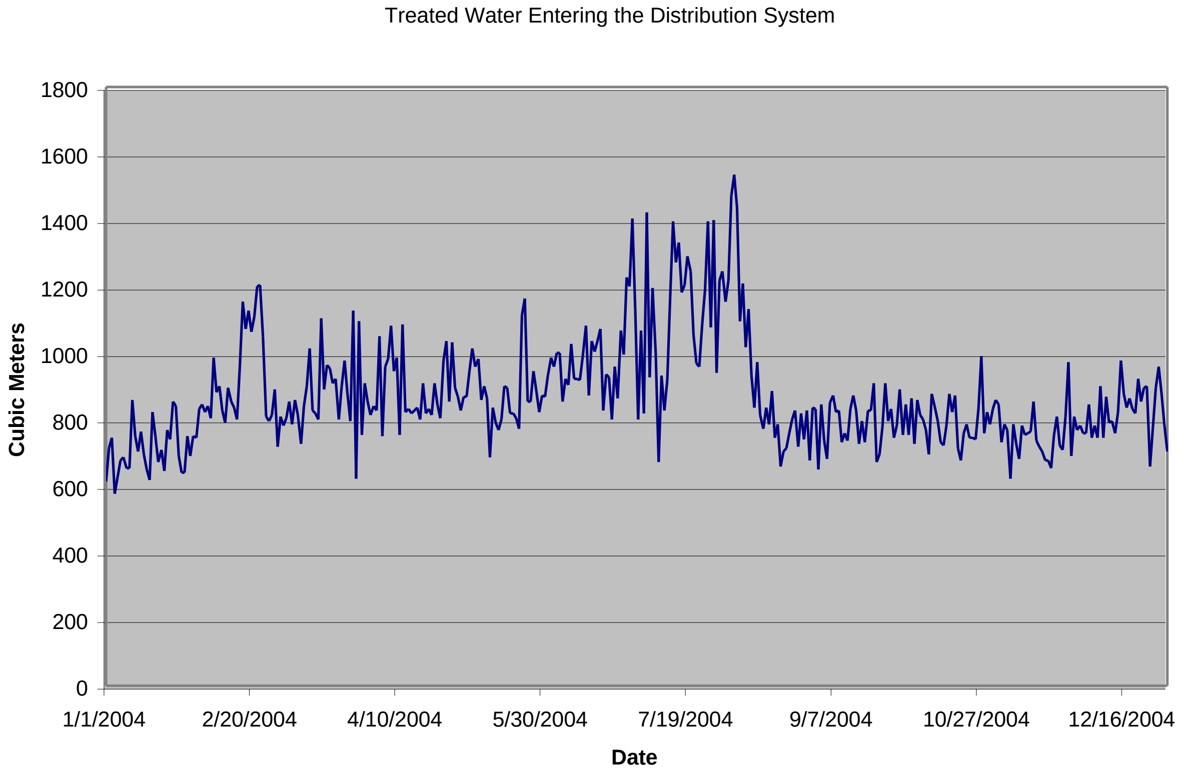
14.1 WATER DISTRIBUTION SYSTEM OVERVIEW

In 1960 the Town of Carman constructed a water supply and distribution system that draws its water from the Boyne River, which flows through the Town. The water treatment process and treatment plants were upgraded to a lime softening process in 1980.

There are two 15 horsepower pumps located in the raw water pump house that pump water from the Boyne River to the Carman Water Treatment Plant. At the plant, the water is treated by lime-soda ash softening, coagulation, flocculation, sedimentation, filtration and chlorination. After the water has been treated, it is stored in one of two reservoirs, either an underground reservoir that has a storage capacity of 1,109 m^3 or a tower with a capacity of 273 $m^{3.}$ From the reservoirs, a 30 horsepower and a 10 horsepower pump are used to pump the water through the distribution system. In case of an emergency there is a 50 horsepower fire pump that is used for flushing the distribution lines and to provide fire flows. In addition to the water that is produced at the water treatment plant, the Town also purchases water from the Pembina Valley Water Cooperative. In 2004, the Town purchased 91,250 m^3 (20,732,100 imperial gallons) of water from the Cooperative at a rate of $1.078 per cubic metre ($4.90 per 1000 imperial gallons).

Based on the data provided, the average amount of water produced in 2004 was approximately 870 m^3 per day with a maximum daily flow of approximately 1,200 m^3 per day. From the information received, the plant has a design flow of 2,900 m^3 per day. From this data, the average water produced per capita was calculated to be approximately 310 lpcd (litres per capita per day). Figure 1 shows the daily production of treated water for the year 2004.

Figure 1 Treated Water Production for 2004



The water plant and original distribution system was built in 1960. Insufficient data was available regarding the length of the distribution system or the types of piping. The Town currently uses IPEX Series 160 PVC piping whenever lines need to be replaced.

There is currently no program in place for replacing old distribution piping. The distribution system is repaired and replaced as breaks occur.

Table 17 lists the following data for the 2004 year: amount of raw water supply, in plant water use, and the amount of water sent to the distribution system by the water treatment plant, as well as the amount of water consumed by clients based on meter readings.

Table 17 2004 Water Use

Period	In Plant Use (m^3)	Annubar (m^3)	3" Bulk (m^3)	Raw Orifice (m^3)	Water Consumption (m^3)	Water From Pembina Valley (m^3)
Jan.-Mar., 2004	16,561	75,702	1,728	74,631	71,756	
Apr.-June, 2004	19,962	83,635	1,234	87,695	68,568	
July-Sept., 2004	18,089	86,862	1,419	92,077	74,620	
Oct.-Dec., 2004	19,375	72,874	1,275	74,878	62,345	
Year of 2004	73,988	319,073	5,656	329,280	277,289	94,250

The raw orifice meter measures the untreated (raw) water entering the plant. According to plant staff, after treatment, an annubar meter measures the water. From here the 3-inch bulk line draws water from the distribution line, as does the in-plant use line. Therefore, the actual amount of water that enters the distribution system is the difference between the annubar reading and the sum of the in-plant use and 3-inch bulk readings, approximately 239,429 m^3 in 2004.

Based on information provided, the cost associated with the Town of Carman's unaccounted for-water loss can be calculated, as shown in Table 18.

Table 18 Unaccounted-For Water Loss Cost

Unaccounted For Water Loss	**2004**
Total Water Distributed (m^3)	333,679
Total Water Sold (m^3)	277,289
Authorized Unmetered Use (m^3)[1]	259
Meter Inaccuracies (m^3)[2]	14,225
Total Unaccounted-for Water Loss (m^3)	41,906
Percent Unaccounted-for Water Loss	12.6%

Cost of Unaccounted For Water Loss	**2004**
Water Produced at WTP (m^3)	319,073
Chemical Costs of Treating Water[3]	$12,000
Electrical Costs of Treating Water[4]	$48,000
Unit Cost per Cubic Meter	$0.188
Cost of Unaccounted For Water Loss	$7,880

[1] Based on information obtained from operation staff.
[2] Based on the probable amount of water loss estimated using typical accuracy figures published by the American Water and Wastewater Association (AWWA) journal for meters with plastic components that are 15 years old.
[3] Based on chemical costs provided for 2004.
[4] From electrical costs obtained for the water treatment plant.

Based on information provided, the Town lost approximately $7,880 due to unaccounted for-water loss in 2004. This amount may not be completely accurate since the error on the distribution meter was unknown and the overall error on the client water meters was estimated. If the distribution water meter did not have an accuracy of 100%, the value for the amount of water produced would be higher, yielding a larger value for the total unaccounted for-water loss, and thus a higher cost for this loss. If, on the other hand, it was found that the client water meters were actually more accurate than the typical 15-year-old water meter with plastic components, the value for the amount of water sold would increase, thus decreasing the amount of unaccounted for-water loss and the associated cost this loss.

Water Meters

There is a 6-inch Neptune Trident water meter that measures water entering the distribution system at the water treatment plant in imperial gallons. There is another 6-inch Neptune meter on the tower fill line.

At present there are 1,166 water meters located along the distribution system that measures water consumption on a per client basis. Data received indicates that most of these meters were installed 15 years ago. Age can have a significant impact on the accuracy of water meters. According to data published in the American Water and Wastewater Association journal, meters with plastic components that are 15 years old have an accepted accuracy of 95.12%. If meters were constructed of all-brass components, the accuracy would be 99.0%. Table 19 displays the number of meters in the distribution by size.

Table 19 Distribution System's Water Meters by Size

Meter Size	5/8"	3/4"	1"	1.5"	2"	3"	Total
Number	1117	16	17	2	13	1	1,166

Pumps

The raw water pumps are located in the raw water pump house on 1st Street. The Low Level, High Level, and Fire pumps are all located in the water treatment plant. Table 20 lists the relevant available pump data.

Table 20 Water Pump Data

Function	Motor Size (hp)	Motor Manufacturer
Fire Pump	50	Unknown
Low Level Pump	10	Fairbanks Morse
High Level Pump	30	Unknown
Raw Water Pump 1	15	US Motors
Raw Water Pump 2	15	Crane Canada

Water Rates

Meters are read and clients are charged on a quarterly basis. For the first 100,000 gallons of water used per quarter, clients are billed at a rate of $4.30 per 1000 gallons for water and at $0.50 per 1000 gallons for sewer service. Once a client passes 100,000 imperial gallons per quarter, they are billed at a rate of $3.20 per 1000 gallons for water, and $0.50 per 1000 gallons for sewer service. Table 21 lists the minimum quarterly fees based on the size of water meter.

Table 21 Minimum Quarterly Water Rates for the Town of Carman

Charges per Quarter per 1000 gallons	Meter Size					
	5/8"	3/4"	1"	1.5"	2"	3"
Service Charge	$9.80	$9.80	$9.80	$9.80	$9.80	$9.80
Water	$12.90	$25.80	$51.60	$129.00	$322.50	$542.00
Sewer	$1.50	$3.00	$6.00	$15.00	$37.50	$67.50
Total Quarterly Minimum	$24.20	$38.60	$67.40	$153.80	$369.80	$619.30
Water Included in Rate (Imp. Gal.)	3,000	6,000	12,000	30,000	75,000	135,000

In addition to these fees, hydrants are rented at $65.00 per year, and bulk sales are charged at a rate of $6.30 per 1000 imperial gallons.

Maintenance Programs

There is currently no scheduled maintenance program in place; 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.

From the data received it is concluded that the distribution system is flushed about once a year, however this is not necessarily consistent from year to year. The water used for flushing is not metered and no estimations are made for the amount of water used. Records of water main breaks are kept, but volumes lost are not estimated.

14.2 WATER DISTRIBUTION SYSTEM AUDIT RESULTS

In general, community water rates should be set at a level that covers the cost of supplying water to clients, including treating the water, distributing the water, maintaining the treatment and distribution systems, and replacing key pumping and process equipment. 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 associated with the treatment process and decreased electrical costs associated with a lower amount of pumping required to supply the water. 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 meter accuracy could 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 losses.

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

14.2.1 Unaccounted-For Water Loss

As calculated from the data supplied, the Town of Carman has an unaccounted-for water loss of water loss of approximately 12.6% for the year 2004.

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

Leakage

All distribution systems experience a certain 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 reports 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 Carman 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

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

Ensuring the client meters are accurate will increase revenues for the Town since clients will be paying for the actual amount of water used. Accurate client meters will also allow the Town to better assess the amount of unaccounted-for water leaving the system, since water that would be unaccounted-for if the meters were inaccurate would actually be included in water consumption data.

At present time, since the Town is not completely aware of the amount of water lost from the system, it would be very difficult to develop a comprehensive leakage prevention program.

Other

Additional 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 estimate the amount of water lost or used. This will increase the accuracy of any water audit performed in the future.

14.2.2 Maintenance Program

It is suggested 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 who would be able to test the accuracy of the meters.

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

14.2.3 Required Information For Future Water Distribution System Audits

In order to provide the Town with a comprehensive water audit in the future, the following information would be required:

- The annual operating and maintenance costs of the water treatment plant and distribution systems.
- The length and type of piping used in the distribution system.
- A record of the number of breaks in the system with a corresponding estimate of the amount of water lost.
- The most recent installation date of the water meters throughout the distribution system.

14.2.4 Cost Saving Opportunities

There are two different methods of calculating potential cost savings for the Town of Carman. The first method involves determining the savings associated with using less energy and chemicals for treating and distributing the water that is treated at the water treatment plant. The second method is by reducing the amount of water that the Town purchases from the Pembina Valley Water Cooperative. The cost of treating and distributing water at the water treatment plant is approximately $0.188 per cubic metre, while the Town purchases water from the Pembina Valley Water Cooperative at $1.078 per cubic metre ($4.90 per 1000 imperial gallons), according to information provided. The best opportunity for cost savings is from reducing the amount of water purchased from the Pembina Valley Water Cooperative, but this may or may not be possible.

According to information received, the Town of Carman's water treatment and distribution system appears to run fairly efficiently. It is possible for the Town to reduce the amount of unaccounted-for water loss in the system, but this may be not cost effective, according to Environment Canada, since Carman's unaccounted for water loss of 12.6% falls in the 10-15% range where a leakage detection and prevention program may not be economically advisable. For each 1% reduction of unaccounted for water loss, the Town could save approximately $600 annually based on the cost of producing water at the water treatment plant. Based on purchasing less water from the Cooperative, the Town could save approximately $3,600 annually.

The accuracy of water meters throughout the Town should be tested. Since operation staff was unsure of whether the metres had brass or plastic components, a metre replacement program may or may not be economically feasible. If the client water metres have brass components, the estimated accuracy would be approximately 99%. With an error of 1%, clients would have consumed approximately 2,800 m^3 of water that they were not billed for in 2004, corresponding to a loss of $500 to the Town based on treating the water, or a loss of approximately $3,000 based on purchased less water. If the water metres had plastic components instead of brass components, the estimated accuracy of the metres would only be 95.12%. With an error of 4.88%, clients would have approximately 14,255 m^3 of water that they were not billed for in 2004, corresponding to a loss of $2,650 to the Town based on the Town treating the water, or approximately $15,300 based on purchasing the water.

The Town could save some costs through improving the backwashing procedures. By assuming that backwashing utilizes the majority of the water measured by the "In Plant Use" meter, we can compare this volume to the measured raw water entering the treatment plant to determine the percentage of the total processed water that is being used for backwashing filters. In Carman's case, filter backwash water represents approximately 22% of the total water processed by the plant. Published data states that typical values for amount of processed water used to backwash filters range from 1 to 6%. If the Town of Carman 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 16%. If the Town reduced that amount of water it treated by this amount, they could save approximately $9,500, based on information for 2004. If, on the other hand, the Town reduced the amount of water it purchased from the Pembina Valley Water Cooperative, the Town could save approximately $56,790 based on the data provided for 2004. It is recommended that the Town of Carman perform a filter audit to determine if a decrease in the amount of water used for backwashing would be feasible.

Since the Town purchases water from the Pembina Valley Cooperative at a far greater cost than it is produced at the water treatment plant, it is recommended that the Town reduced the amount of water purchases from the Cooperative. This recommendation assumes that the Town did not enter into an agreement where it is required to purchase a set amount of water from the Cooperative, in which case decreasing the amount of purchased water would not be feasible.

14.3 WASTEWATER COLLECTION SYSTEM OVERVIEW

Carman's sewer system was constructed in 1908. There is no information on the current length of the collection system or the type of piping. When piping needs to be replaced, the Town is using IPEX Series 35 PVC pipe. Information regarding the total number of manholes was unavailable, but the information provided does state that many of the manholes are of old brick construction.

There are four lift stations along the distribution system. Both the Bishop Bay lift station and the Elementary lift station pump to the Main lift station. The Main lift station and the Industrial Park lift station both pump sewage to the lagoon.

The lagoon system consists of four cells. The primary cell has a storage capacity of 37,188 m^3, the secondary cell has a capacity of 41,935 m^3, the tertiary cell has a capacity of 36,569 m^3 and the quaternary cell has a capacity of 151,684 m^3. The quaternary cell is discharged to the Boyne River

The sewage collection system has an older section that is a combined system collecting both sewer flow and storm water, while the newer section consists of a separate system collecting only sewer flow. The entire north end up to 7th Street has a combined collection system.

Information regarding the annual operation and maintenance costs for the sewer system was unavailable.

Pumps

There are four lift stations located throughout Carman that help move the sewage to the lagoon. If the amount of sewage flowing through the system were decreased there would be savings associated with reduced pumping costs. Savings by reducing the flow through the Bishop Bay and Elementary lift stations would be multiplied since not only would there be savings at these lift stations, but also at the Main lift station, as well.

Currently, the Town does not estimate the annual volume of sewage that is pumped by the lift stations. However, pump operation times are periodically recorded. Table 22 provides the available relevant pump data.

Table 22 Lift Station Pump Data

Function	Motor Size (Hp)	Manufacturer
Main SLS* Pump 1	30	Flygt
Main SLS* Pump 2	30	Flygt
Industrial Park SLS* Pump 1	10	Flygt
Industrial Park SLS* Pump 2	10	Flygt
Bishop Bay SLS* Pump	7	Flygt
Elementary SLS* Pump	7	Flygt

* SLS stands for sewage lift station.

Sewer Rates

Sewage rates are included in the quarterly water bills. The rate structure is given in Table 21 in the Water System Overview.

Maintenance Programs

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

Contec Projects Limited inspects and maintains the pumps at the sewage lift stations on an annual basis.

14.4 WASTEWATER COLLECTION SYSTEM AUDIT RESULTS

Due to the fact that Carman operates a combined sewer system in some areas of town, there will be a large discrepancy in the volume of water pumped to the lagoon over the course of a year. These variations will be caused by precipitation entering the system through sump pumps, weeping tiles, or infiltration.

Pump hours were used to estimate the flow through the system. This method can be very inaccurate and will be affected by pump plugging, worn impellers and other parameters. All of these conditions result in a reduced volume of sewage that is actually pumped than would be expected for the recorded time frame, resulting in an exaggerated volume of sewage pumped. The second problem encountered with using pump hours is that the actual operating conditions were unknown; therefore peak operating conditions were assumed for the pumps. Again, this could lead to an exaggeration of the volume of sewage pumped.

From information provided by the Town of Carman, it appears that the sewer system is experiencing significant infiltration, approaching approximately 40 per cent of the total annual flow through the sewer system. The Town could potentially decrease infiltration and inflows to the sewer system by sealing manholes; lining pipes; and disconnecting rain leaders, sump pumps and weeping tiles from the sanitary sewer system. Further study should be conducted to determine the feasibility of these infiltration reduction options, since they may be cost effective in this specific case. Since information regarding the annual operation and maintenance costs of the sewer system was unavailable, the actual potential savings cannot be calculated. However, 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 storm water sources. This study should include a detailed review of manholes within the system and the televising of the sewage collection system.

Maintenance Program

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

By-Laws

In order to limit the amount of storm water entering the sewer system, the Town should consider instituting a by-law that prohibits any future hook-ups of sump pumps or weeping tiles to the sewer system. This may require the expansion of the existing storm sewer system in order to service the entire town, but it will greatly decrease the amount of water entering the lagoons, and will decrease pumping costs since less water will be flowing through the sanitary sewer system.

Required Information for Future Wastewater Collection Audits

In order to provide the Town with a more complete sewer audit in the future, the following information would be required:

- Daily flows through the sewer system.
- The length and type of pipe used in the collection system.
- The rated flow and head of the pumps.
- The number of manholes along the collection system.
- Annual operation and maintenance costs of the collection, pumping and lagoon systems.

14.5 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 could help the community gain support for the following initiatives:

- Installing water meters, low flush toilets, or water efficient showerheads.
- Fixing leaky taps and toilets.
- Only watering lawns once per week.
- Using drip irrigation for trees and shrubs.

14.6 RECOMMENDATIONS

It is recommended that the Town:

1. Either calibrate and repair the existing meters at the water treatment plant, or replace them altogether.

2. Develop a program for assessing the accuracy of water meters at the water treatment plant, as well as client water meters.

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

4. Keep track of the dates when breaks or flushing occur and meter all authorized municipal water use in order to accurately estimate the amount of water loss within the distribution system.

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

6. Conduct a filter audit to determine if the filter operations could be optimized.

7. Reduce the amount of water purchased from the Pembina Valley Water Cooperative, if possible.

8. Conduct a study on the feasibility of options for reducing infiltration inflow to the sewage collection system. This may include sealing manholes, lining pipes; televising the system and developing a staged collection system upgrade strategy.

9. Install flow meters at the sewage lift stations and take daily meter readings so that the influence of storm water and runoff on the overall flow through the system can be more accurately determined.

10. Establish a by-law that prevents the connection of sump pumps or diversion of water from weeping tiles into the sewer system.

