ASSOCIATION OF MANITOBA MUNICIPALITIES
MANITOBA MUNICIPAL ENERGY, WATER AND WASTEWATER EFFICIENCY PROJECT
R.M. OF WHITEMOUTH
FINAL REPORT
JULY 2006

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

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July 17, 2006

File No. 05-1285-01-1000.12

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

ATTENTION: Mr. Tyler MacAfee

RE: Municipal Energy, Water, and Wastewater
Efficiency Study for the R.M. of Whitemouth – Final Report

Dear Mr. Tyler MacAfee:

Enclosed is the Final Report of the Manitoba Municipal Energy, Water and Wastewater Efficiency Study for the Rural Municipality of Whitemouth.

Included with this submission are 10 hard copies (3 in colour, 7 in black and white) of the report and 10 copies on compact disk in PDF format with searchable text functionality, as requested in the "Request for Proposal". The PDF file consists of the entire report, including the Executive Summary, Sections 1 to 15, 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,

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

RBB/mg
Enclosure

STRUCTURAL ▪ GEOTECHNICAL ▪ ENVIRONMENTAL ▪ HYDRAULICS ▪ HYDROGEOLOGY ▪ MUNICIPAL ▪ MECHANICAL ▪ ELECTRICAL
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EXECUTIVE SUMMARY

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

An energy and water efficiency audit was conducted on eight buildings and two sewage lift stations in the R.M. of Whitemouth. 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 and water consumption for each of the buildings for the period October 2004 to October 2005. This year was selected as it represents a typical year for energy and water consumption. In addition, the most recent year was selected since the conditions of the buildings throughout this time most closely resemble the buildings' current conditions. The buildings included in this audit use electricity exclusively for energy. 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. The percent of the total energy density ranges from a high of 43.7% for the Waterline Pumphouse to a low of 0.1% for the Municipal Shop #2.

Tables E2 (a) and (b) show overall energy and water saving opportunities for eight buildings in the R.M. of Whitemouth. Since the lift stations have no lighting, heating, or water, there are no energy or water saving opportunities for these stations, which is why they are not included in Tables E2 (a) and (b). These tables include approximate product and installation prices for each measure, both with and without incentives (refer to Appendix D for a list of Manitoba Hydro incentives) and simple payback years. The "Simple Payback Years" column is the overall payback period and may vary for individual buildings.

From the energy saving opportunities table (Table E2(a)) it can be seen that the total potential for energy savings in all ten buildings is 182,025 kWh, or 47% of the current total energy consumption.

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

- Some of the buildings have little or no heating (e.g. Municipal Shop #2, Small Garage, Lift Stations).
- Some of the buildings are infrequently used (e.g. Fire Hall, Waterline Pumphouse).

The water saving opportunities table (Table E2(b)) shows percent water savings, water savings in litres/year, and cost savings. The percentages shown in this table indicate percent water savings that would result from replacing the current water fixtures in all the buildings with water efficient fixtures. The water savings in litres per year are based on estimates of the various buildings' occupancies. The cost of water is taken as $0.258 per cubic meter.

The results and recommendations from the water and wastewater audit are shown in Section 15 of this report. From the water system audit, it was determined that from July 2004 to June 2005, the water treatment plant produced an average of 435.3 m^3 of water per day. Based on the data supplied by the municipality, 20% of this water produced is considered water losses due to either leakage in the system, inaccurate water meters, water main breaks or water main flushing. Reducing the water losses will reduce chemical costs required for water treatment, reduce electrical energy consumed by the pumps, and extend the life of the facility.

The sewer collection system in Whitemouth is restricted to sanitary sewage only. There are two lift stations that collect the wastewater and pump it to the sewage lagoon. There was no information available to determine the amount of inflow and infiltration into the system. It is recommended that a flow meter be installed to record daily flows through the system to determine whether there is a need to reduce infiltration. Through measures such as sealing manholes and lining pipes, the municipality could potentially decrease infiltration and inflows to the sewer system. Reducing infiltration will reduce pumping costs and extend the life of the lagoon.

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

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

Table E1 Energy Consumption for the Period from October 04 – October 05

Site	Energy Density (kWh/m^2)	% of Total Energy Density	Area (m^2)	Electricity	
				kWh	Cost
Municipal Office Building	296	7.2%	256	75,815	$4,868
Municipal Shop #1	155	3.7%	245	38,078	$2,399
Municipal Shop #2	4	0.1%	178	797	$108
Hospital Street Lift Station	185	4.5%	9	1,720	$417
Front Street Lift Station	868	21.0%	9	8,060	$846
Small Garage	163	4.0%	36	5,910	$613
Fire Hall	290	7.1%	164	47,470	$3,404
Waterline Pumphouse	1797	43.7%	25	44,930	$3,333
Waste Management Facility #1	145	3.5%	398	57,830	$3,541
Waste Management Facility #2	212	5.1%	515	109,100	$6,680
Total				**389,710**	**$26,209**