11. Provide public education to create a better understanding of the water and wastewater treatment systems.

APPENDIX A

INVENTORY SHEETS

TABLE OF CONTENTS – APPENDIX A

KGS GROUP

BUILDING INSPECTION INVENTORY

Municipality: Carman	**Date:** October 5, 2005
Tour Personnel: Joel Lambert	**Construction Date:** ~pre-1960, unknown
Building: Carman and Dufferin Arena	**Renovations:** No change to building envelop.
L x W x H: 220' x 180' x 18' Rink, 12' in reception 2nd Floor: 34' x 150' x 12' — **Area:** 44,700SF	
Building Occupancy: Approx. 150	
Building Floor Plan: Arena, curling rink, lobby, hall, change rooms, washrooms, and storage rooms.	**Occupied Times:** Peak use from mid October until end of March and a reduced use for the remainder of the year. ~ 3624 hours/year

ARCHITECHTURAL/STRUCTURAL	
Wall type/R-value:	
Unknown – fibreglass insulation on the second floor in roof of the storage room. Assume R12 fibreglass.	
Roof Type/R-value:	
Spray foam –unknown thickness – R12?	
Door Type/weather stripping:	
1) 2-Old wooden entry double doors	2) 2- Old wooden exit doors
3) 4- Doors b/w lobby and rink	4) 2- Sliding doors for equipment
Window type/caulking:	
2 – Plexiglass windows	
Other:	

MECHANICAL
Heating System:
Hydrognic natural gas water boiler; electric baseboards in the office (A.O. Smith model HW 800 SB8705S)
Cooling System:
No A/C
Ventilation System:
None
HVAC Controls: None
HVAC Maintenance/Training:
None

BUILDING INSPECTION INVENTORY
(CONTINUED)

Water Supply System:
Municipal
Domestic Hot Water System:
NG HW boiler – 2 TJU M Storage rank, modelBC300 – 7965 (A.O. Smith Model BC 300-7945 300MH)
Water Fixtures:
13- faucets 13 – toilets 8 – urinals 2 – hot water tanks
ELECTRICAL
Indoor Lighting:
162 – Fluorescent lights of type 4' T12 48 – Fluorescent lights of type 8' T12 14 – Incandescent lights
Outdoor Lighting:
Exit Signs:
LED exit signs.
Motors:
1- 100 hp Compressor 1- 20 hp Brine Pump 1- 10 hp Condenser Fan
Parking Lot Plugs:
OTHER BUILDING SYSTEMS
3 natural gas unit heaters in the second ice rink that are not used.
PROCESS SYSTEMS
Ice plant – one compressor (Caryle Model 5H120-19219, 100 hp); 20hp brine pump; 10 hp condensor fan
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
Hydro, Gas and Water

KGS GROUP

BUILDING INSPECTION INVENTORY

<table>
<tr><td colspan="2">Municipality: Carman</td><td>Date: October 5, 2005</td></tr>
<tr><td colspan="2">Tour Personnel: Joel Lambert</td><td>Construction Date: ~ 48 years old</td></tr>
<tr><td colspan="2">Building: Carman Fire Hall</td><td rowspan="3">Renovations:
No change to building envelop</td></tr>
<tr><td>L x W x H:
31’ x 70.5’ x 12’</td><td>Area:
2,224 SF</td></tr>
<tr><td colspan="2">Building Occupancy:
~ 6</td></tr>
<tr><td colspan="2">Building Floor Plan: Fire Hall, meeting room, office and washroom.</td><td>Occupied Times: ~2 hours/week. Annually ~ 104 hours.</td></tr>
<tr><td colspan="3">ARCHITECHTURAL/STRUCTURAL</td></tr>
<tr><td colspan="3">Wall type/R-value:</td></tr>
<tr><td colspan="3">Unknown.</td></tr>
<tr><td colspan="3">Roof Type/R-value:</td></tr>
<tr><td colspan="3">Blanket Type.</td></tr>
<tr><td colspan="3">Door Type/weather stripping:</td></tr>
<tr><td colspan="3">3- steel man doors – two require new weather stripping
2- overhead metal doors</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td colspan="3"></td></tr>
<tr><td colspan="3">Other:</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td colspan="3">MECHANICAL</td></tr>
<tr><td colspan="3">Heating System:</td></tr>
<tr><td colspan="3">Electric baseboard in office area.
No unit heater in garage.</td></tr>
<tr><td colspan="3">Cooling System:</td></tr>
<tr><td colspan="3">None.</td></tr>
<tr><td colspan="3">Ventilation System:</td></tr>
<tr><td colspan="3">None.</td></tr>
<tr><td colspan="3">HVAC Controls:</td></tr>
<tr><td colspan="3">2- thermostats at ~ 65°F in the winter for garage, 70 °F everywhere else all the time.</td></tr>
<tr><td colspan="3">HVAC Maintenance/Training:</td></tr>
<tr><td colspan="3">None</td></tr>
</table>

BUILDING INSPECTION INVENTORY (CONTINUED)

Water Supply System:
Domestic Hot Water System:
40 gal. Electric hot water tank – needs pipe insulation.
Water Fixtures:
3- faucets 1 – toilet 1 – urinal 1 – hot water tank
ELECTRICAL
Indoor Lighting:
24 – Fluorescent lights of type 4' T12; 6- Garage incandescent lights.
Outdoor Lighting:
2- floodlights on front of building; 1- floodlight on building side; 2- incandescent on motion sensors on building side.
Exit Signs:
None
Motors:
None
Parking Lot Plugs:
None
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
Hydro, gas and water.

KGS GROUP

BUILDING INSPECTION INVENTORY

<table>
<tr><td colspan="2">Municipality: Carman</td><td>Date: October 5, 2005</td></tr>
<tr><td colspan="2">Tour Personnel: Joel Lambert</td><td>Construction Date: ~ Early 1900's – Old CN Station</td></tr>
<tr><td colspan="2">Building: Golden Prairie Arts Council (Friendship Centre)</td><td rowspan="3">Renovations:</td></tr>
<tr><td>L x W x H:
Main floor: 22' x 74' x 9'
2nd floor: 18' x 60' x 8'</td><td>Area:
2,708 SF</td></tr>
<tr><td colspan="2">Building Occupancy:
Approx. 10</td></tr>
<tr><td colspan="2">Building Floor Plan:</td><td>Occupied Times: ~2484 hours/year
M-W @ 12 hrs/day, R-F @ 7 hrs/day, one Sat/month @ 7 hrs/day</td></tr>
</table>

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value:
2' x 4' Filled w/ wood shavings. No vapour barrier.
Roof Type/R-value:
2' x 4' filled w/ wood shavings. No vapour barrier.
Door Type/weather stripping:
1- wooden door.
Window type/caulking:
15- single pane windows. 9 – double pane windows.
Other:
MECHANICAL
Heating System:
Electric baseboards – forced flows.
Cooling System:
None.
Ventilation System:
Main floor – bathroom fan exh bathroom + kitchen – controlled by humidistat in kitchen. Upstairs – 2 bathroom fans only. No ventilation system.
HVAC Controls:
Wall stats.
HVAC Maintenance/Training:

BUILDING INSPECTION INVENTORY (CONTINUED)

Water Supply System:
Town water.
Domestic Hot Water System:
Electric hot water tank.
Water Fixtures:
4- faucets 3 – toilets 0 – urinals 1 – hot water tank
ELECTRICAL
Indoor Lighting:
27 – Fluorescent lights of type 4' T12 20 – Fluorescent lights of type 8' T12 24 – Indoor incandescent lights.
Outdoor Lighting:
2- outdoor compact lights.
Exit Signs:
1- outdoor exit sign.
Motors:
None
Parking Lot Plugs:
None
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
Water and hydro.

KGS GROUP

BUILDING INSPECTION INVENTORY

<table>
<tr><td colspan="2">Municipality: Carman</td><td>Date: October 5, 2005</td></tr>
<tr><td colspan="2">Tour Personnel: Joel Lambert</td><td>Construction Date: Built 1915 w/ additions built in 1985 & 1999.</td></tr>
<tr><td colspan="2">Building: Boyne Regional Library</td><td rowspan="3">Renovations:</td></tr>
<tr><td>L x W x H:
Main floor: (49’x40’x12’) + (23’x32’x12’)
2nd floor: 52’x40. 5’x8’</td><td>Area:
Total = 4,802 SF</td></tr>
<tr><td colspan="2">Building Occupancy:
Approx. 10</td></tr>
<tr><td colspan="2">Building Floor Plan:</td><td>Occupied Times: ~ 3952 hours/year
- 12 hrs/weekday & 8 hrs/ weekend day</td></tr>
<tr><td colspan="3">ARCHITECHTURAL/STRUCTURAL</td></tr>
<tr><td colspan="3">Wall type/R-value:</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td colspan="3">Roof Type/R-value:</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td colspan="3">Door Type/weather stripping:</td></tr>
<tr><td colspan="3">2- Glass doors.
2- Old metal doors.</td></tr>
<tr><td colspan="3">Window type/caulking:</td></tr>
<tr><td colspan="3">6 – Single pane windows
3 – Double pane windows</td></tr>
<tr><td colspan="3">Other:</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td colspan="3">MECHANICAL</td></tr>
<tr><td colspan="3">Heating System:</td></tr>
<tr><td colspan="3">2 gas heat, DX cooling furnaces</td></tr>
<tr><td colspan="3">Cooling System:</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td colspan="3">Ventilation System:</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td colspan="3">HVAC Controls:</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td colspan="3">HVAC Maintenance/Training:</td></tr>
</table>

BUILDING INSPECTION INVENTORY (CONTINUED)

Water Supply System:
Domestic Hot Water System:
1-hot water tank 35 MBH input, 40 USGal (State Water Heaters) - No insulation on heating or domestic water piping except for main heating loop in the basement.
Water Fixtures:
4- faucets 4 – toilets 0 – urinals 1 – hot water tank
ELECTRICAL
Indoor Lighting:
4- Fluorescent lights of type 2' T12 176 – Fluorescent lights of type 4' T12 2 – Fluorescent lights of type 8' T12 12 – Incandescent lights
Outdoor Lighting:
Exit Signs:
11- Incandescent Exit Signs
Motors:
Parking Lot Plugs:
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
Hydro, Gas and Water

KGS GROUP

BUILDING INSPECTION INVENTORY

Municipality: Carman	**Date:** October 5, 2005
Tour Personnel: Joel Lambert	**Construction Date:** ~1985
Building: Municipal Garage	**Renovations:**
L x W x H: 100'x50'x15' / **Area:** 5000 SF	
Building Occupancy: Approx. 3	
Building Floor Plan:	**Occupied Times:** ~ 2600 hours/year - 50 hours/week

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value:
Blanket insulation – metal clad out and in up to 8' AFF.
Roof Type/R-value:
Blanket insulation – metal clad out.
Door Type/weather stripping:
6 – Old metal doors.
Window type/caulking:
3 – Double pane windows.
Other:
MECHANICAL
Heating System:
In floor radiant system.
Cooling System:
None.
Ventilation System:
None.
HVAC Controls:
HVAC Maintenance/Training:

BUILDING INSPECTION INVENTORY
(CONTINUED)

Water Supply System:	
Domestic Hot Water System:	
Gas – 40 US gal.	
Water Fixtures:	
1 – faucet 1 – toilet 0 – urinals 1 – hot water tank	
ELECTRICAL	
Indoor Lighting:	
16 – Fluorescent lights of type 4' T12 1 – Garage fluorescent of type 4' T12 34 - Garage fluorescent of type 8' T12	3 - Incandescent
Outdoor Lighting:	
3- Outdoor incandescents	
Exit Signs:	
Motors:	
Parking Lot Plugs:	
OTHER BUILDING SYSTEMS	
PROCESS SYSTEMS	
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)	
Hydro, Gas and Water	

KGS GROUP

BUILDING INSPECTION INVENTORY

Municipality: Carman	**Date:** October 5, 2005
Tour Personnel: Joel Lambert	**Construction Date:** Unknown
Building: Landfill NW 13 6 5 W 7767	**Renovations:**
L x W x H: Shed: 23'x40'x15' Green Bldg: 20'x20'x10' — **Area:** 920 + 400 = 1320 SF	
Building Occupancy:	
Building Floor Plan:	**Occupied Times:** ~ 2600 hours/year - 50 hours/week

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value:
2 x 4 Construction of R12 type
Roof Type/R-value:
Blanket insulation throughout the shed.
Door Type/weather stripping:
4 – Wooden Doors
Window type/caulking:
1- Double pane windows 4- Single pane windows
Other:
MECHANICAL
Heating System:
Natural gas radiant heater that is not vented outside. 1- Electric baseboard heater in office. Shed has a natural gas unit heater.
Cooling System:
Small window AC
Ventilation System:
HVAC Controls:
HVAC Maintenance/Training:

BUILDING INSPECTION INVENTORY
(CONTINUED)

Water Supply System:
Domestic Hot Water System:
Water Fixtures:
No plumbing on site.
ELECTRICAL
Indoor Lighting:
16 – Fluorescent lights of type 4' T12 3 - Incandescent 1 – Garage fluorescent of type 4' T12 34 - Garage fluorescent of type 8' T12
Outdoor Lighting:
3- Outdoor incandescent lights.
Exit Signs:
Motors:
Parking Lot Plugs:
One outside plug for car – used 25 hours/week during winter.
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
Hydro and Gas.

KGS GROUP

BUILDING INSPECTION INVENTORY

Municipality: Carman	**Date:** October 5, 2005
Tour Personnel: Joel Lambert	**Construction Date:** Unknown
Building: Museum (Dufferin Historical Society) 4th Ave SW	**Renovations:**
L x W x H: Refer to attached sketch. / **Area:** 4,316 SF	
Building Occupancy: Approx. 6 people	
Building Floor Plan: Refer to attached sketch.	**Occupied Times: 232 hours/year** -Open May long to mid-June on weekends; Mid June until Aug – 7days/week for 4hr/day

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value:
Back part of the building – walls are R20. Remainder of building is comprised of old cinder block.
Roof Type/R-value:
Back part of the building – roof is of R20 type.
Door Type/weather stripping:
1 – Old wooden door.
Window type/caulking:
No windows.
Other:
MECHANICAL
Heating System:
Cooling System:
4 ceiling fans in the museum.
Ventilation System:
None –but combustion air duct present.
HVAC Controls:
None
HVAC Maintenance/Training: None

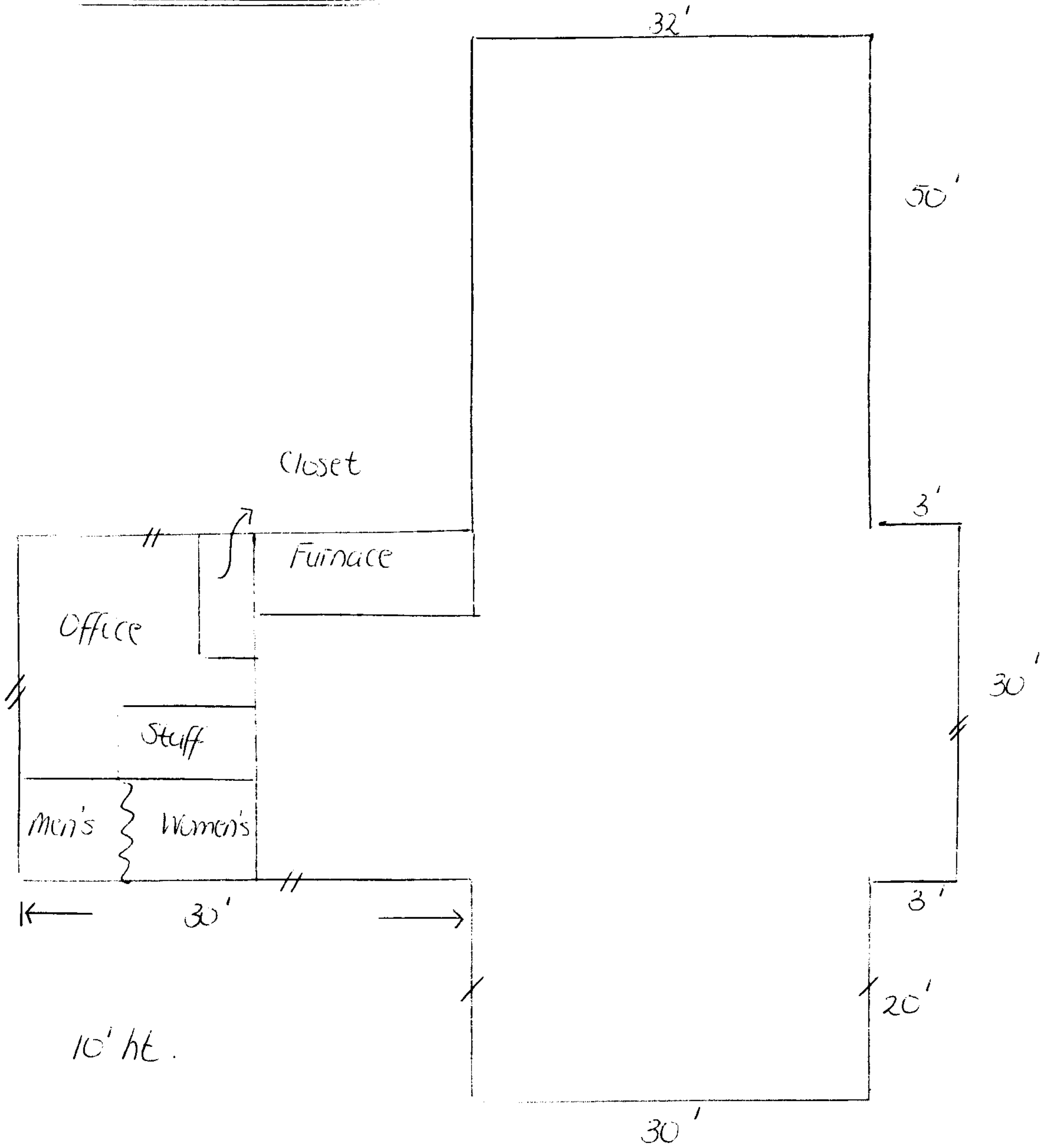
BUILDING INSPECTION INVENTORY
(CONTINUED)

Water Supply System:
Domestic Hot Water System:
Electric HWT – 6 gal. Rheem RE6 (under the counter within office washroom and services all the washrooms).
Water Fixtures:
2- faucets 3 – toilets 0 – urinals 1 – hot water tank
ELECTRICAL
Indoor Lighting:
20 – Fluorescent lights of type 4' T12 6 – Fluorescent lights of type 8' T12 31 – Incandescent lights
Outdoor Lighting:
3 – Outdoors incandescent lights (2 compact floor and 1 wall pack).
Exit Signs:
Motors:
None
Parking Lot Plugs:
None
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
Hydro and Gas.

KGS GROUP

CLIENT ____________
FILE NO. ____________
PROJECT ____________
REF. DWG. ____________
SHEET ______ OF ______
BY ______ DATE ______
CHD ______ DATE ______

Carman - Museum



KGS GROUP

BUILDING INSPECTION INVENTORY

Municipality: Carman	**Date:** October 5, 2005
Tour Personnel:	**Construction Date:** Unknown
Building: Carman Aquatic Centre 30 Kings Park Road	**Renovations:** ** The building uses the same electrical service as the Arena Ice Plant.
L x W x H: From drawing / **Area:** 5,680 SF	
Building Occupancy:	
Building Floor Plan:	**Occupied Times:** 924 hours/year Open mid June until Sept. long weekend for 12hr/day, 7 days a week.

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value:
N/A
Roof Type/R-value:
N/A
Door Type/weather stripping:
No doors.
Window type/caulking:
No windows.
Other:
MECHANICAL
Heating System:
Pool heater – natural gas boiler; Teledyne Laars, 1,825,000 BTU input and 1,496,000 BTU output. 5 years old, but looks 25 years old – likely due to pool chemicals. Pool facility is unheated.
Cooling System: None
Ventilation System:
Pool filters – approx. 5 years old.
HVAC Controls:
HVAC Maintenance/Training:

BUILDING INSPECTION INVENTORY
(CONTINUED)

Water Supply System:
Domestic Hot Water System:
Water Fixtures:
ELECTRICAL
Indoor Lighting:
6 – Fluorescent 4' T12 3- Indoor incandescent lights
Outdoor Lighting:
1- Outdoor incandescent light.
Exit Signs:
Motors:
Parking Lot Plugs:
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
Gas. Hydro shared with Arena.

KGS GROUP

BUILDING INSPECTION INVENTORY

Municipality: Carman	**Date:** October 25, 2005
Tour Personnel: Tibor Takach	**Construction Date:** 1960 & 1980 (addition)
Building: Water Treatment Plant 59 1st St. SW 01	**Renovations:** Plant addition and new treatment system constructed in 1980.
L x W x H: Refer to below to floor plan. — **Area:** 608 m^2	
Building Occupancy:	
Building Floor Plan: Original Plant: 13m x 18m Plant Addition: 22m x 17m Heights: 10', 22' and 32'	**Occupied Times:** 8:00 am – 4:00 pm on a daily basis WTP operates approximately 18 hr/day.

ARCHITECHTURAL/STRUCTURAL

Wall type/R-value:

- Concrete block construction; brick exterior; metal siding on top portion of plant addition.
- Some holes noted through exterior wall in pump room that were plugged with rags.

Roof Type/R-value:

- Tar and gravel built-up roof; insulated.
- Suspended ceiling in office/sample room area.

Door Type/weather stripping:

- 1 – 36" aluminium exterior storm door at office entrance.
- 1 – 36" metal, insulated door at office entrance; weather stripping present but gaps noted; draft felt coming from door area.
- 1 – dual receiving door.
- 1 – 36" metal insulated door.

Window type/caulking:

- 5 – 72"x20" dual pane perimeter windows (pump and meter room).
- 1 – 48"x48" dual pane main window in office.
- 4 – 20"x43" single pane; aluminium sliding windows; gaps not caulked or insulated; one window was open at time of visit (pump room).
- 2 – 4 brick wide by 5 brick high sliding PVC windows in new process area.

Other:

MECHANICAL

Heating System:

- 1 – 120,000 BTU, natural gas, suspended heating unit; Thermal Efficiency 80%; Power consumption 130 W, 115V, 60hz, single phase, 4.8A. Unit is located in the lower original plant area.
- 1 – 200,000 BTU, natural gas, Keeprite (model UHA2500NS) suspended heating unit; Thermal Efficiency 80%; Power consumption 115V, 60hz, single phase, 5.6A. Unit is located in lower, new process area.
- 1 – 5 kW; Chromolox, suspended coil type unit heater in chlorine room.
- 1 – 8' baseboard heater section; 2000W, 8.3A. Located in lab/office area.

Cooling System:

- 1 – residential, window mounted AC feeding office area.

BUILDING INSPECTION INVENTORY
(CONTINUED)

Ventilation System:

- Perimeter windows.
- 1 – small blower on floor providing air movement in new process area.
- 1 – 1/3hp, blower on floor providing air movement through lower area in new addition.
- 3 – ceiling mounted fans providing air movement in new process area.

HVAC Controls:

- Thermostat controls for building temperature.
- Temperature maintained at approximately 20ºC throughout winter months.

HVAC Maintenance/Training:

Water Supply System:

- Town water supply.
- System pressure maintained at approximately 40-45 psi.

Domestic Hot Water System:

- MaCleod's; 40 gal. Electric water heater; 3000W; 240V

Water Fixtures:

- 1 – sample sink with hot/cold faucet fixtures.
- 1 – shower/eyewash station in chlorine room

ELECTRICAL

Indoor Lighting:

Pump and Meter Room:

- 6 – 100W incandescent fixtures.

Office Area and Lab:

- 4 – triple lamp; 40W fluorescent fixtures, standard units.
- 1 – Emergency lighting system; 2 bulbs.

Original WTP Area:

- 9 – 100W incandescent light fixtures
- 6 –2 lamp; 40W fluorescent light fixtures

New Plant Area:

- 12- 2 lamp; 40W, standard efficiency, fluorescent light fixtures in main process area
- 1 –2 lamp; 40W, standard efficiency, fluorescent light fixtures above lime slaker area
- 1 – 2 bulb emergency light fixture\
- 4 – 2 lamp, 40W, standard efficiency, fluorescent light fixtures in lower new plant area
- 2 – wall mount fluorescent light fixtures in lower plant area
- 6 –2 lamp, 40W, standard efficiency, fluorescent light fixtures in workshop area.

Outdoor Lighting:

- 1 – sodium exterior fixture

Exit Signs:

- 1 – exit sign in new plant area

Motors:

BUILDING INSPECTION INVENTORY
(CONTINUED)

Parking Lot Plugs:

- None.

OTHER BUILDING SYSTEMS

PROCESS SYSTEMS

New Process Area:

- 1 – Aerzen Blower (air scour); 7 ½ hp, 3150 rpm, 208/230V, 3 phase, 88.5 nom. Eff.; WEG 21 motor
- 1 – 5hp, 11.2 cfm @ 90 psi, 60 gal, 230V, single phase, 60 hz, 15 A process air compressor
- 1 – soda ash mixer, rating could not be observed
- 1 –Fire Pump, 50hp, 3 phase, 60 hz, 3450 rpm, Frame 324 TPH, Design B, code G, service factor 1.15
- 1 –6" Neptune Turbine meter on water tower fill line

Low Level Distribution Pump:

- Motor: 10jp, 3 phase, 60 hz, 1750 rpm, 208/220/440V, 28.6/27.0/13.5A, 40ºC ambient temperature, continuous duty, S.F. 1.15, Type KZKV, Frame 2KV256P, model number F35067
- Pump: Fairbanks Morse vertical turbine unit.

High Level Pump:

- Motor: 30hp, 3 phase, 60hz, 1770 rpm, 208/220/440V, 80/76/36A, S.F. 1.15, Code G, 40ºC ambient temp., continuous duty, Type KZKV, Frame 2KV1626PV, model number F333256

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

- 800A, 240V, 3-phase main power supply located in original supply room.
- 240V, 400A, 3 phase power supply noted in new process area.

NOTES

KGS GROUP

BUILDING INSPECTION INVENTORY

Municipality: Carman	**Date:** October 25, 2005
Tour Personnel: Tibor Takach & Bob Lambert	**Construction Date:** 1960
Building: Water Treatment Plant Tower House 59 1st St. SW	**Renovations:** No building renovations since construction.
L x W x H: 4m x 4m x 2.5m — **Area:** 16 m^2	
Building Occupancy:	
Building Floor Plan: Square open floor plan with bathroom.	**Occupied Times:** Periodic on short-term basis.

ARCHITECHTURAL/STRUCTURAL

Wall type/R-value:

- 2 x 4 wood construction; fibreglass batt insulation; vapour barrier; plywood interior sheeting; metal clad exterior; plywood ceiling

Roof Type/R-value:

- 2 x 4 framed roof construction; insulated; Metal clad roofing.

Door Type/weather stripping:

- 36” solid wood core interior door with weather stripping; no door sweep.
- Weather striping damaged and not effective.

Window type/caulking:

- None.

Other:

MECHANICAL

Heating System:

- 2 – 1500 W retail space heaters in bathroom area. Units run continuously during winter months.
- 1 – 4800 W; 240V; coil type suspended unit heater in tower/transmitter room.

Cooling System:

- None.

Ventilation System:

- None.

HVAC Controls:

HVAC Maintenance/Training:

Water Supply System:

- Water tower.

Domestic Hot Water System:

- John Wood; 1500 W; 120 V; electric water heater; 11 imperial gallon capacity. Unit does not appear operational.

Water Fixtures:

- 1 –wash basin hot/cold fixture
- 1 – standard flush toilet.

BUILDING INSPECTION INVENTORY
(CONTINUED)

ELECTRICAL
Indoor Lighting: ▪ 2 –100 W incandescent fixtures.
Outdoor Lighting: ▪ 1 – metal halide fixture.
Exit Signs: ▪ None.
Motors:
Parking Lot Plugs: ▪ None.
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
▪ **None.**
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
▪ 200A main power supply. Appears to be used primarily for tower transmitter.
NOTES

KGS GROUP

BUILDING INSPECTION INVENTORY

Municipality: Carman	**Date:** October 25, 2005
Tour Personnel: Tibor Takach & Bob Lambert	**Construction Date:** 1960
Building: Raw Water Pumphouse 59 1st St. SW	**Renovations:** No building renovations since construction.
L x W x H: 5m x 5m x 2.5m — **Area:** 25 m^2	
Building Occupancy:	
Building Floor Plan: Square open floor plan.	**Occupied Times:** Periodic on short-term basis.

ARCHITECHTURAL/STRUCTURAL

Wall type/R-value:

- 2 x 4 wood construction; fibreglass batt insulation; vapour barrier; particle board interior sheeting; metal clad exterior; particle board ceiling.

Roof Type/R-value:

- 2 x 4 framed roof construction; insulated; Metal clad roofing.

Door Type/weather stripping:

- 36” solid wood core interior door with weather stripping; no door sweep; threshold weather stripping damaged.
- Weather striping damaged and not effective.

Window type/caulking:

- None.

Other:

MECHANICAL

Heating System:

- Chromolox; 5 kW; 208 V; suspended coil type unit heater.

Cooling System:

- None.

Ventilation System:

- 12” x 16” motorized damper;
- 12” x 12” exhaust opening;
- 1 –Penn Domex Ventilator; ¼ hp; single phase, 60 hz.

HVAC Controls:

HVAC Maintenance/Training:

Water Supply System:

- N/A

Domestic Hot Water System:

- N/A

Water Fixtures:

- N/A

BUILDING INSPECTION INVENTORY
(CONTINUED)

ELECTRICAL
Indoor Lighting: ▪ 2 – 40W, dual lamp fluorescent fixture. Standard units.
Outdoor Lighting: ▪ None.
Exit Signs: ▪ None.
Motors:
Parking Lot Plugs: ▪ None.
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
Raw Water Pumps: ▪ Motor: 15hp; Frame 254T 3 phase; Insul Class B; Design B; 40ºC continuous duty; S.F. 1.15; 200V; 46A; 1770 rpm; Manufacturer US Motors ▪ Pump: crane Canada; size M10A; Type 2ST; 1750 rpm; imp. Dia. 7-1/8"; vertical turbine pump; rated at 600 usgpm @ 62' TDH ▪ Two raw water pumps (M19 and M20) provide raw water pumping both with the same above specifications.
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
▪ Hydro main service.
NOTES

KGS GROUP

BUILDING INSPECTION INVENTORY

Municipality: Carman	**Date:** October 25, 2005
Tour Personnel: Tibor Takach & Bob Lambert	**Construction Date:** 1960
Building: Main Sewage Lift Station	**Renovations:** No building renovations since construction.
L x W x H: 6m x 4m x 3m — **Area:** 24m^2	
Building Occupancy:	
Building Floor Plan: Square open floor plan.	**Occupied Times:** Periodic on short-term basis.

ARCHITECHTURAL/STRUCTURAL

Wall type/R-value:

- Concrete block wall construction; assumed to have vermiculite insulation in blocks.

Roof Type/R-value:

- 2 x 4 framed roof construction; insulated; Asphalt shingle roofing.

Door Type/weather stripping:

- 36” solid wood core exterior door.

Window type/caulking:

- 3 –32” x 24”, architectural block windows.

Other:

MECHANICAL

Heating System:

- Suspended coil type, electric unit heater; heating capacity unknown; approx 3kW or 5kW.
- Temperature is maintained at approximately 10ºC - 15ºC during winter months.

Cooling System:

- None.

Ventilation System:

- 1 – wetwell vent fan, Type AVS, size 182, class I, SWSI, ARR 10, 673 rpm. Severe external corrosion observed on fan ductwork and components.

HVAC Controls:

HVAC Maintenance/Training:

Water Supply System:

- N/A

Domestic Hot Water System:

- N/A

Water Fixtures:

- N/A

BUILDING INSPECTION INVENTORY
(CONTINUED)

ELECTRICAL
Indoor Lighting: ▪ 4 – incandescent light fixtures in wetwell.
Outdoor Lighting: ▪ 1 – external incandescent fixture, wattage could not be observed.
Exit Signs: ▪ None.
Motors:
Parking Lot Plugs: ▪ None.
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
Sewage Pumps: ▪ 2 – Flygt, Model 3170.180, imp. 442, 3 hp, 208V, 80A, 3 phase, 60hz, 1750 rpm, eff. 51% ▪ Rated capacity of the pumps is unknown.
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
▪ 480/600V; 400A main power supply
NOTES

KGS GROUP

BUILDING INSPECTION INVENTORY

Municipality: Carman	**Date:** October 25, 2005
Tour Personnel: Tibor Takach & Bob Lambert	**Construction Date:** 1960
Building: Industrial Park Sewage Lift Station	**Renovations:**
L x W x H: N/A — **Area:**	
Building Occupancy:	
Building Floor Plan: Manhole style pumping station with external access hatches.	**Occupied Times:**

ARCHITECHTURAL/STRUCTURAL

Wall type/R-value:
- N/A

Roof Type/R-value:
- N/A

Door Type/weather stripping:
- N/A

Window type/caulking:
- N/A

Other:

MECHANICAL

Heating System:
- N/A

Cooling System:
- N/A

Ventilation System:
- N/A

HVAC Controls:

HVAC Maintenance/Training:

Water Supply System:
- N/A

Domestic Hot Water System:
- N/A

Water Fixtures:
- N/A

BUILDING INSPECTION INVENTORY
(CONTINUED)

ELECTRICAL
Indoor Lighting: ▪ N/A
Outdoor Lighting: ▪ N/A
Exit Signs: ▪ N/A
Motors:
Parking Lot Plugs: ▪ N/A
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
Sewage Pumps: ▪ 2 – Flygt, Model 3127.180.6006, imp. 442, 10 HP, 208V, 28A, 3 phase, 60 hz, 1750 rpm, eff. 51% ▪ Rated capacity of the pumps is unknown.
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
NOTES
▪ This station pumps directly into the lagoon.

KGS GROUP

BUILDING INSPECTION INVENTORY

Municipality: Carman	**Date:** October 25, 2005
Tour Personnel: Tibor Takach & Bob Lambert	**Construction Date:** Unknown
Building: Elementary Sewage Lift Station	**Renovations:**
L x W x H: N/A **Area:**	
Building Occupancy:	
Building Floor Plan: Manhole style pumping station with external access hatches.	**Occupied Times:**

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: ▪ N/A
Roof Type/R-value: ▪ N/A
Door Type/weather stripping: ▪ N/A
Window type/caulking: ▪ N/A
Other:
MECHANICAL
Heating System: ▪ N/A
Cooling System: ▪ NA/
Ventilation System: ▪ N/A
HVAC Controls:
HVAC Maintenance/Training:
Water Supply System: ▪ N/A
Domestic Hot Water System: ▪ N/A
Water Fixtures: ▪ N/A

BUILDING INSPECTION INVENTORY
(CONTINUED)

ELECTRICAL
Indoor Lighting: ▪ N/A
Outdoor Lighting: ▪ N/A
Exit Signs: ▪ N/A
Motors:
Parking Lot Plugs: ▪ N/A
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
Sewage Pumps: ▪ 2 – Flygt, 7 hp, 208V, 3 phase, 60 hz. ▪ Rate capacity of the pumps is unknown.
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
NOTES
▪ Lift station pumps sewage to Main Sewage Lift Station

KGS GROUP

BUILDING INSPECTION INVENTORY

Municipality: Carman	**Date:** October 25, 2005
Tour Personnel: Tibor Takach & Bob Lambert	**Construction Date:** Unknown
Building: Bishop Bay Sewage Lift Station	**Renovations:**
L x W x H: N/A — **Area:**	
Building Occupancy:	
Building Floor Plan: Manhole style pumping station with external access hatches.	**Occupied Times:**

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: ▪ N/A
Roof Type/R-value: ▪ N/A
Door Type/weather stripping: ▪ N/A
Window type/caulking: ▪ N/A
Other:

MECHANICAL
Heating System: ▪ N/A
Cooling System: ▪ NA/
Ventilation System: ▪ N/A
HVAC Controls:
HVAC Maintenance/Training:
Water Supply System: ▪ N/A
Domestic Hot Water System: ▪ N/A
Water Fixtures: ▪ N/A

BUILDING INSPECTION INVENTORY
(CONTINUED)

ELECTRICAL
Indoor Lighting: ▪ N/A
Outdoor Lighting: ▪ N/A
Exit Signs: ▪ N/A
Motors:
Parking Lot Plugs: ▪ N/A
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
Sewage Pumps: ▪ 2 – Flygt, 7 hp, 208V, 3 phase, 60 hz. ▪ Rate capacity of the pumps is unknown.
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
NOTES
▪ Lift station pumps sewage to Main Sewage Lift Station

APPENDIX B

TABLES TO CALCULATE ENERGY SAVINGS

TABLE OF CONTENTS – APPENDIX B

Table B.1.1 - Annual Energy Consumption for Carman & Dufferin Arena

	Energy Consumption (kWh)	% of Total Energy Consumption
HVAC	814,005	75%
Lighting	47,148	4%
Hot Water	15,831	1%
Motors	205,797	19%
Total	**1,082,782**	

Table B.1.2 (a) - Electricity Usage for Carman & Dufferin Arena

	Consumption Data			Calculated Costs		
Month (2004-2005)	**Maximum KVA**	**Billed KVA**	**Energy (kWh)**	**Demand Charge**	**Energy Charge**	**Total Charge**
September	0	0	53,760	$0	$1,776	$2,050.02
October	0	0	69,120	$0	$2,136	$2,459.58
November	0	0	66,720	$0	$2,079	$2,395.59
December	0	0	80,640	$0	$2,405	$2,766.76
January	0	0	60,480	$0	$1,934	$2,229.20
February	0	0	65,760	$0	$2,057	$2,369.99
March	0	0	60,960	$0	$1,945	$2,242.00
April	0	0	42,720	$0	$1,566	$1,809.99
May	0	0	16,320	$0	$872	$1,018.83
June	0	0	24,000	$0	$1,108	$1,288.42
July	0	0	42,240	$0	$1,554	$1,796.62
August	0	0	2,800	$0	$168	$216.74
TOTAL		**0**	**585,520**	**$0**	**$19,600**	**$22,644**

Table B.1.2 (b) - Natural Gas Usage for Carman & Dufferin Arena

Month (2004-2005)	**Gas (m^3)**	**Gas (kWh)**	**Total Charge**
September	213	2,204	$160
October	534	5,527	$281
November	3,943	40,809	$1,566
December	6,620	68,515	$2,538
January	9,864	102,089	$3,739
February	8,101	83,843	$3,082
March	8,095	83,781	$2,945
April	6,394	66,176	$2,343
May	2,695	27,892	$1,067
June	1,016	10,515	$489
July	353	3,653	$222
August	218	2,256	$169
TOTAL	**48,046**	**497,262**	**$18,598**

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

The electricity consumption for the Carman & Dufferin Arena is charged based on the General Service Small, Three Phase Manitoba Hydro rates.

Table B.1.3 - Lighting Analysis Summary for Carman & Dufferin Arena

Description	Quantity	Current Conditions		After Improvements		Savings ($)	
		Annual Energy Consumption (kWh)	Annual Cost	Annual Energy Consumption (kWh)	Annual Cost	Energy (kWh)	Annual Cost ($)
Boiler Room Incandescants - convert to compact fluorescents	3	1,087	$65	304	$18	783	$47
Boiler Room Fluorescents - convert 4' T12s to 4' T8s (1x2)	2	355	$21	214	$13	141	$8
Main Floor South -fluorescents- convert 4' T12s to 4' T8s (2x2)	4	710	$43	428	$26	283	$17
Main Floor South - incandescant - convert to compact fluorescents	1	362	$22	101	$6	261	$16
South Lobby - incandescant - convert to compact fluorescents	1	362	$22	101	$6	261	$16
South End Hall -fluorescents- convert 4' T12s to 4' T8s (9x4)	36	13,046	$783	3,653	$219	9,393	$564
South End Hall -fluorescents- convert 4' T12s to 4' T8s (1x2)	2	355	$21	214	$13	141	$8
Electrical Room - incandescants - convert to compact fluorescents	1	362	$22	101	$6	261	$16
Electrical Room -fluorescents- convert 4' T12s to 4' T8s (1x4)	4	710	$43	428	$26	283	$17
Lobby - fluorescents- convert 4' T12s to 4' T8s (18 x 2)	36	6,393	$384	3,849	$231	2,544	$153
Maintenance Office - fluorescents- convert 8' T12s to 8' T8s (1x2)	2	841	$50	391	$23	449	$27
Maintenance Office - fluorescents- convert 4' T12s to 4' T8s (1x2)	2	355	$21	214	$13	141	$8

Main Floor North -fluorescents - convert 4' T12s to 4' T8s (2x2)	4	710	$43	428	$26	283	$17
Main Floor North - incandescants - convert to compact fluorescents	2	725	$44	203	$12	522	$32
Barrier-free washroom - fluorescents - convert 4' T12s to 4' T8s (1x2)	2	355	$21	214	$13	141	$8
North Stairwell - fluorescents - convert 4' T12s to 4' T8s (1x4)	4	710	$43	428	$26	282	$17
Second Floor Corridor - fluorescents - convert 4' T12s to 4' T8s (6x2)	12	2,131	$128	1,283	$77	848	$51
North End - locker/storage room - fluorescents - convert 4' T12s to 4' T8s (2x2)	4	710	$43	428	$26	283	$17
North End - locker/storage room - incandescants convert to compact fluorescents	2	725	$44	203	$12	522	$32
Official's Change room - fluorescents - convert 4' T12s to 4' T8s (3x2)	6	1,065	$64	641	$39	424	$25
Change Rooms - fluorescents - convert 4' T12s to 4' T8s (18x2)	36	6,393	$384	3,849	$231	2,544	$153
Change Rooms - incandescants - convert to compact fluorescents	1	362	$22	101	$6	261	$16
Washrooms for Change rooms - fluorescents - convert 4' T12s to 4' T8s (6x2)	12	2,131	$128	1,283	$77	848	$51
Cougar's change room - fluorescents - convert 4' T12s to 4' T8s (3x2)	6	1,065	$64	641	$39	424	$25
Cougar's change room - incandescants - convert to compact fluorescents	1	362	$22	101	$6	261	$16

Senior Team change room - fluorescents -convert 4' T12s to 4' T8s (8x1)	8	1,421	$85	855	$51	565	$34
South stairwell - fluorescents - convert 4' T12s to 4' T8s (1x4)	4	710	$43	428	$26	283	$17
Zamboni Room - fluorescents - convert 4' T12s to 4' T8s (4x2)	8	1,421	$85	855	$51	565	$34
Second Ice Rink - fluorescents - convert 8' T12s to 8' T8s (21x2)	42	17,656	$1,060	8,219	$493	9,437	$567
Ice Plant Room - incandescants - convert to compact fluorescents	2	725	$44	203	$12	522	$32
Room adj. Ice Plant - incandescants - convert to compact fluorescents	2	725	$44	203	$12	522	$32
Main Entrance - fluorescent - convert 4' T12s to 4' T8s (1x4)	4	710	$43	428	$26	283	$17
Ticket Box - incandescant - convert to compact fluorescents	1	362	$22	101	$6	261	$16
Main Office - fluorescents - convert 4' T12s to 4' T8s (2x2)	4	1,450	$87	406	$24	1,044	$63
Main Office - fluorescents - convert 4' T12s to 4' T8s (4x4)	16	2,841	$171	1,711	$103	1,131	$68
Canteen - fluorescents - convert 8' T12s to 8' T8s (2x2)	4	1,682	$101	783	$47	899	$54
TOTALS		**47,148**	**$2,831**	**23,995**	**$1,441**	**37,312**	**$2,243**

Annual Energy Savings (KWH)	**23,154**
Annual Cost Savings	**$1,390**
Percent Annual Energy Savings	**49%**

Notes:
These calculations are based on an occupancy rate of 3624 hours/year.

Table B.1.4 (a) Window and Door Replacement Calculations for Carman & Dufferin 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 old wooden entry double doors 64"x84" with insulated wooden doors (2)	75	1.578	4,274	$195	6.67	1,011	$46	3,263	$149
Replace wooden exit door 3'x7' with insulated wooden door (2)	42	1.578	2,404	$110	6.67	569	$26	1,835	$84
Replace doors between rink and lobby 6'x7' to insulated wooden doors (4)	168	1.578	9,617	$439	6.67	2,275	$104	7,342	$336
Replace sliding doors for tractor 144"x90" to insulated wooden doors (2)	180	1.578	10,303	$471	6.67	2,437	$111	7,866	$359
Replace single layer plexiglass 70"x48" with triple pane (10)	233	1.000	21,072	$963	6.25	3,371	$154	17,700	$809
TOTALS			**47,670**	**$2,179**		**9,663**	**$442**	**38,007**	**$1,737**

Table B.1.4 (b) Window and Door Infiltration Calculations for Carman & Dufferin 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 ($)
Windows (10)	49	0.025	50	67	22,354,496	6,551	$299
Old wooden entry doors (2)	12	0.05	125	42	14,018,921	4,109	$188
Wooden exit door (2)	10	0.05	125	34	11,366,693	3,331	$152
Rink to lobby doors (4)	26	0.05	125	89	29,553,401	8,661	$396
Sliding door for tractor (2)	20	0.05	125	67	22,165,051	6,496	$297
TOTALS						**29,148**	**$1,332**

Table B.1.4 (c) Wall/Roof Insulation Upgrade for Carman & Dufferin Arena

Description	Existing				New			Savings	
	Area (ft^2)	R-Value ($^oF\ ft^2hr/BTU$)	Annual Heat Loss (kWh)	Cost ($)	R-Value ($^oF\ ft^2hr/BTU$)	Annual Heat Loss (kWh)	Cost($)	Energy (kWh)	Cost ($)
Upgrade wall insulation	9168	12.000	68,994	$3,153	20	41,397	$1,892	27,598	$1,261
TOTALS			**68,994**	**$3,153**		**41,397**	**$1,892**	**27,598**	**$1,261**

Crack length for the doors and windows is 1/4 of their respective perimeters.
As of November 1, 2005, the cost of primary natural gas is 0.0457 $/kWh.

Table B.1.5 - Water Usage for Carman & Dufferin Arena

	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 ($)
Faucets	13	5.2	244,620	1.60	391,392	0.32	78,278	313,114	11,734	$536
Toilets	13	2.6	122,310	13.25	1,620,608	6.00	733,860	886,748	NA	NA
Urinal	8	4.2	122,310	9.50	1,161,945	3.80	464,778	697,167	NA	NA
Total					**3,173,945**		**1,276,916**	**1,897,028**	**11,734**	**$536**

Frequency at Which Fixtures are Used			
	Females	Males	Totals
Number of People	60	90	
Number of WC Uses/day	3	1	
Number of WCs	13	13	
WC Uses/hour/fixture	1.73	0.87	2.60
Number of urinal uses/day	0	3	
Number of urinals	0	8	
urinal uses/hour/fixture	0	4.22	4.22
Number of Faucets	13	13	
Number of Faucet uses/day	3	4	
Faucet uses/hr/fixture	1.73	3.46	5.19

Current Hot Water Usage (kWh)		
Fixture	L/Yr	kWh
Faucets	391,392	14,667
Total		**14,667**

The current sinks are assumed to consume 2.5 gpm and the new sinks are 0.5 gpm (energy efficient metering faucets).
The current toilets are assumed to use 3.5 gallons per flush and the 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 gas to heat the water is 0.0457 $/kWh.

Table B.1.6 Energy Savings with Heating, Ventilation & Airconditioning for Carman and Dufferin Arena

Description	Quantity	Current Efficiency	New Efficiency	Energy Savings (kWh)
Install high efficiency NG boiler	1	0.75	0.95	99,452

Description	Quantity	Leakage (cfm)	Annual Heat Loss (BTU)	Annual Heat Loss (kWh)	Cost ($)
Install motorized dampers on changeroom	1	10	3,327,904	975	$45

Description	Quantity	Current Energy Consumption of Condensor & Compressor	Energy Savings (kWh)	Cost Savings ($)
Install outdoor thermostat to control rink ventilation	1	152,770	22,915	$1,047

Table B.1.7 Energy Consumption and Savings Calculations for Motors in Carman & Dufferin Arena

Description	HP	Required HP	# of hours	Current Motors		
				Actual HP	kW	kWh
Condensor Fan	10	8	2,200	8.5	6.31	13,888
Brine Pump	20	16	4,200	16.9	12.63	53,028
Compressor	100	80	2,200	84.7	63.13	138,882
TOTAL						**205,797**

Table B.2.1 - Annual Energy Breakdown for Fire Hall

	Energy Consumption (kWh)	% of Total Energy Consumption
HVAC	93,299	99%
Hot Water	1,182	1%
Total	**94,482**	

Table B.2.2 (a) - Electricity Usage for Fire Hall

	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.2.2 (b) - Natural Gas Usage for Fire Hall

Month (2004-2005)	Gas (m^3)	Gas (kWh)	Total Charge
September	70	724	$42
October	168	1,739	$84
November	238	2,463	$114
December	828	8,570	$359
January	1,724	17,843	$735
February	1,450	15,007	$618
March	1,223	12,658	$510
April	1,052	10,888	$441
May	409	4,233	$191
June	36	373	$28
July	70	724	$43
August	78	807	$48
TOTAL	**7,346**	**76,029**	**$3,211**

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.2.3 - Lighting Analysis Summary for Fire Hall

Description	Quantity	Current Conditions		After Improvements		Savings ($)	
		Annual Energy Consumption (kWh)	Annual Cost	Annual Energy Consumption (kWh)	Annual Cost	Energy (kWh)	Annual Cost ($)
Fluorescents in office - convert 4' T12s to 4' T8s (5x4)	20	102	$6	61	$4	41	$2
Bathroom Fluorescents - Convert 4' T12s to 4' T8s (1x4)	4	20	$1	12	$1	8	$0
Garage Incandescents - Convert to compact fluorescents	6	62	$4	17	$1	45	$3
TOTALS		**185**	**$11**	**91**	**$5**	**94**	**$6**

Annual Energy Savings (KWH)	**94**
Annual Cost Savings	**$6**
Percent Annual Energy Savings	**51%**

Notes:
These calculations are based on an occupancy rate of 104 hours/year.

Table B.2.4 Window and Door Infiltration Calculations for Fire Hall

Description	Crack Length (ft)	Crack Width (in)	Leakage on typical door (cfm)	Leakage on these doors (cfm)	Annual Heat Loss (BTU)	Annual Heat Loss (kWh)	Cost ($)
One 3' x 7' metal door	5	0.05	125	17	5,683,346	1,666	$76
Man metal doors 3'x7' (2)	10	0.05	125	34	11,366,693	3,331	$152
Overhead metal doors 12'x11' (2)	23	0.05	125	79	26,143,393	7,662	$350
TOTALS						**12,659**	**$579**

Notes:
Crack length around doors is 1/4 of the door perimeter except for one 3'x7' where 1/2 of the perimeter was used.
As of November 1,2005, the cost of primary natural gas is 0.0457$/kWh.

Table B.2.5 - Water Usage for 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 ($)
Faucets	3	1.0	312	1.60	499	0.32	100	399	15	$1
Toilets	1	0.8	78	13.25	1,034	6.00	468	566	NA	NA
Urinal	1	2.3	234	9.50	2,223	3.80	889	1,334	NA	NA
Total					**3,756**		**1,457**	**2,299**	**15**	**$1**

Frequency at Which Fixtures are Used			
	Females	Males	Totals
Number of People	0	6	
Number of Toilet Uses/Day	3	1	
Number of Toilets	1	1	
Toilet Uses/Hour/Fixture	0.00	0.75	0.75
Number of Urinal Uses/Day	0	3	
Number of Urinals	1	1	
Urinal Uses/Hour/Fixture	0	2.25	2.25
Number of Faucets	3	3	
Number of Faucet Uses/Day	3	4	
Faucet Uses/Hr/Fixture	0.00	1.00	1.00

Current Hot Water Usage (kWh)		
Fixture	L/Yr	kWh
Faucets	499	19
Total		**19**

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.

Table B.2.6 Energy Savings with Heating, Ventilation and Air Conditioning for Fire Hall

Description	Quantity	Currency Efficiency	Current Energy Used to Heat Building (kWh)	New Efficiency	Heat Savings (kWh)	Energy Savings ($)
Replace NG unit radiant heater in garage with a high efficiency NG heater	1	0.75	76,029	0.95	15,206	$695

Table B.3.1 - Annual Energy Consumption for Golden Prairie Arts Council

	Energy Consumption (kWh)	% of Total Energy Consumption
HVAC	51,330	75%
Lighting	15,274	22%
Hot Water	1,797	3%
Total	**68,400**	

Table B.3.2 - Electricity Usage for Golden Prairie Arts Council

	Consumption Data			Calculated Costs		
Month (2004-2005)	Maximum KVA	Billed KVA	Energy (kWh)	Demand Charge	Energy Charge	Total Charge
September	0	0	2,100	$0	$123	$158
October	0	0	2,280	$0	$134	$170
November	0	0	5,460	$0	$320	$383
December	0	0	7,920	$0	$464	$547
January	0	0	13,200	$0	$731	$851
February	0	0	11,040	$0	$647	$755
March	0	0	10,080	$0	$591	$691
April	0	0	7,500	$0	$450	$531
May	0	0	5,520	$0	$331	$396
June	0	0	600	$0	$36	$59
July	0	0	2,040	$0	$122	$158
August	0	0	660	$0	$40	$63
TOTAL		**0**	**68,400**	**$0**	**$3,989**	**$4,764**

Notes

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

Table B.3.3 - Lighting Analysis Summary for Golden Prairie Arts Coucil

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 (2*2)	4	487	$29	293	$18	194	$12
Fluorescents - convert 4' T12s to 4' T8s (23*1)	23	2,799	$168	1,685	$101	1,114	$67
Fluorescents - convert 8' T12s to 8' T8s (10*2)	20	5,763	$346	2,683	$161	3,080	$185
Indoor incandescents- convert to compact fluorescents	24	5,962	$358	1,669	$100	4,292	$258
Exit Signs - convert incandescents to LEDs	1	263	$16	26	$2	237	$14
TOTALS		**15,274**	**$917**	**6,357**	**$382**	**8,917**	**$535**

Annual Energy Savings (KWH)	**8,917**
Annual Cost Savings	**$535**
Percent Annual Energy Savings	**58%**

Notes:

These calculations are based on an occupancy rate of 2484 hours/year for the Golden Prairie Arts Council.
The exit lights are assumed to be on for 24 hours a day, 365 days of the year.

Table B.3.4 (a) Window and Door Replacement Calculations for the Golden Prairie Arts Council

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 3'x7' wood door in basement to an insulated wood door (1).	21	1.578	828	$50	6.67	196	$12	632	$38
Upstairs -replace 2'x3' single pane windows with triple pane windows (5).	30	1.000	1,865	$112	6.25	298	$18	1,567	$94
Upstairs -replace 3'x4.5' windows with triple pane windows (2)	27	1.000	1,679	$101	6.25	269	$16	1,410	$85
Upstairs -replace 3'x1.5' window with triple pane window (1).	5	1.000	280	$17	6.25	45	$3	235	$14
Main Floor - replace 32"x5' double pane windows with triple pane windows (6)	80	2.000	2,487	$149	6.25	796	$48	1,691	$102
32"x5' single pane windows with triple pane windows (3)	40	1.000	2,487	$149	6.25	398	$24	2,089	$125
Main Floor - replace 32"x12" single pane windows with triple pane widows (2)	5	1.000	332	$20	6.25	53	$3	279	$17
24"x44" double pane windows with triple pane windows (3)	22	2.000	684	$41	6.25	219	$13	465	$28

Main Floor - replace 24"x44" single pane window with triple pane window (1)	7	1.000	456	$27	6.25	73	$4	383	$23
Basement - replace single pane 20"x 20" window with a triple pane window (1).	3	1.000	173	$10	6.25	28	$2	145	$9
TOTALS			**11,271**	**$677**		**2,374**	**$143**	**8,897**	**$534**

Table B.3.4 (b) Window and Door Infiltration Calculations for the Golden Prairie Arts Council

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- 5 of 2' x 3' size	13	0.025	50	17	3,913,318	1,147	$69
Window - 2 of 3' x 4.5' siz	8	0.025	50	10	2,347,991	688	$41
Windows - 1 of 3' x 1.5' si	2	0.025	50	3	704,397	206	$12
Windows- 9 of 32"x 5' size	35	0.025	50	47	10,800,758	3,165	$190
Windows - 2 of 32" x 12"	4	0.025	50	5	1,147,907	336	$20
Windows - 4 of 24" x 44"	11	0.025	50	15	3,548,075	1,040	$62
Window - 1 of 20" x 20" si	2	0.025	50	2	521,776	153	$9
Basement door (1)	5	0.05	125	17	3,913,318	1,147	$69
TOTALS						**7,883**	**$473**

Table B.3.4 (c) Wall/Roof Insulation Upgrade for the Golden Prairie Arts Council

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	600	7.500	4,975	$299	40	933	$56	4,042	$243
Upgrade wall insulation - main floor	1605	12.000	8,317	$499	20	4,990	$300	3,327	$200
Upgrade wall insulation - 2nd floor	1326	7.500	10,994	$660	20	4,123	$248	6,871	$413
TOTALS			**24,285**	**$1,458**		**10,045**	**$603**	**14,240**	**$855**

Notes:
Crack length for the doors and windows are assumed to be 1/4 of their respective perimeters.
The Golden Prairie Arts Council is assumed to be kept at a constant temperature of 60F.
The cost of electricity to heat the Coucil is 0.06004 $/kWh (as of November 1st, 2005). Natural gas is not used to heat the building.

Table B.3.5 - Water Usage for Golden Prairie Arts Council

	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 ($)
Faucets	4	1.1	10,557	1.60	16,891	0.32	3,378	13,513	506	$30
Toilets	3	0.9	6,831	13.25	90,511	6.00	40,986	49,525	1,856	$111
Total					**107,402**		**44,364**	**63,038**	**2,362**	**$142**

Frequency at Which Fixtures are Used			
	Females	**Males**	**Totals**
Number of People	6	4	
Number of Toilet Uses/day	3	1	
Number of Toilets	3	3	
Toilet Uses/hour/fixture	0.75	0.17	0.92
Number of Faucets	4	4	
Number of Faucet Uses/day	3	4	
Faucet Uses/hr/fixture	0.56	0.50	1.06

Current Hot Water Usage (kWh)		
Fixture	**L/Yr**	**kWh**
Faucet	16,891	633
Total		**633**

Notes:

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

The current water closets are assumed to use 3.5 gallons per flush and the new wash closets use 1.5 gallons per flush

The current urinals consume 2.5 gpm and the new urinals are 1 gpm

The cost of electricity to heat the water is 0.06004 $/kWh(as of November 1st 2005)

Table B.3.6 - Energy Savings with Heating, Ventilation and Air Conditioning for Golden Prairie Arts Council

Description	Quantity	Flow Rate (cfm)	Heat Loss (KWH)	Energy Savings for 1 HRV (KWH)
Install HRVs	1	200	7,898	3,949

Description	Quantity	Current Efficiency	New Efficiency	Current Energy Required for Heating	Energy Savings (KWH)	$ NI	Peak Winter Load (kW)	Annual Energy Use (kWh)-Incentive	Total Incentive ($)	$ WI
Install heat pump (geothermal)	1	1	3	51,330	34,220	$31,140	$3,645	$1,369	$5,014	$26,126

Table B.4.1 - Annual Energy Consumption for Boyne Regional Library

	Energy Consumption (kWh)	% of Total Energy Consumption
HVAC	149,812	87%
Lighting	21,464	12%
Hot Water	1,678	1%
Total	**172,955**	

Table B.4.2 (a) - Electricity Usage for Boyne Regional Library

	Consumption Data			Calculated Costs		
Month (2004-2005)	Maximum KVA	Billed KVA	Energy (kWh)	Demand Charge	Energy Charge	Total Charge
September	0	0	3,840	$0	$225	$274
October	0	0	2,720	$0	$159	$200
November	0	0	2,720	$0	$159	$200
December	0	0	3,760	$0	$220	$269
January	0	0	5,280	$0	$309	$371
February	0	0	4,080	$0	$239	$291
March	0	0	3,920	$0	$230	$280
April	0	0	3,840	$0	$231	$281
May	0	0	3,040	$0	$183	$226
June	0	0	2,640	$0	$159	$199
July	0	0	4,240	$0	$255	$308
August	0	0	2,800	$0	$168	$210
TOTAL		**0**	**42,880**	**$0**	**$2,537**	**$3,108**

Table B.4.2 (b) - Natural Gas Usuage for Boyne Regional Library

Month (2004-2005)	Gas (m^3)	Gas (kWh)	Total Charge
September	45	466	$43
October	160	1,656	$80
November	685	7,090	$307
December	1,391	14,396	$595
January	3,039	31,453	$1,287
February	2,465	25,512	$1,044
March	2,211	22,883	$913
April	1,861	19,261	$771
May	613	6,344	$278
June	0	0	$0
July	39	404	$41
August	59	611	$39
TOTAL	**12,568**	**130,075**	**$5,396**

Notes

The Total Charge column includes the energy charge, the demand charge, the monthly basic charge, and 14% taxes.
The electricity consumption for the Boyne Regional Library is charged based on the General Service Small, Single Phase Manitoba Hydro rates.

Table B.4.3 - Lighting Analysis Summary for Boyne Regional 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 - convert to compact fluorescents	6	1,248	$75	349	$21	899	$54
Basement Fluorescents - convert 4' T12s to 4' T8s (1x4)	4	408	$24	245	$15	162	$10
Basement - Exit Signs - convert incandescents to LEDs	1	263	$16	26	$2	237	$14
Stairwell Incandescents - convert to compact fluorescents	2	416	$25	116	$7	300	$18
Fluorescents on main floor - convert 4' T12s to 4' T8s (33x4)	132	13,453	$808	8,100	$486	5,354	$321
Fluorescents on main floor - convert 2' T12 to 2' T8s (1x4)	4	233	$14	141	$8	92	$5
Exit Signs - convert incandescents to LEDs	6	1,577	$95	158	$9	1,419	$85
Second Floor - Incandescents - convert to compact fluorescents	4	832	$50	233	$14	599	$36
Second Floor Fluorescents - convert 4' T12s to 4' T8s (8x4)	32	3,261	$196	1,964	$118	1,298	$78
Second Floor Fluorescents - convert 4' T12s to 4' T8s (4x2)	8	815	$49	491	$29	324	$19
Second Floor - Exit Signs - convert incandescents to LEDs	4	1,051	$63	105	$6	946	$57
Locked room - second floor- convert 8' T12 to 8' T8 (1x2)	1	241	$14	112	$7	129	$8
TOTALS		**21,464**	**$1,289**	**11,303**	**$679**	**11,758**	**$706**

Annual Energy Savings (KWH)	**10,161**
Annual Cost Savings	**$610**
Percent Annual Energy Savings	**47%**

Notes:
These calculations are assuming that the library is occupied for 2080 hours/year.
The exit signs are assumed to be on 24 hours a day, 365 days of the year.

Table B.4.4 (a) Window and Door Replacement Calculations for Boyne Regional 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 old metal exit door (3'x7') door on second floor stoarage room with an insulated metal door. (1)	42	1.500	2,529	$116	6.84	555	$25	1,974	$90
Replace basement 4'x2' single pane windows with triple pane windows (5)	40	1.000	3,612	$165	6.25	578	$26	3,034	$139
Replace 5'x6' old doube pane window on main floor-front entrance-with triple pane (1)	30	2.000	1,355	$62	6.25	433	$20	921	$42
Replace 44"x78" double pane window-second floor-with triple pane (1)	24	2.000	1,076	$49	6.25	344	$16	732	$33
Replace broken 4'x2' window on second floor with triple pane window (1)	8	2.000	361	$17	6.25	116	$5	246	$11
Replace 2.5' x 6' single pane window in second floor washroom with triple pane window (1)	15	1.000	1,355	$62	6.25	217	$10	1,138	$52
TOTALS			**10,287**	**$470**		**2,243**	**$102**	**8,045**	**$368**

Table B.4.4 (b) Window and Door Infiltration Calculations for Boyne Regional 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 ($)
Windows (9)	33	0.025	50	45	14,928,256	4,375	$200
Doors on main floor and front entrance 3'x7' (2).	10	0.05	125	34	11,366,693	3,331	$152
Replace second floor storage door 3'x7' (1).	5	0.05	125	17	5,683,346	1,666	$76
TOTALS						**9,372**	**$428**

Table B.4.4 (c) Wall/Roof Insulation Upgrade for Boyne Regional Library

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 ($)
Upgrade wall insulation	2750	12.000	20,695	$946	20	12,417	$567	8,278	$378
Upgrade roof insulation	1575	12.000	11,853	$542	40	3,556	$163	8,297	$379
TOTALS			**32,548**	**$1,487**		**15,973**	**$730**	**16,575**	**$757**

Notes:

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

The Boyne Regional Library is assumed to be kept at a constant temperature of 70F.

The cost of primary natural gas to heat the library is 0.0457 $/kWh (as of November 1st, 2005).

Table B.4.5 - Water Usage for Boyne Regional 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 ($)
Faucets	4	1.0	8,580	1.60	13,728	0.32	2,746	10,982	412	$19
Toilets	4	0.8	6,240	13.25	82,680	6.00	37,440	45,240	NA	NA
Total					**96,408**		**40,186**	**56,222**	**412**	**$19**

Frequency at Which Fixtures are Used			
	Females	**Males**	**Totals**
Number of People	7	3	
Number of Toilet Uses/day	3	1	
Number of Toilets	4	4	
Toilet Uses/hour/fixture	0.66	0.09	0.75
Number of urinal uses/day	0	3	
Number of urinals	0	0	
urinal uses/hour/fixture	0	0	0
Number of Faucets	4	4	
Number of Faucets Uses/da	3	4	
Faucets Uses/hr/fixture	0.66	0.38	1.03

Current Hot Water Usage (kWh)		
Fixture	**L/Yr**	**kWh**
Faucets	13,728	514
Total		**514**

Notes:

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

The current water closets are assumed to use 3.5 gallons per flush and the new wash closets use 1.5 gallons per flush

The current urinals consume 2.5 gpm and the new urinals are 1 gpm

The cost of the natural gas to heat the water is 0.0457$/kWh (as of November 1st 2005)

Table B.4.6 - Energy Savings with Heating, Ventilation and Air Conditioning for Boyne Regional Library

Description	Quantity	Current Efficiency	New Efficiency	Energy Savings (KWH)
Replace hot water heater with high efficiency hot water heater	1	0.8	0.95	252

Description	Quantity	Flow Rate (cfm)	Heat Loss (KWH)	Energy Savings for 1 HRV (KWH)	Energy Savings for 2 HRV (KWH)
Install HRVs	2	200	7,898	3,949	7898

Description	Quantity	Current Efficiency	New Efficiency	Energy Savings (kWh)	Cost Savings ($)
Replace furnace with a high efficiency furnace	1	0.75	0.95	26,015	$1,189

Description	Quantity	Current Efficiency	New Efficiency	Energy Savings (kWh)	Cost Savings ($)
Replace NG boiler with a high efficiency boiler	1	0.75	0.95	26,015	$1,189

Table B.5.1 - Annual Energy Consumption for Municipal Garage

	Energy Consumption (kWh)	% of Total Energy Consumption
HVAC	202,475	94%
Lighting	13,200	6%
Hot Water	234	0%
Motors	0	0%
Total	**215,909**	

Table B.5.2 (a) - Electricity Usage for Municipal Garage

	Consumption Data			Calculated Costs		
Month (2004-2005)	**Maximum KVA**	**Billed KVA**	**Energy (kWh)**	**Demand Charge**	**Energy Charge**	**Total Charge**
September	0	0	2,700	$0	$158	$198
October	0	0	2,220	$0	$130	$166
November	0	0	2,940	$0	$172	$214
December	0	0	4,680	$0	$274	$331
January	0	0	16,440	$0	$856	$994
February	0	0	5,940	$0	$348	$415
March	0	0	15,600	$0	$824	$957
April	0	0	4,620	$0	$271	$327
May	0	0	5,160	$0	$310	$371
June	0	0	1,680	$0	$101	$133
July	0	0	2,160	$0	$130	$166
August	0	0	1,740	$0	$104	$137
TOTAL		**0**	**65,880**	**$0**	**$3,678**	**$4,409**

Table B.5.2 (b) - Natural Gas Usage for Municipal Garage

Month (2004-2005)	Gas (m^3)	Gas (kWh)	Total Charge
September	0	0	$0
October	109	1,128	$71
November	792	8,197	$353
December	1,116	11,550	$481
January	2,493	25,802	$1,058
February	3,669	37,973	$1,550
March	2,401	24,850	$991
April	2,351	24,332	$970
May	1,354	14,013	$594
June	59	611	$38
July	48	497	$33
August	104	1,076	$59
TOTAL	**14,496**	**150,029**	**$6,198**

Notes

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

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

Table B.5.3 - Lighting Analysis Summary for Municipal Garage

Description	Quantity	Current Conditions		After Improvements		Savings ($)	
		Annual Energy Consumption (kWh)	Annual Cost	Annual Energy Consumption (kWh)	Annual Cost	Energy (kWh)	Annual Cost ($)
Fluorescents in lobby and office - convert 4' T12s to 4' T8s (8x2)	16	2,038	$122	1,227	$74	811	$49
Garage Fluorescents - Convert 4' T12s to 4' T8s (1x2)	1	127	$8	77	$5	51	$3
Garage Fluorescents - Convert 8' T12s to 8' T8s (17x2)	34	10,254	$616	4,774	$287	5,481	$329
Incandescents - Convert to compact fluorescents	3	780	$47	218	$13	562	$34
TOTALS		**13,200**	**$793**	**6,296**	**$378**	**6,904**	**$415**

Annual Energy Savings (KWH)	**6,904**
Annual Cost Savings	**$415**
Percent Annual Energy Savings	**52%**

Notes:
These calculations are assuming that the garage is occupied for 50 hours a week (2600 hours/year).
The outdoor lights are assumed to be on 12 hours per day, 365 days per year.

Table B.5.4 (a) Window and Door Replacement Calculations for 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 ($)
Replace old 7'x3' steel door in front main with an insulated metal door	21	1.500	1,264	$58	6.84	277	$13	987	$45
Replace old 7'x3' steel door in garage with insulated metal doors (1)	21	1.500	1,264	$58	6.84	277	$13	987	$45
Replace 58"x32" windows with triple pane windows (3)	39	2.000	1,746	$80	6.25	559	$26	1,187	$54
TOTALS			**4,275**	**$195**		**1,113**	**$51**	**3,161**	**$144**

Table B.5.4 (b) Window and Door Infiltration Calculations for Municipal Garage

Description	Crack Length (ft)	Crack Width (in)	Leakage on typical door (cfm)	Leakage on these doors (cfm)	Annual Heat Loss (BTU)	Annual Heat Loss (kWh)	Cost ($)
Windows (3)	11	0.025	50	15	5,115,012	1,499	$69
Front Door (1)	20	0.05	125	68	22,733,385	6,662	$304
Overhead Door (1)	24	0.05	125	82	27,280,062	7,995	$365
Overhead Door (1)	28	0.05	125	96	31,826,739	9,327	$426
Doors in garage (2)	20	0.05	125	68	22,733,385	6,662	$304
TOTALS						**32,147**	**$1,469**

Notes:
The crack length around the doors is half the perimeter (except door to basement - full length of perimeter).
The crack length around the windows is a quarter of the perimter;
The garage is kept at a constant temperature of 70 F.
The cost of primary natural gas to heat the municipal garage is 0.0457 $/kWh (as of November 1st, 2005).

Table B.5.5 - Water Usage for 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 ($)
Faucets	1	1.5	3,900	1.60	6,240	0.32	1,248	4,992	187	$9
Toilets	1	0.4	975	13.25	12,919	6.00	5,850	7,069	NA	NA
Total					**19,159**		**7,098**	**12,061**	**187**	**$9**

Frequency at Which Fixtures are Used			
	Females	Males	Totals
Number of People	0	3	
Number of Toilets Uses/day	3	1	
Number of Toilets Uses/day	1	1	
Toilet Uses/hour/fixture	0.00	0.38	0.38
Number of urinal uses/day	0	3	
Number of urinals	0	0	
urinal uses/hour/fixture	0	0	0
Number of Faucets	1	1	
Number of Faucet Uses/day	3	4	
Faucet Uses/hr/fixture	0.00	1.50	1.50

Fixture	L/Yr	kWh
Faucet	6,240	234
Total		**234**

Notes:
The current sinks are assumed to consume 2.5 gpm and the new sinks are 0.5 gpm
The current water closets are assumed to use 3.5 gallons per flush and the new wash closets use 1.5 gallons per flush
The current urinals consume 2.5 gpm and the new urinals are 1 gpm
The cost of gas to heat the water is 0.0457 $/kWh(as of November 1st 2005)

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

Description	Quantity	Current Efficiency	New Efficiency	Energy Savings (KWH)
Replace natural gas boiler with a high efficiency boiler.	1	0.75	0.95	30,006

	% of Time Unoccupied	HDD below 70 F	HDD below 59 F	Current Energy Used to Heat Basement	Heat Savings (kWh)
Setback Thermostats to 15C (59 F)	97.63%	10399.7	8,841	30,371	4,445

Table B.6.1 - Annual Energy Consumption for Landfill

	Energy Consumption (kWh)	% of Total Energy Consumption
HVAC	100,060	98%
Lighting	1,730	2%
Total	**101,790**	

Table B.6.2 (a) - Electricity Usage for Landfill

	Consumption Data			Calculated Costs		
Month (2004-2005)	Maximum KVA	Billed KVA	Energy (kWh)	Demand Charge	Energy Charge	Total Charge
September	0	0	220	$0	$13	$33
October	0	0	0	$0	$0	$0
November	0	0	590	$0	$35	$75
December	0	0	380	$0	$22	$43
January	0	0	1,630	$0	$96	$127
February	0	0	540	$0	$32	$54
March	0	0	0	$0	$0	$0
April	0	0	0	$0	$0	$0
May	0	0	160	$0	$10	$65
June	0	0	190	$0	$11	$31
July	0	0	170	$0	$10	$30
August	0	0	230	$0	$14	$34
TOTAL		**0**	**4,110**	**$0**	**$242**	**$492**

Table B.6.2 (b) - Natural Gas Usage for Landfill

Month (2004-2005)	Gas (m^3)	Gas (kWh)	Total Charge
September	0	0	$0
October	28	290	$34
November	601	6,220	$270
December	1,013	10,484	$436
January	1,833	18,971	$781
February	1,933	20,006	$822
March	1,517	15,700	$630
April	1,500	15,525	$623
May	621	6,427	$269
June	319	3,302	$157
July	53	549	$40
August	20	207	$20
TOTAL	**9,438**	**97,680**	**$4,084**

Notes:

The Total Charge column includes the energy charge, the demand charge, the monthly basic charg
The electricity consumption for the Municipal Landfill is charged based on the General Service Small, Single Phase Manitoba Hydro rates.

Table B.6.3 - Lighting Analysis Summary for Landfill

Description	Quantity	Current Conditions		After Improvements		Savings ($)	
		Annual Energy Consumption (kWh)	Annual Cost	Annual Energy Consumption (kWh)	Annual Cost	Energy (kWh)	Annual Cost ($)
Incandescents - Convert to compact fluorescents	16	416	$25	116	$7	300	$18
Outdoor Incandescents - Convert to High Pressure Sodium	3	1,314	$79	657	$39	657	$39
TOTALS		**1,730**	**$104**	**773**	**$46**	**957**	**$57**

Annual Energy Savings (KWH)	**957**
Annual Cost Savings	**$57**
Percent Annual Energy Savings	**55%**

Notes:
These calculations are assuming that the landfill is occupied for 5 hours per week (260 hours/year).
The outdoor lights are assumed to be on 12 hours per day, 365 days per year.

Table B.6.4 (a) Window and Door Replacement Calculations for Landfill.

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 32"x7' wood door with an insulated wood door.	19	1.578	1,069	$49	6.67	253	$12	816	$37
Replace old overhead wood door 9'x9' with insulated wood door.	81	1.578	4,637	$212	6.67	1,097	$50	3,540	$162
Replace old overhead wood door 14'x14' with insulated wood door.	196	1.578	11,219	$513	6.67	2,654	$121	8,566	$391
Replace 36"x24" window with triple pane window (1)	6	2.000	271	$12	6.25	87	$4	184	$8
Replace 16"x48" window with triple pane window (1)	5	1.000	482	$22	6.25	77	$4	405	$18
Replace 18"x20" window with triple pane window (2)	5	1.000	452	$21	6.25	72	$3	379	$17
Replace 20"x20" window with triple pane window (1)	3	1.000	251	$11	6.25	40	$2	211	$10
TOTALS			**18,379**	**$840**		**4,279**	**$196**	**14,100**	**$644**

Table B.6.4 (b) Window and Door Infiltration Calculations for Landfill.

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 ($)
Window - 1 of 36" x 24"	3	0.025	50	4	1,439,781	422	$19
Windows - 1 of 16" x 48"	3	0.025	50	4	1,212,447	355	$16
Windows - 2 of 18" x20"	3	0.025	50	4	1,439,781	422	$19
Window - 1 of 20" x 20"	2	0.025	50	2	757,780	222	$10
Old wood door 7'x3' in shed	5	0.05	125	17	5,683,346	1,666	$76
Old wood door 32"x7'	5	0.05	125	17	5,493,901	1,610	$74
Overhead wooden door 9'x9'	18	0.05	125	61	20,460,047	5,996	$274
Overhead wooden door 14'x14'	14	0.05	125	48	15,913,370	4,664	$213
TOTALS						**15,357**	**$702**

Table B.6.4 (c) Wall/Roof Insulation Upgrade for the Carman Municipal Landfill.

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 - green building	400	12.000	3,010	$138	40	903	$41	2,107	$96
Upgrade wall insulation - green building	760	12.000	5,719	$261	20	3,432	$157	2,288	$105
TOTALS			**8,730**	**$399**		**4,335**	**$198**	**4,395**	**$201**

Notes:

Crack length around the doors is 1/4 of its perimeter.

The crack length around the windows is a quarter of the perimter

The cost of primary natural gas to heat the municipal landfill is 0.0457 $/kWh (as of November 1st, 2005).

Table B.7.1 - Annual Energy Consumption for Museum

	Energy Consumption (kWh)	% of Total Energy Consumption
HVAC	24,221	89.6%
Lighting	2,742	10.1%
Hot Water	58	0.2%
Total	**27,021**	

Table B.7.2 (a) - Electricity Usage for Museum

	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	2,820	$0	$165	$187
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	2,270	$0	$136	$369
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**	**5,090**	**$0**	**$302**	**$556**

Table B.7.2 (b) - Natural Gas Usage for Museum

Month (2004-2005)	Gas (m^3)	Gas (kWh)	Total Charge
September	176	1,822	$87
October	104	1,076	$56
November	34	352	$26
December	285	2,950	$131
January	241	2,494	$112
February	425	4,399	$190
March	274	2,836	$123
April	336	3,477	$148
May	0	0	$0
June	151	1,563	$94
July	48	497	$33
August	45	466	$32
TOTAL	**2,119**	**21,931**	**$1,033**

Notes
The Total Charge column includes the energy charge, the demand charge, the monthly basic charge, and 14% taxes.
The electricity consumption for the Museum is charged based on the General Service Small, Single Phase Manitoba Hydro rates.

Table B.7.3 - Lighting Analysis Summary for Museum

Description	Quantity	Current Conditions		After Improvements		Savings ($)	
		Annual Energy Consumption (kWh)	Annual Cost	Annual Energy Consumption (kWh)	Annual Cost	Energy (kWh)	Annual Cost ($)
Fluorescents in museum - convert 4' T12s to 4' T8s (10x2)	20	401	$24	241	$14	160	$6
Fluorescents - convert 8' T12s to 8' T8s (3x2)	6	285	$17	133	$8	152	$9
Incandescents - Convert to compact fluorescents	31	1,268	$76	355	$21	913	$55
Exit Signs - Convert Incandescents to LEDs	3	788	$47	79	$5	709	$42
TOTALS		**2,742**	**$165**	**808**	**$48**	**1,934**	**$112**

Annual Energy Savings (KWH)	**1,934**
Annual Cost Savings	**$116**
Percent Annual Energy Savings	**71%**

Notes:
These calculations are assuming that the museum is occupied for 409 hours/year.

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

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 6'x7' wooden entrance double doors with insulated wooden doors (1)	42	2.000	870	$40	6.67	261	$12	609	$28
TOTALS			**870**	**$40**		**261**	**$12**	**609**	**$28**

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

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 ($)
Entrance double door (1)	6.5	0.05	125	22	3,388,296	993	$45
TOTALS						**993**	**$45**

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

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	2400	20.000	4,970	$227	40	2,485	$114	2,485	$114
Upgrade wall insulation	1660	12.000	5,729	$262	20	3,437	$157	2,292	$105
TOTALS			**10,699**	**$489**		**5,922**	**$271**	**4,776**	**$218**

Notes:
The crack length is 1/4 of the perimeter for the doors.
The cost of primary natural gas to heat the museum is 0.0457 $\$/m^3$ (as of November 1st, 2005).

Table B.7.5 - Water Usage for the Museum

	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 ($)
Faucets	2	1.2	971	1.60	1,554	0.32	311	1,243	47	$3
Toilets	3	0.7	818	13.25	10,839	6.00	4,908	5,931	NA	NA
Total					**12,393**		**5,219**	**7,174**	**47**	**$3**

Frequency at Which Fixtures are Used			
	Females	**Males**	**Totals**
Number of People	5	1	
Number of Toilet Uses/day	3	1	
Number of Toilets	3	3	
Toilets Uses/hour/fixture	0.63	0.04	0.67
Number of urinal uses/day	0	3	
Number of urinals	0	0	
urinal uses/hour/fixture	0	0	0
Number of Faucets	2	2	
Number of Faucet Uses/day	3	4	
Faucet Uses/hr/fixture	0.94	0.25	1.19

Current Hot Water Usage (kWh)		
Fixture	**L/Yr**	**kWh**
Faucet	1,554	58
Total		**58**

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

Table B.8.1 - Annual Energy Consumption for Carman Aquatic Centre

	Energy Consumption (kWh)	% of Total Energy Consumption
Gas Consumption	396,104	98%
Lighting	549	0%
Motors	8,750	2%
Total	**405,402**	

Table B.8.2 - Natural Gas Usage for Carman Aquatic Centre

Month (2004-2005)	Gas (m^3)	Gas (kWh)	Total Charge
September	13,601	140,766	$5,866
October	950	9,832	$421
November	0	0	$11
December	0	0	$11
January	0	0	$11
February	4	41	$13
March	0	0	$11
April	0	0	$11
May	0	0	$16
June	13,378	138,458	$6,117
July	5,255	54,388	$2,410
August	5,084	52,618	$2,357
TOTAL	**38,272**	**396,104**	**$17,257**

Notes

The natural gas consumption for the Carman Aquatic Centre is based on the total charge plus 14% tax.

Table B.8.3 - Lighting Analysis Summary for Carman Aquatic Centre

Description	Quantity	Current Conditions		After Improvements		Savings ($)	
		Annual Energy Consumption (kWh)	Annual Cost	Annual Energy Consumption (kWh)	Annual Cost	Energy (kWh)	Annual Cost ($)
Fluorescents in the pumphouse - convert 4' T12s to 4' T8s (3x2)	6	272	$16	164	$10	108	$6
Incandescents in the pumphouse - convert to compact fluorescents	3	277	$17	78	$5	199	$12
TOTALS		**549**	**$33**	**461**	**$14**	**307**	**$31**

Annual Energy Savings (KWH)	**88**
Annual Cost Savings	**$18**
Percent Annual Energy Savings	**16%**

Notes:

These calculations are assuming that the Carman Aquatic Centre is occuppied for 924 hours/year.
The outdoor lights are assumed to be on 12 hours per day, 365 days per year.

Table B.8.4 - Energy Savings with Heating, Ventilation and Air Conditioning for Carman Aquatic Centre

Description	Quantity	Current Efficiency	New Efficiency	Energy Savings (KWH)
Install high efficiency NG pool boiler	1	0.75	0.95	79,221

Description	Quantity/Month	Current Energy Use (kWh)	Efficiency	Energy Savings (KWH)	Energy Savings ($)
Install liquid pool covers	7	396,104	0.2	79,221	$3,620

Table 8.5 Energy Consumption and Savings Calculations for Motors in Carman Aquatic Centre

Description	HP	Required HP	# of hours	Current Motors		
				Actual HP	kW	kWh
Pool Pump	15	12	924	12.7	9.47	8,750
TOTAL						**8,750**

Table B.9.1 - Annual Energy Consumption for Water Treatment Plant

	Energy Consumption (kWh)	**% of Total Energy Consumption**
HVAC	374,422	74%
Lighting	16,084	3%
Hot Water	2,781	1%
Motors	111,651	22%
Total	**504,938**	

Table B.9.2 (a) - Electricity Usage for Water Treatment Plant

	Consumption Data			Calculated Costs		
Month (2004-2005)	Maximum KVA	Billed KVA	Energy (kWh)	Demand Charge	Energy Charge	Total Charge
September	0	0	16,260	$0	$899	$1,050.09
October	0	0	15,480	$0	$881	$1,029.30
November	0	0	17,580	$0	$930	$1,085.29
December	0	0	23,640	$0	$1,072	$1,246.88
January	0	0	25,260	$0	$1,110	$1,290.08
February	0	0	25,980	$0	$1,127	$1,309.27
March	0	0	20,940	$0	$1,009	$1,174.88
April	0	0	26,160	$0	$1,161	$1,348.60
May	0	0	21,840	$0	$1,055	$1,228.24
June	0	0	17,580	$0	$951	$1,109.55
July	0	0	16,140	$0	$916	$1,069.43
August	0	0	17,400	$0	$947	$1,104.53
TOTAL		**0**	**244,260**	**$0**	**$12,058**	**$14,046**

Table B.9.2 (b) - Natural Gas Usage for Water Treatment Plant

Month (2004-2005)	Gas (m^3)	Gas (kWh)	Total Charge
September	114	1,180	$210
October	1,044	10,805	$473
November	792	8,197	$378
December	2,955	30,583	$1,176
January	4,958	51,314	$1,919
February	4,620	47,816	$1,788
March	2,815	29,134	$1,076
April	3,621	37,476	$1,361
May	3,571	36,959	$1,650
June	0	0	$0
July	241	2,494	$256
August	456	4,719	$266
TOTAL	**25,187**	**260,678**	**$10,554**

Notes

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

Table B.9.3 - Lighting Analysis Summary for Water Treatment Plant

Description	Quantity	Current Conditions		After Improvements		Savings ($)	
		Annual Energy Consumption (kWh)	Annual Cost	Annual Energy Consumption (kWh)	Annual Cost	Energy (kWh)	Annual Cost ($)
Pump and Meter Room Incandescants - convert to compact fluorescents	6	1,747	$105	489	$29	1,258	$76
Office Area/Lab - convert 4' T12s to 4' T8s (4x3)	12	1,712	$103	1,031	$62	681	$41
Office Area/lab - 60W incandescent emergency lights	2	349	$21	349	$21	0	$0
Original WTP Area - convert incandescents to compact fluorescents	9	2,621	$157	734	$44	1,887	$113
Original WTP Area fluorescents- convert 4' T12s to 4' T8s (6x2)	12	1,712	$103	1,031	$62	681	$41
New Plant Area fluorescents- convert 4' T12s to 4' T8s (23x2)	46	6,564	$394	3,952	$237	2,612	$157
New Plant Area - 60W - incandescent emergency lights	2	349	$21	349	$21	0	$0
New Plant Area - wall mounted fluorescent fixtures	2	438	$26	438	$26	0	$0
Outdoor - high pressure sodium lamp	1	329	$20	329	$20	0	$0
New Plant Area EXIT sign - Convert to LED module	1	263	$16	26	$2	237	$14
TOTALS		**16,084**	**$966**	**8,728**	**$524**	**7,356**	**$442**

Annual Energy Savings (KWH)	**7,356**
Annual Cost Savings	**$442**
Percent Annual Energy Savings	**46%**

Notes:
These calculations are based on an occupancy rate of 2912 hours/year.

Table B.9.4 (a) Window Replacement Calculations for Water Treatment Plant

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 single pane windows 20"x43" with triple pane (4).	24	1.000	2,157	$99	6.25	345	$16	1,812	$83
TOTALS			**2,157**	**$99**		**345**	**$16**	**1,812**	**$83**

Table B.9.4 (b) Window and Door Infiltration Calculations for Water Treatment Plant

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 ($)
Single pane windows (4).	11	0.025	50	14	4,774,011	1,399	$64
Pedestrian Door-office entrance (1)	5	0.05	125	17	5,683,346	1,666	$76
TOTALS						**3,065**	**$140**

Table B.9.5 - Water Usage for the Water Treatment Plant

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	4,368	1.60	6,989	0.32	1,398	5,591	210	$13
Showers	1	0.2	546	66.25	36,170	47.30	25,826	10,344	388	$23
Total					**43,159**		**27,224**	**15,935**	**597**	**$36**

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	0	
Urinal Uses/hr/fixture	0	0	0
Number of Showers	1	1	
Number of Shower Uses/day	1	1	
Shower Uses/hr/fixture	0	0.1875	0.1875

Current Hot Water Usage (kWh)		
Fixture	**L/Yr**	**kWh**
Sinks	6,989	262
Showers	36,170	1,355
Total	**43,159**	**1,617**

Table B.9.6 Energy Savings with Heating, Ventilation and Air Conditioning for Water Treatment Plant

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)	66.76%	10399.7	8,841	260,678	18,264

Description	Quantity	Current Efficiency	New Efficiency	Energy Savings (kWh)
Replace natural gas unit heater with a high efficiency furnace (120,000 BTU)	1	0.8	0.941	13,967

Description	Quantity	Current Efficiency	New Efficiency	Energy Savings (kWh)
Replace natural gas unit heater with a high efficiency furnace (200,000 BTU)	1	0.8	0.941	22,605

Table B.9.7 Energy Consumption and Savings Calculations for Motors in Water Treatment Plant

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
Air Compressor	5.0	4.0	3,276	85%	4.2	3.16	10,340	0.12	0.09	293
Air Scour	7.5	6.0	3,276	85%	6.3	4.73	15,511	0.18	0.13	440
Distribution Pump Motor	10.0	8.0	3,372	85%	8.5	6.31	21,288	0.24	0.18	604
High Level Pump Motor	30.0	24.0	3,406	85%	25.4	18.94	64,512	0.72	0.54	1829
TOTAL							**111,651**			**3,165**

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.

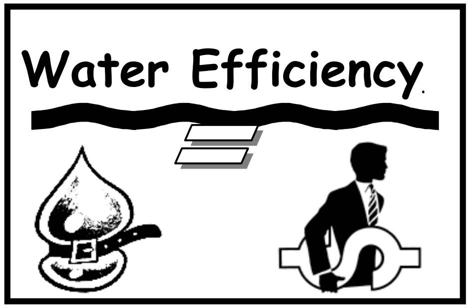
For More Information, Please Contact:

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

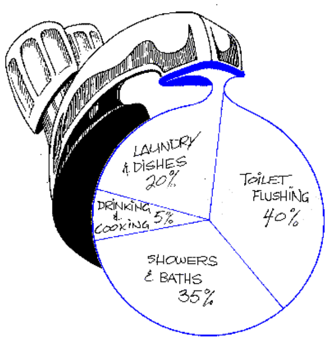
Pollution Prevention
Manitoba Conservation



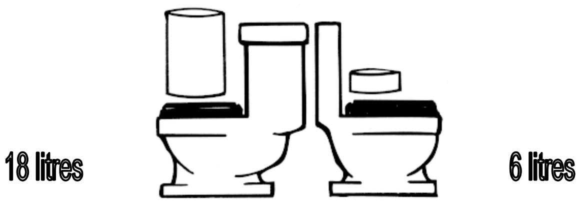
Water Use

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.

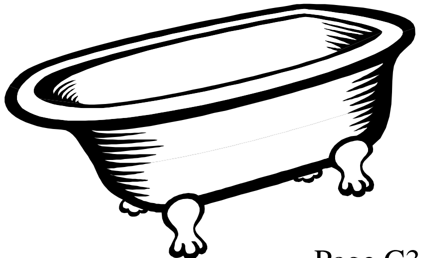
- Ensure a water softener regenerates only when the resin is exhausted.

- 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	Cheryl Pilek at cdpilek@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	Cheryl Pilek at cdpilek@hydro.mb.ca or 204-474-3615
LED Exit Signs	$45 per new sign	Cheryl Pilek at cdpilek@hydro.mb.ca or 204-474-3615
High Pressure Sodium Lighting	The lesser of $500 per kilowatt saved or $100 of lighting fixture cost	Cheryl Pilek at cdpilek@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

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
Energy Innovators Initiative: Energy Retrofit Assistance (ERA)	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/financial-assistance/existing/retrofits/implementation.cfm?attr=0
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

TABLE OF CONTENTS – APPENDIX F

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

	2004-2005					2005-2006					2006-2007				
Month	**Billed Elect Energy (kWh)**	**Billed Natural Gas (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
September	53,760	213	55,964	88.3	55,964			0		#DIV/0!			0		#DIV/0!
October	69,120	534	74,647	340.7	74,647			0		#DIV/0!			0		#DIV/0!
November	66,720	3,943	107,529	525.4	107,529			0		#DIV/0!			0		#DIV/0!
December	80,640	6,620	149,155	970.3	149,155			0		#DIV/0!			0		#DIV/0!
January	60,480	9,864	162,569	1116	162,569			0		#DIV/0!			0		#DIV/0!
February	65,760	8,101	149,603	816.7	149,603			0		#DIV/0!			0		#DIV/0!
March	60,960	8,095	144,741	735.1	144,741			0		#DIV/0!			0		#DIV/0!
April	42,720	6,394	108,896	293.2	108,896			0		#DIV/0!			0		#DIV/0!
May	16,320	2,695	44,212	214.9	44,212			0		#DIV/0!			0		#DIV/0!
June	24,000	1,016	34,515	41.3	34,515			0		#DIV/0!			0		#DIV/0!
July	42,240	353	45,893	12	45,893			0		#DIV/0!			0		#DIV/0!
August	2,800	218	5,056	20.5	5,056			0		#DIV/0!			0		#DIV/0!
TOTAL	585,520	48,046	1,082,782	5174	1,082,782	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

	2007-2008					2008-2009					2009-2010				
Month	**Billed Elect Energy (kWh)**	**Billed Natural Gas (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
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=CA&StationID=28051&Year=2005&Month=11&Day=18
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 F20) 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 Carman and Dufferin Arena

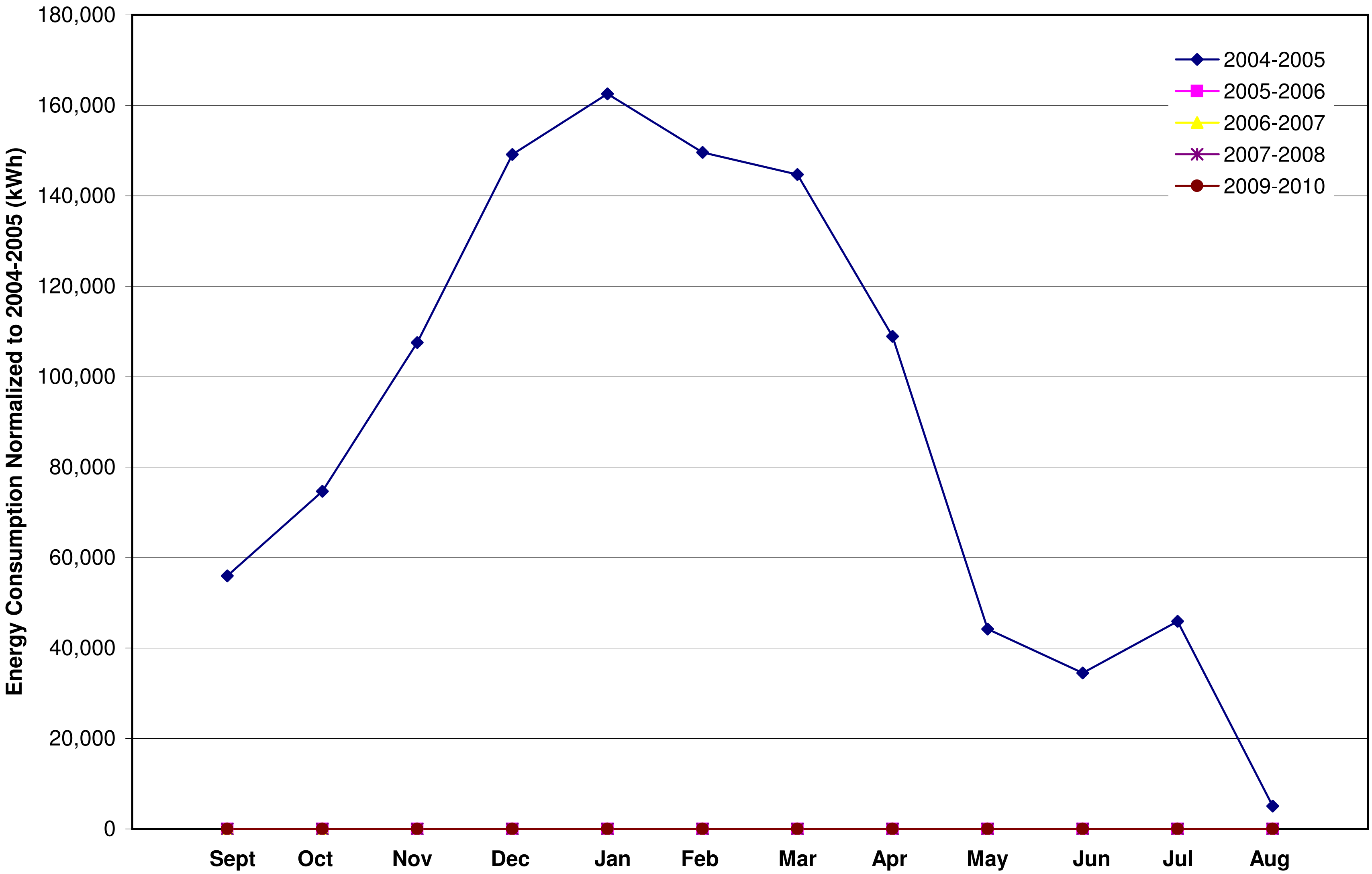


Table F.2 - Energy Consumption Monitoring Data for the Fire Hall

	2004-2005					2005-2006					2006-2007				
Month	Billed Elect Energy (kWh)	Billed Natural Gas Energy (m^3)	Total Energy Consumption (kWh)	HDD (°C days/ mo)	Energy Normalized to 2004-2005 (kWh)	Billed Elect Energy (kWh)	Billed Natural Gas Energy (m^3)	Total Energy Consumption (kWh)	HDD (°C days/ mo)	Energy Normalized to 2004-2005 (kWh)	Billed Elect Energy (kWh)	Billed Natural Gas Energy (m^3)	Total Energy Consumption (kWh)	HDD (°C days/ mo)	Energy Normalized to 2004-2005 (kWh)
September	720	70	1,444	88.3	1,444			0		#DIV/0!			0		#DIV/0!
October	895	168	2,634	340.7	2,634			0		#DIV/0!			0		#DIV/0!
November	1,776	238	4,239	525.4	4,239			0		#DIV/0!			0		#DIV/0!
December	2,225	828	10,795	970.3	10,795			0		#DIV/0!			0		#DIV/0!
January	2,045	1,724	19,888	1116	19,888			0		#DIV/0!			0		#DIV/0!
February	2,344	1,450	17,351	816.7	17,351			0		#DIV/0!			0		#DIV/0!
March	2,109	1,223	14,767	735.1	14,767			0		#DIV/0!			0		#DIV/0!
April	1,860	1,052	12,748	293.2	12,748			0		#DIV/0!			0		#DIV/0!
May	2,382	409	6,615	214.9	6,615			0		#DIV/0!			0		#DIV/0!
June	439	36	812	41.3	812			0		#DIV/0!			0		#DIV/0!
July	1,205	70	1,929	12	1,929			0		#DIV/0!			0		#DIV/0!
August	453	78	1,260	20.5	1,260			0		#DIV/0!			0		#DIV/0!
TOTAL	18,453	7,346	94,482	5174	94,482	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

	2007-2008					2008-2009					2009-2010				
Month	Billed Elect Energy (kWh)	Billed Natural Gas Energy (m^3)	Total Energy Consumption (kWh)	HDD (°C days/ mo)	Energy Normalized to 2004-2005 (kWh)	Billed Elect Energy (kWh)	Billed Natural Gas Energy (m^3)	Total Energy Consumption (kWh)	HDD (°C days/ mo)	Energy Normalized to 2004-2005 (kWh)	Billed Elect Energy (kWh)	Billed Natural Gas Energy (m^3)	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=CA&StationID=28051&Year=2005&Month=11&Day=18
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 F20) 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 Fire Hall

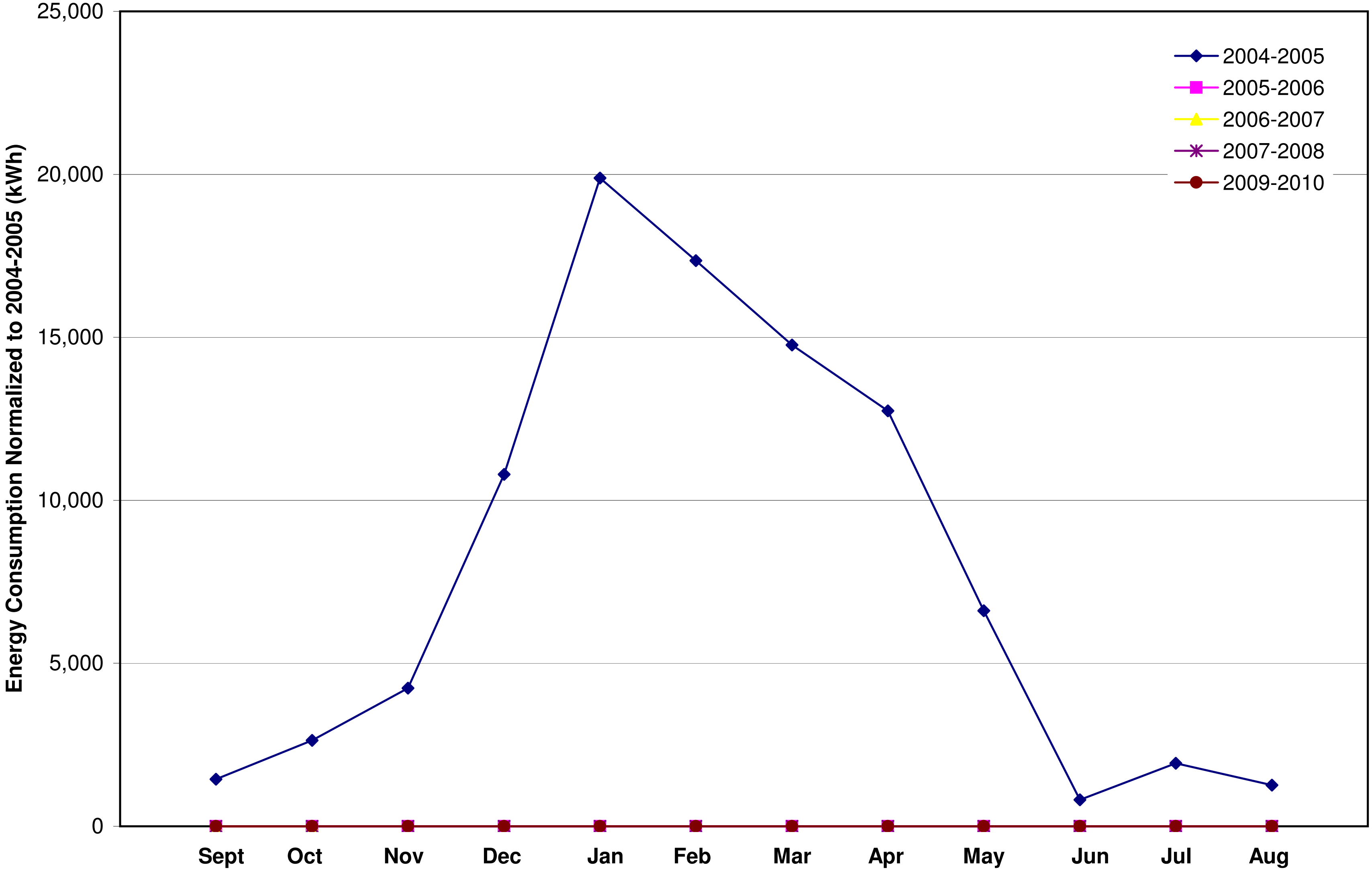


Table F.3 - Energy Consumption Monitoring Data for the The Golden Prairie Arts Council

	2004-2005					2005-2006					2006-2007				
Month	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
September	2,100	0	2,100	88.3	2,100			0		#DIV/0!			0		#DIV/0!
October	2,280	0	2,280	340.7	2,280			0		#DIV/0!			0		#DIV/0!
November	5,460	0	5,460	525.4	5,460			0		#DIV/0!			0		#DIV/0!
December	7,920	0	7,920	970.3	7,920			0		#DIV/0!			0		#DIV/0!
January	13,200	0	13,200	1116	13,200			0		#DIV/0!			0		#DIV/0!
February	11,040	0	11,040	81637	11,040			0		#DIV/0!			0		#DIV/0!
March	10,080	0	10,080	735.1	10,080			0		#DIV/0!			0		#DIV/0!
April	7,500	0	7,500	293.2	7,500			0		#DIV/0!			0		#DIV/0!
May	5,520	0	5,520	214.9	5,520			0		#DIV/0!			0		#DIV/0!
June	600	0	600	41.3	600			0		#DIV/0!			0		#DIV/0!
July	2,040	0	2,040	12	2,040			0		#DIV/0!			0		#DIV/0!
August	660	0	660	20.5	660			0		#DIV/0!			0		#DIV/0!
TOTAL	68,400	0	68,400	85994	68,400	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

	2007-2008					2008-2009					2009-2010				
Month	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**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=CA&StationID=28051&Year=2005&Month=11&Day=18
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 F20) 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 Golden Prairie Arts Council

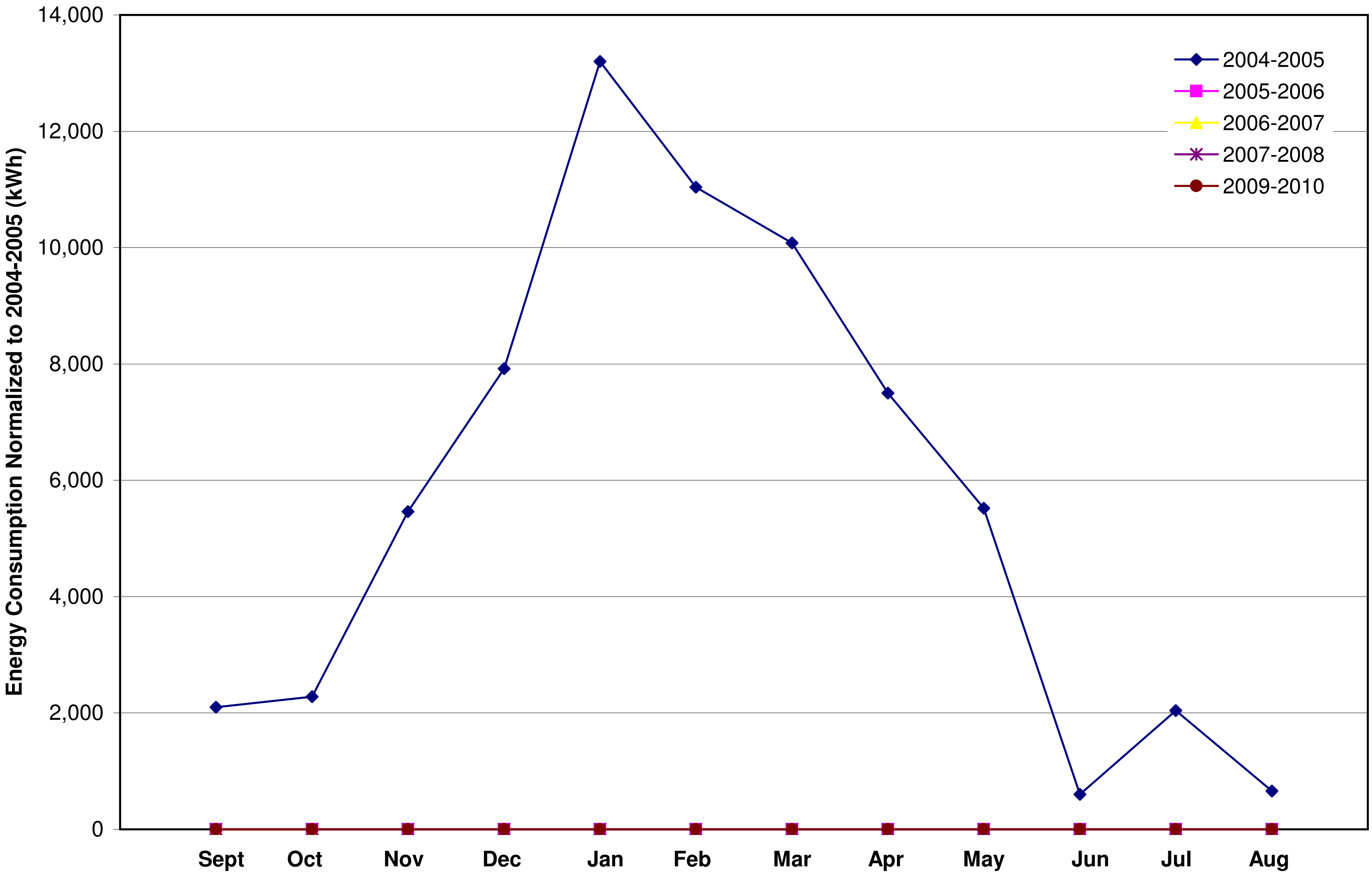


Table F.4 - Energy Consumption Monitoring Data for the Boyne Regional Library

	2004-2005					2005-2006					2006-2007				
Month	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (^oC days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (^oC days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (^oC days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
September	3,840	45	4,306	88.3	4,306			0		#DIV/0!			0		#DIV/0!
October	2,720	160	4,376	340.7	4,376			0		#DIV/0!			0		#DIV/0!
November	2,720	685	9,810	525.4	9,810			0		#DIV/0!			0		#DIV/0!
December	3,760	1,391	18,156	970.3	18,156			0		#DIV/0!			0		#DIV/0!
January	5,280	3,039	36,733	1115	36,733			0		#DIV/0!			0		#DIV/0!
February	4,080	2,465	29,592	816.7	29,592			0		#DIV/0!			0		#DIV/0!
March	3,920	2,211	26,803	735.1	26,803			0		#DIV/0!			0		#DIV/0!
April	3,840	1,861	23,101	293.2	23,101			0		#DIV/0!			0		#DIV/0!
May	3,040	613	9,384	214.9	9,384			0		#DIV/0!			0		#DIV/0!
June	2,640	0	2,640	41.3	2,640			0		#DIV/0!			0		#DIV/0!
July	4,240	39	4,644	12	4,644			0		#DIV/0!			0		#DIV/0!
August	2,800	59	3,411	20.5	3,411			0		#DIV/0!			0		#DIV/0!
TOTAL	42,880	12,568	172,955	5174	172,955	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

	2007-2008					2008-2009					2009-2010				
Month	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (^oC days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (^oC days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**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	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=CA&StationID=28051&Year=2005&Month=11&Day=18
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 F20) 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 Boyne Regional Library

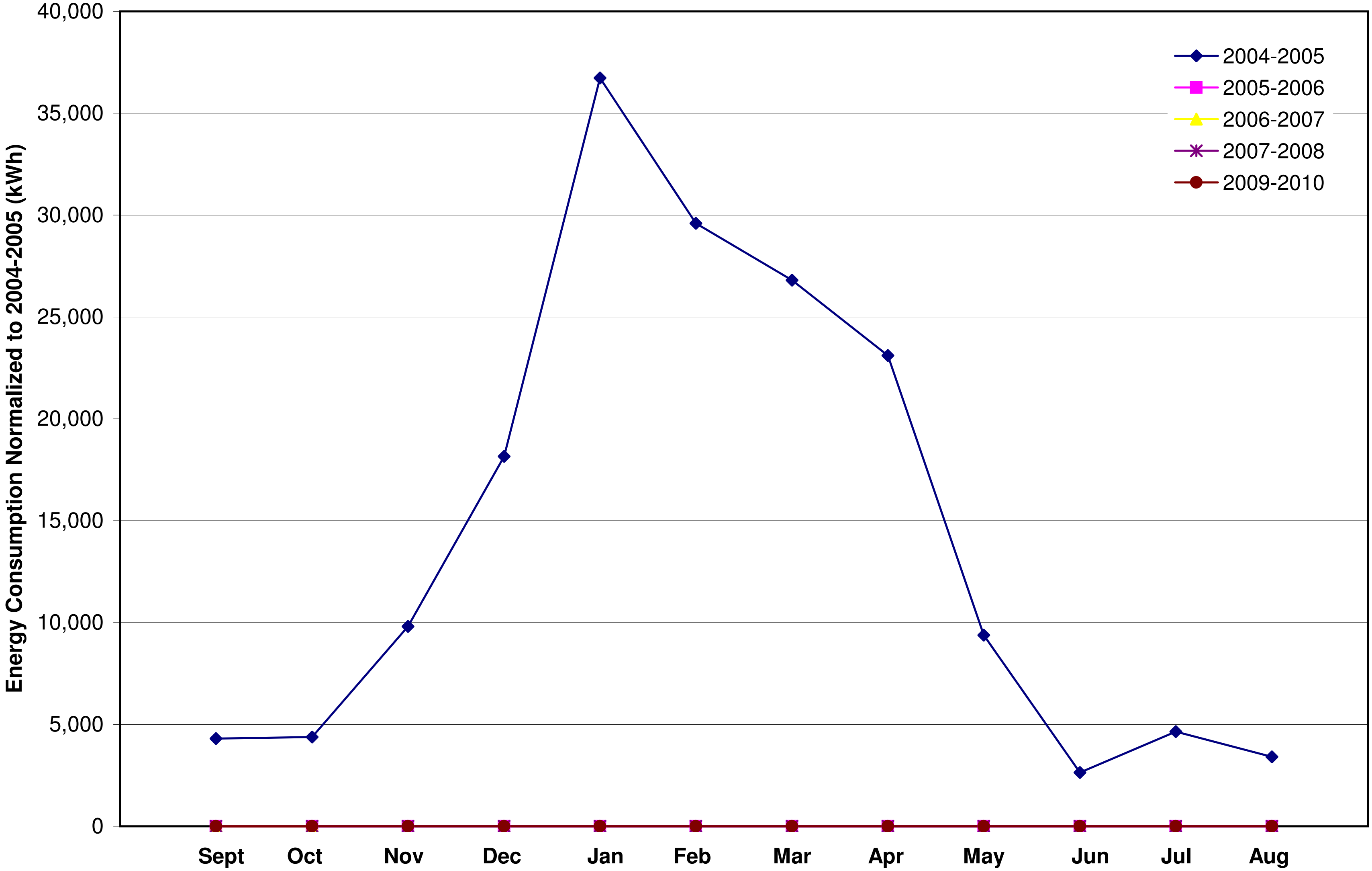


Table F.5 - Energy Consumption Monitoring Data for the Municipal Garage

Month	2004-2005 Billed Elect Energy (kWh)	2004-2005 Billed Natural Gas Energy (m^3)	2004-2005 Total Energy Consumption (kWh)	2004-2005 HDD (°C days/ mo)	2004-2005 Energy Normalized to 2004-2005 (kWh)	2005-2006 Billed Elect Energy (kWh)	2005-2006 Billed Natural Gas Energy (m^3)	2005-2006 Total Energy Consumption (kWh)	2005-2006 HDD (°C days/ mo)	2005-2006 Energy Normalized to 2004-2005 (kWh)	2006-2007 Billed Elect Energy (kWh)	2006-2007 Billed Natural Gas Energy (m^3)	2006-2007 Total Energy Consumption (kWh)	2006-2007 HDD (°C days/ mo)	2006-2007 Energy Normalized to 2004-2005 (kWh)
September	2,700	0	2,700	88.3	2,700			0		#DIV/0!			0		#DIV/0!
October	2,220	109	3,348	340.7	3,348			0		#DIV/0!			0		#DIV/0!
November	2,940	792	11,137	525.4	11,137			0		#DIV/0!			0		#DIV/0!
December	4,680	1,116	16,230	970.3	16,230			0		#DIV/0!			0		#DIV/0!
January	16,440	2,493	42,242	1116	42,242			0		#DIV/0!			0		#DIV/0!
February	5,940	3,669	43,913	816.7	43,913			0		#DIV/0!			0		#DIV/0!
March	15,600	2,401	40,450	735.1	40,450			0		#DIV/0!			0		#DIV/0!
April	4,620	2,351	28,952	293.2	28,952			0		#DIV/0!			0		#DIV/0!
May	5,160	1,354	19,173	214.9	19,173			0		#DIV/0!			0		#DIV/0!
June	1,680	59	2,291	41.3	2,291			0		#DIV/0!			0		#DIV/0!
July	2,160	48	2,657	12	2,657			0		#DIV/0!			0		#DIV/0!
August	1,740	104	2,816	20.5	2,816			0		#DIV/0!			0		#DIV/0!
TOTAL	65,880	14,496	215,909	5174	215,909	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

Month	2007-2008 Billed Elect Energy (kWh)	2007-2008 Billed Natural Gas Energy (m^3)	2007-2008 Total Energy Consumption (kWh)	2007-2008 HDD (°C days/ mo)	2007-2008 Energy Normalized to 2004-2005 (kWh)	2008-2009 Billed Elect Energy (kWh)	2008-2009 Billed Natural Gas Energy (m^3)	2008-2009 Total Energy Consumption (kWh)	2008-2009 HDD (°C days/ mo)	2008-2009 Energy Normalized to 2004-2005 (kWh)	2009-2010 Billed Elect Energy (kWh)	2009-2010 Billed Natural Gas Energy (m^3)	2009-2010 Total Energy Consumption (kWh)	2009-2010 HDD (°C days/ mo)	2009-2010 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=CA&StationID=28051&Year=2005&Month=11&Day=18
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 F20) 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 Municipal Garage

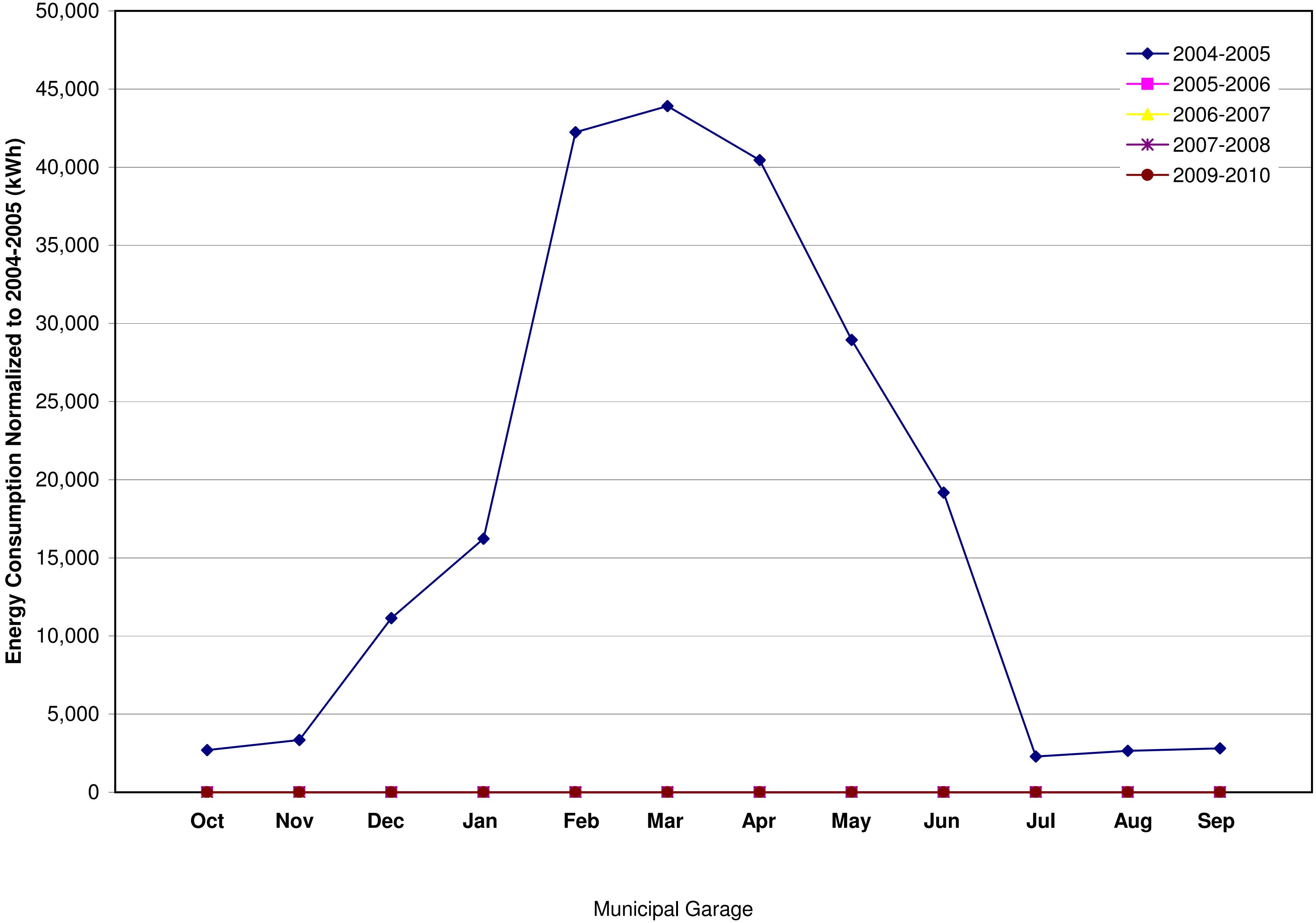


Table F.6 - Energy Consumption Monitoring Data for the Municipal Landfill

	2004-2005					2005-2006					2006-2007				
Month	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (^oC days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (^oC days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (^oC days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
September	220	0	220	88.3	220			0		#DIV/0!			0		#DIV/0!
October	0	28	290	340.7	290			0		#DIV/0!			0		#DIV/0!
November	590	601	6,810	525.4	6,810			0		#DIV/0!			0		#DIV/0!
December	380	1,013	10,864	970.3	10,864			0		#DIV/0!			0		#DIV/0!
January	1,630	1,833	20,601	1116	20,601			0		#DIV/0!			0		#DIV/0!
February	540	1,933	20,546	816.7	20,546			0		#DIV/0!			0		#DIV/0!
March	0	1,517	15,700	735.1	15,700			0		#DIV/0!			0		#DIV/0!
April	0	1,500	15,525	293.2	15,525			0		#DIV/0!			0		#DIV/0!
May	160	621	6,587	214.9	6,587			0		#DIV/0!			0		#DIV/0!
June	190	319	3,492	41.3	3,492			0		#DIV/0!			0		#DIV/0!
July	170	53	719	12	719			0		#DIV/0!			0		#DIV/0!
August	230	20	437	20.5	437			0		#DIV/0!			0		#DIV/0!
TOTAL	4,110	9,438	101,790	5174	101,790	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!

	2007-2008					2008-2009					2009-2010				
Month	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (^oC days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (^oC days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**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	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=CA&StationID=28051&Year=2005&Month=11&Day=18
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 F20) 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 Municipal Landfill

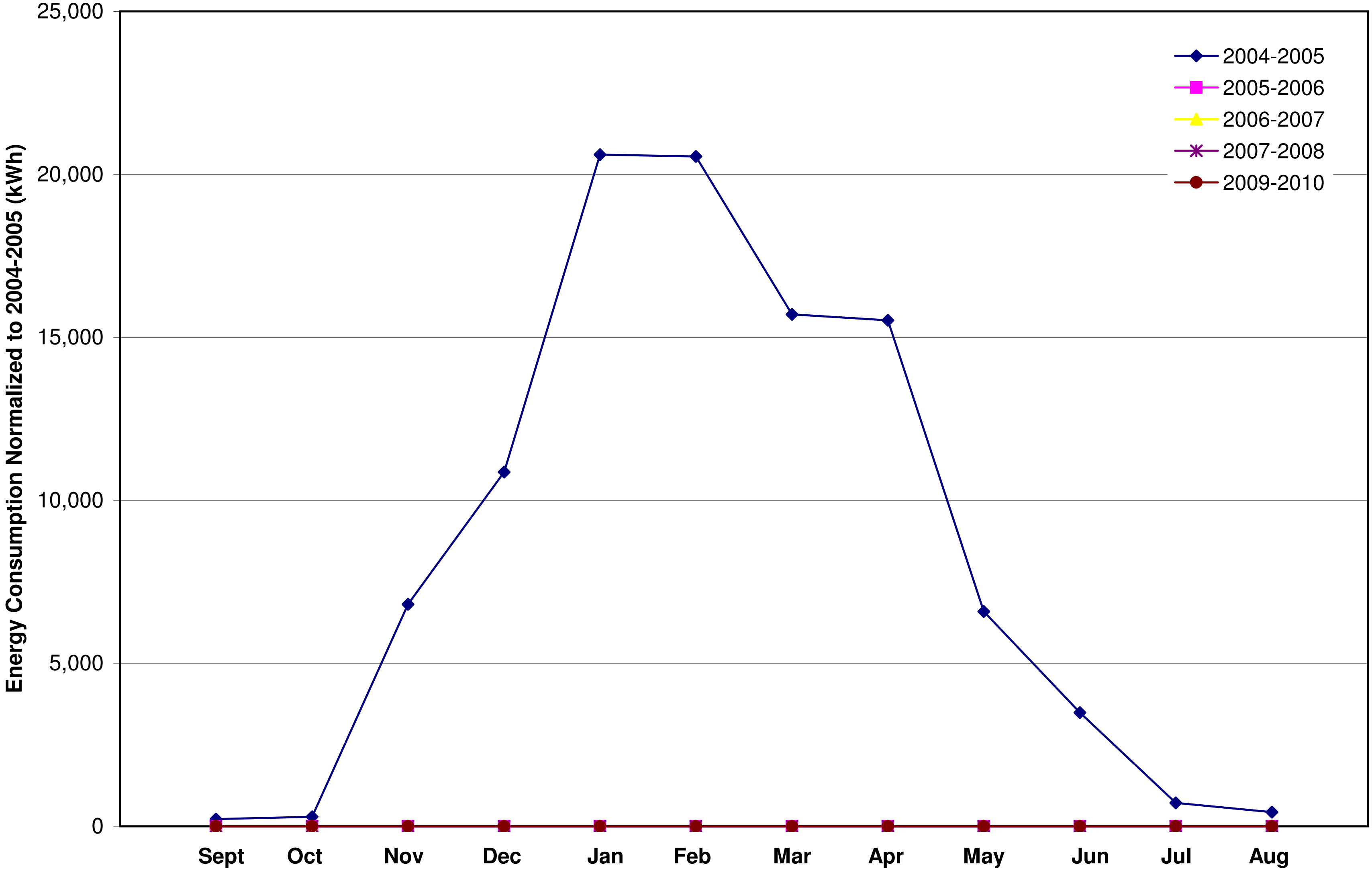


Table F.7 - Energy Consumption Monitoring Data for the Museum

	2004-2005					2005-2006					2006-2007				
Month	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
September	0	176	1,822	88.3	1,822			0		#DIV/0!			0		0
October	2,820	104	3,896	340.7				0		#DIV/0!			0		0
November	0	34	352	525.4	352			0		#DIV/0!			0		0
December	0	285	2,950	970.3	2,950			0		#DIV/0!			0		0
January	0	241	2,494	1116	2,494			0		#DIV/0!			0		0
February	0	425	4,399	816.7	4,399			0		#DIV/0!			0		0
March	0	274	2,836	735.1	2,836			0		#DIV/0!			0		0
April	2,270	336	5,747	293.2	5,747			0		#DIV/0!			0		0
May	0	0	0	214.9	0			0		#DIV/0!			0		0
June	0	151	1,563	41.3	1,563			0		#DIV/0!			0		0
July	0	48	497	12	497			0		#DIV/0!			0		0
August	0	45	466	20.5	466			0		#DIV/0!			0		0
TOTAL	5,090	2,119	27,021	5174	23,125	0	0	0	0	#DIV/0!	0	0	0	0	0

	2007-2008					2008-2009					2009-2010				
Month	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
September			0		#DIV/0!			0		#DIV/0!			0		0
October			0		#DIV/0!			0		#DIV/0!			0		0
November			0		#DIV/0!			0		#DIV/0!			0		0
December			0		#DIV/0!			0		#DIV/0!			0		0
January			0		#DIV/0!			0		#DIV/0!			0		0
February			0		#DIV/0!			0		#DIV/0!			0		0
March			0		#DIV/0!			0		#DIV/0!			0		0
April			0		#DIV/0!			0		#DIV/0!			0		0
May			0		#DIV/0!			0		#DIV/0!			0		0
June			0		#DIV/0!			0		#DIV/0!			0		0
July			0		#DIV/0!			0		#DIV/0!			0		0
August			0		#DIV/0!			0		#DIV/0!			0		0
TOTAL	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/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) 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=CA&StationID=28051&Year=2005&Month=11&Day=18
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 F20) 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 Museum

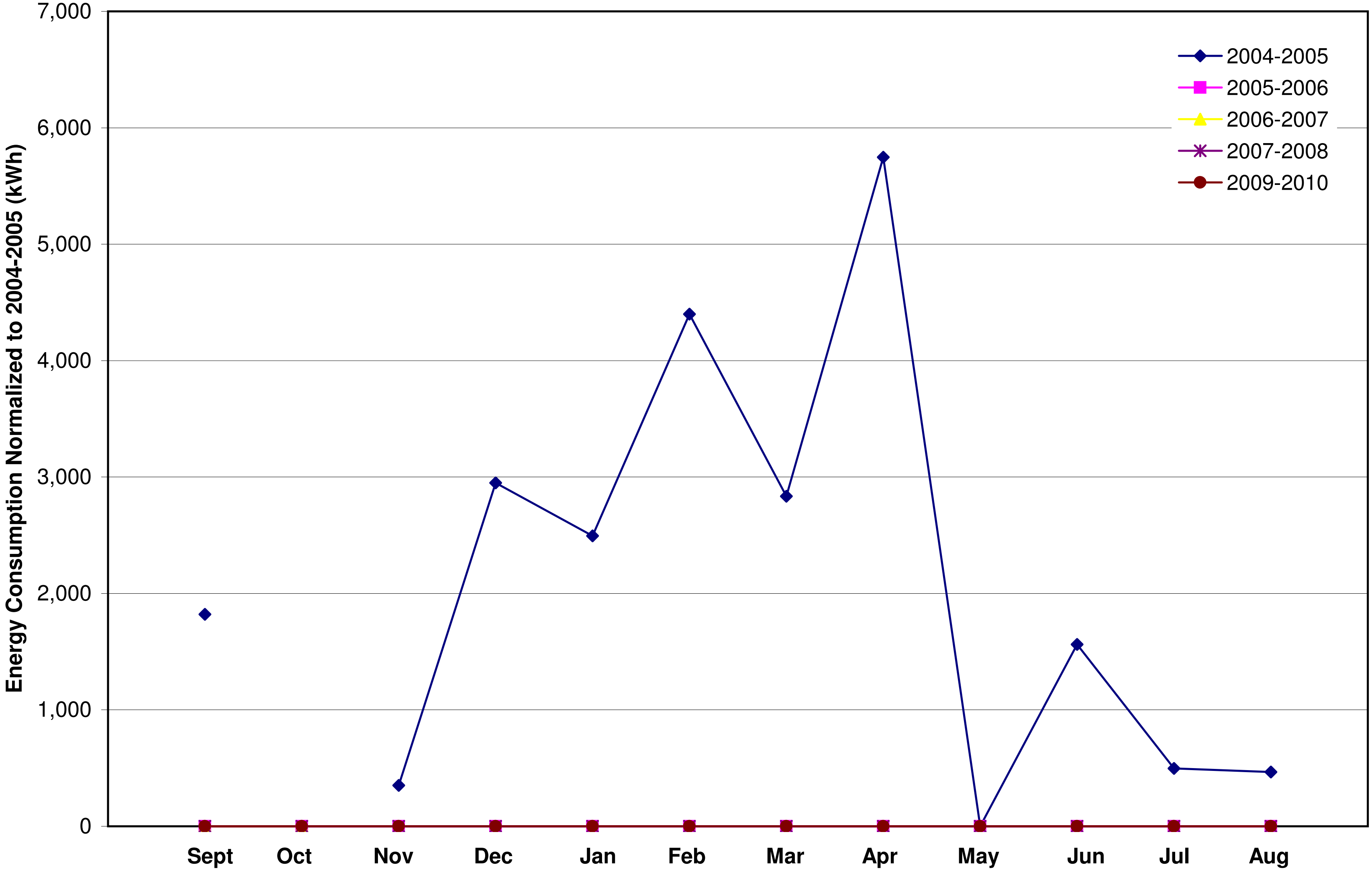


Table F.8 - Energy Consumption Monitoring Data for the Carman Aquatic Centre

	2004-2005					2005-2006					2006-2007				
Month	Billed Elect Energy (kWh)	Billed Natural Gas Energy (m^3)	Total Energy Consumption (kWh)	HDD (°C days/ mo)	Energy Normalized to 2004-2005 (kWh)	Billed Elect Energy (kWh)	Billed Natural Gas Energy (m^3)	Total Energy Consumption (kWh)	HDD (°C days/ mo)	Energy Normalized to 2004-2005 (kWh)	Billed Elect Energy (kWh)	Billed Natural Gas Energy (m^3)	Total Energy Consumption (kWh)	HDD (°C days/ mo)	Energy Normalized to 2004-2005 (kWh)
September	0	13,601	140,766	88.3	140,766			0		#DIV/0!			0		0
October	0	950	9,832	340.7	9,832			0		#DIV/0!			0		0
November	0	0	0	525.4	0			0		#DIV/0!			0		0
December	0	0	0	970.3	0			0		#DIV/0!			0		0
January	0	0	0	1116	0			0		#DIV/0!			0		0
February	0	4	41	816.7	41			0		#DIV/0!			0		0
March	0	0	0	735.1	0			0		#DIV/0!			0		0
April	0	0	0	293.2	0			0		#DIV/0!			0		0
May	0	0	0	214.9	0			0		#DIV/0!			0		0
June	0	13,378	138,458	41.3	138,458			0		#DIV/0!			0		0
July	0	5,255	54,388	12	54,388			0		#DIV/0!			0		0
August	0	5,084	52,618	20.5	52,618			0		#DIV/0!			0		0
TOTAL	0	38,272	396,104	5174	396,104	0	0	0	0	#DIV/0!	0	0	0	0	0

	2007-2008					2008-2009					2009-2010				
Month	Billed Elect Energy (kWh)	Billed Natural Gas Energy (m^3)	Total Energy Consumption (kWh)	HDD (°C days/ mo)	Energy Normalized to 2004-2005 (kWh)	Billed Elect Energy (kWh)	Billed Natural Gas Energy (m^3)	Total Energy Consumption (kWh)	HDD (°C days/ mo)	Energy Normalized to 2004-2005 (kWh)	Billed Elect Energy (kWh)	Billed Natural Gas Energy (m^3)	Total Energy Consumption (kWh)	HDD (°C days/ mo)	Energy Normalized to 2004-2005 (kWh)
September			0		#DIV/0!			0		#DIV/0!			0		0
October			0		#DIV/0!			0		#DIV/0!			0		0
November			0		#DIV/0!			0		#DIV/0!			0		0
December			0		#DIV/0!			0		#DIV/0!			0		0
January			0		#DIV/0!			0		#DIV/0!			0		0
February			0		#DIV/0!			0		#DIV/0!			0		0
March			0		#DIV/0!			0		#DIV/0!			0		0
April			0		#DIV/0!			0		#DIV/0!			0		0
May			0		#DIV/0!			0		#DIV/0!			0		0
June			0		#DIV/0!			0		#DIV/0!			0		0
July			0		#DIV/0!			0		#DIV/0!			0		0
August			0		#DIV/0!			0		#DIV/0!			0		0
TOTAL	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/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) 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=CA&StationID=28051&Year=2005&Month=11&Day=18
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 F20) 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 Carman Aquatic Centre

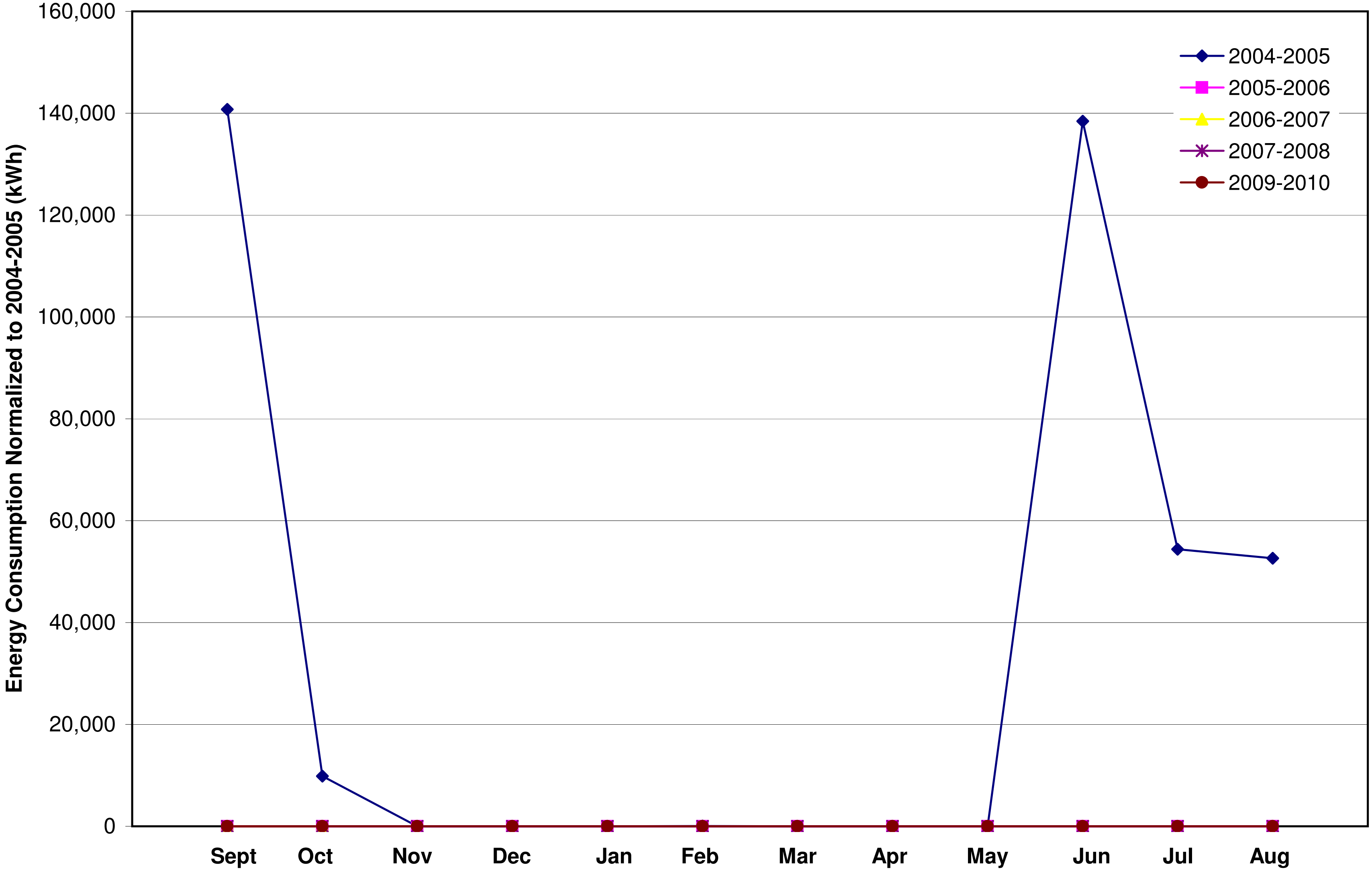


Table F.9 - Energy Consumption Monitoring Data for the Water Treatment Plant

	2004-2005					2005-2006					2006-2007				
Month	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
September	16,260	114	17,440	88.3	17,440			0		#DIV/0!			0		0
October	15,480	1,044	26,285	340.7	26,285			0		#DIV/0!			0		0
November	17,580	792	25,777	525.4	25,777			0		#DIV/0!			0		0
December	23,640	2,955	54,223	970.3	54,223			0		#DIV/0!			0		0
January	25,260	4,958	76,574	1116	76,574			0		#DIV/0!			0		0
February	25,980	4,620	73,796	816.7	73,796			0		#DIV/0!			0		0
March	20,940	2,815	50,074	735.1	50,074			0		#DIV/0!			0		0
April	26,160	3,621	63,636	293.2	63,636			0		#DIV/0!			0		0
May	21,840	3,571	58,799	214.9	58,799			0		#DIV/0!			0		0
June	17,580	0	17,580	41.3	17,580			0		#DIV/0!			0		0
July	16,140	241	18,634	12	18,634			0		#DIV/0!			0		0
August	17,400	456	22,119	20.5	22,119			0		#DIV/0!			0		0
TOTAL	244,260	25,187	504,938	5174	504,938	0	0	0	0	#DIV/0!	0	0	0	0	0

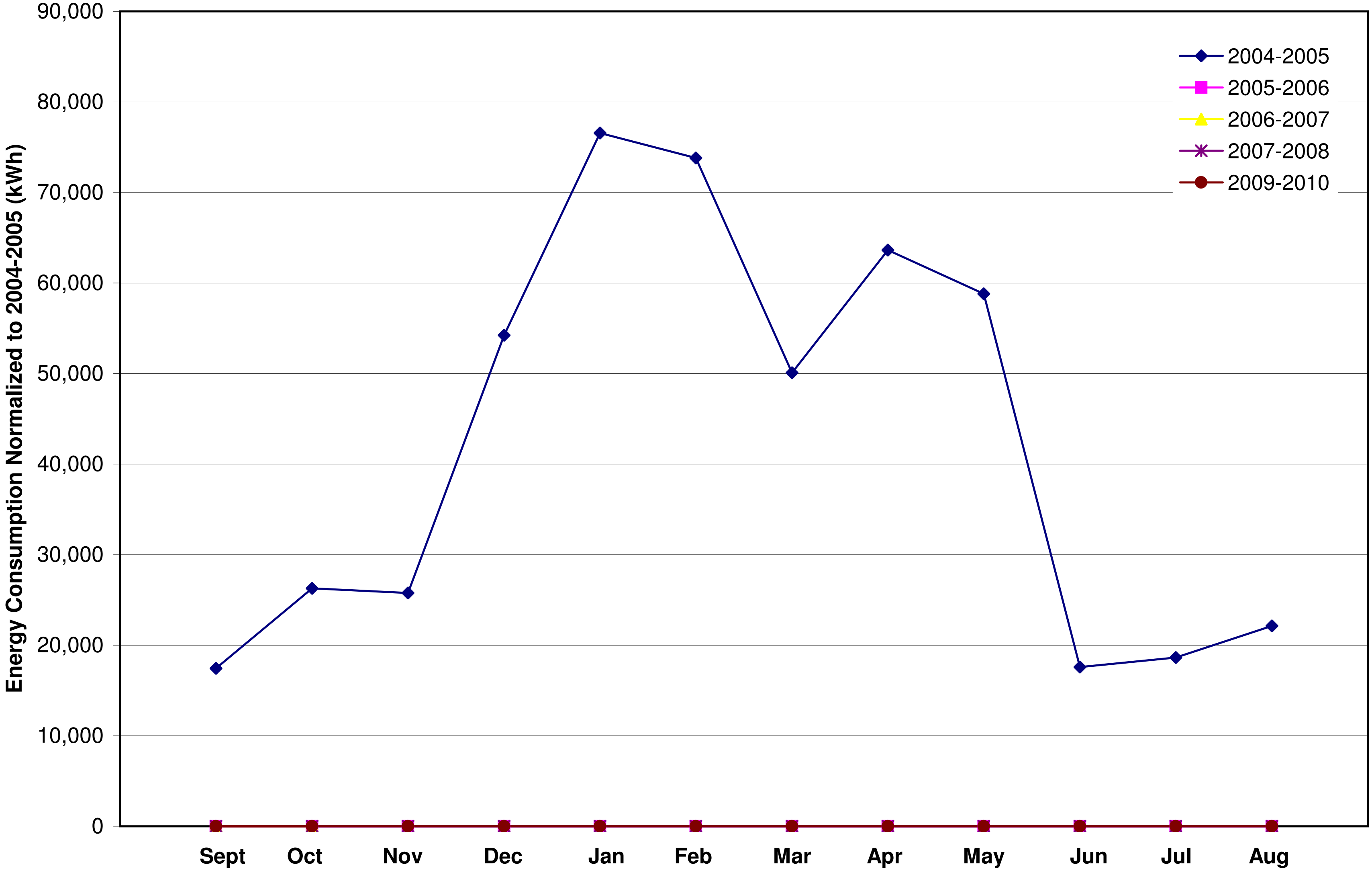
	2007-2008					2008-2009					2009-2010				
Month	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Elect Energy (kWh)**	**Billed Natural Gas Energy (m^3)**	**Total Energy Consumption (kWh)**	**HDD (°C days/ mo)**	**Energy Normalized to 2004-2005 (kWh)**
September			0		#DIV/0!			0		#DIV/0!			0		0
October			0		#DIV/0!			0		#DIV/0!			0		0
November			0		#DIV/0!			0		#DIV/0!			0		0
December			0		#DIV/0!			0		#DIV/0!			0		0
January			0		#DIV/0!			0		#DIV/0!			0		0
February			0		#DIV/0!			0		#DIV/0!			0		0
March			0		#DIV/0!			0		#DIV/0!			0		0
April			0		#DIV/0!			0		#DIV/0!			0		0
May			0		#DIV/0!			0		#DIV/0!			0		0
June			0		#DIV/0!			0		#DIV/0!			0		0
July			0		#DIV/0!			0		#DIV/0!			0		0
August			0		#DIV/0!			0		#DIV/0!			0		0
TOTAL	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/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) 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=CA&StationID=28051&Year=2005&Month=11&Day=18
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 F20) 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 Water Treatment Plant



Environment Canada Environnement Canada

[français] [Back]

Daily Data Report for November 2005

Notes on Data Quality.

WINNIPEG THE FORKS
MANITOBA

Latitude: 49° 52' N **Longitude:** 97° 7' W **Elevation:** 230.00 m
Climate ID: 5023262 **WMO ID:** 71579 **TC ID:** XWN

Daily Data Report for November 2005

Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days C	Cool Deg Days C	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
01	8.8	2.8	5.8	12.2	0.0	0.0	0.0	0.0			
02	10.5	1.1	5.8	12.2	0.0	0.4	0.0	0.4			
03	3.8	2.3	3.1	14.9	0.0	0.2	0.0	0.2			
04	3.2	1.2	2.2	15.8	0.0	1.0	0.0	1.0			
05	4.7	1.9	3.3	14.7	0.0	0.4	0.0	0.4			
06	9.0	-1.5	3.8	14.2	0.0	0.2	0.0	0.2			
07	6.2	0.5	3.4	14.6	0.0	0.0	0.0	0.0			
08	4.0	-0.8	1.6	16.4	0.0	7.4	7.3	14.7			
09	2.6	-0.3	1.2	16.8	0.0	0.4	0.0	0.4			
10	8.9	-0.2	4.4	13.6	0.0	0.0	0.0	0.0			
11	12.1	3.4	7.8	10.2	0.0	0.0	0.0	0.0			
12	6.6	-0.2	3.2	14.8	0.0	0.2	0.0	0.2			
13	2.9	-4.2	-0.7	18.7	0.0	0.2	0.0	0.2			
14	0.9	-5.5	-2.3	20.3	0.0	0.0	1.8	1.8			
15	0.2	-9.5	-4.7	22.7	0.0	0.0	13.8	13.8			
16	-9.5	-17.1	-13.3	31.3	0.0	0.0	0.0	0.0			
17	-5.6	-20.3	-13.0	31.0	0.0	0.0	0.0	0.0			
18	3.5	-7.4	-2.0	20.0	0.0	11.0	1.6	12.6			
19	3.4	-2.9	0.3	17.7	0.0	0.0	0.7	0.7			
20	9.3	-1.3	4.0	14.0	0.0	0.0	0.0	0.0			
21	5.5	-2.4	1.6	16.4	0.0	0.0	0.0	0.0			
22	4.1	-3.2	0.5	17.5	0.0	0.0	0.0	0.0			
23	4.1	-13.4	-4.7	22.7	0.0	0.0	0.0	0.0			
24	-7.8	-13.5	-10.7	28.7	0.0	0.0	0.0	0.0			
25	-5.9	-10.6	-8.3	26.3	0.0	0.0	0.0	0.0			
26	-4.0	-10.3	-7.2	25.2	0.0	0.0	0.0	0.0			
27	-3.5	-10.0	-6.8	24.8	0.0	0.0	0.0	0.0			
28	-4.2	-11.4	-7.8	25.8	0.0	0.0	0.0	0.0			
29	-7.3	-11.3	-9.3	27.3	0.0	0.0	0.0	0.0			
30	-9.1	-12.6	-10.9	28.9	0.0	0.0	0.0	0.0			
Sum				**589.7**	**0.0**	**21.4**	**25.2**	**46.6**			
Avg	**1.9**	**-5.2**	**-1.7**								
Xtrm	**12.1**	**-20.3**									

Legend

[empty] = No data available

M = Missing

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APPENDIX G

THE MUNICIPALITIES TRADING COMPANY OF MANITOBA LTD. REPORT

TABLE OF CONTENTS - APPENDIX G

MEMBER SERVICES

M.T.C.M.L.

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.

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.