Percentage of Total Energy Density for Buildlings in the R.M. of Whitemouth

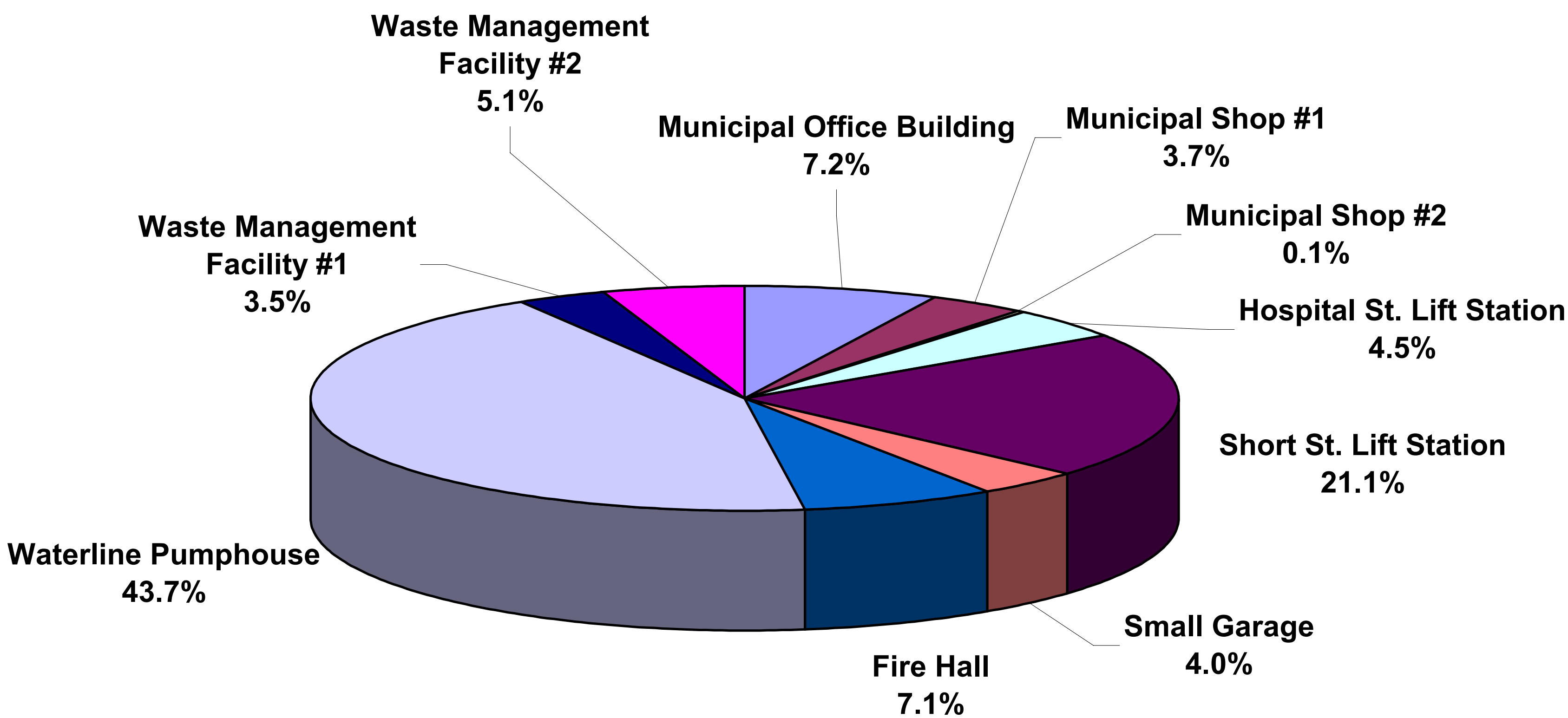

Table E2 (a) Summary of Energy Saving Opportunities for Buildings in the R.M. of Whitemouth **Page 1 of 3**

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											
When 4' x 4 T12 ballasts burn out replace them with T8 ballasts and tubes.	27	$32	$12	$0	$997	$382	5,476	$329	3.0	1.2	Municipal Office Building.
When 4' x 2 T12 ballasts burn out replace them with T8 ballasts and tubes.	14	$41	$21	$0	$658	$338	1,369	$82	8.0	4.1	Municipal Office Building, Municipal Shop #1 & Waste Management Facility 1.
When 8' x 2 T12 ballasts burn out replace them with T8 ballasts and tubes.	48	$47	$12	$0	$2,588	$673	12,397	$744	3.5	0.9	Municipal Shop #1, Small Garage, Fire Hall, Waste Management Facility 1 & Waste Management Facility 2.
When the 100W/150W incandescent lights require replacement, replace them with compact fluorescents.	10	$13	$8	$0	$148	$91	1,642	$99	1.5	0.9	Municipal Office Building, Municipal Shop #1, Waterline Pumphouse & Waste Management Facility 1.
When the 200W/300W incandescent lights require replacement, replace them with compact fluorescents.	5	$15	$10	$0	$86	$57	1,962	$118	0.7	0.5	Waterline Pumphouse & Waste Management Facility 1.
Install photocell on outdoor incandescents.	6	$25	$25	$65	$616	$616	1,577	$95	6.5	6.5	Municipal Office Building.
Replace incandescent exit signs with LEDs.	6	$50	$5	$80	$889	$581	1,419	$85	10.4	6.8	Municipal Office Building.
Install parking lot controllers.	2	$100	$75	$150	$570	$513	480	$29	19.8	17.8	Municipal Shop #1.
Lighting Subtotal					**$6,552**	**$3,251**	**26,322**	**$1,580**			
ENVELOPE											
Replace windows with new triple pane windows.	8	$646	$542	$215	$7,855	$6,903	6,089	$366	21.5	18.9	Municipal Office Building, Municipal Shop #1 & Fire Hall.
Replace pedestrian doors.	1	$350	$350	$100	$513	$513	1,619	$97	5.3	5.3	Waste Management Facility 1.
Caulk pedestrian doors.	2	$5	$5	$25	$68	$68	1,209	$73	0.9	0.9	Municipal Office Building.

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*	
Replace top half of vehicle door.	1	$500	$500	$300	$912	$912	3,228	$194	4.7	4.7	Fire Hall.
Weather-strip pedestrian doors.	7	$15	$15	$50	$519	$519	9,544	$573	0.9	0.9	Municipal Office Building, Municipal Shop #1, Small Garage & Waste Management Facility 2.
Caulk vehicle doors.	1	$5	$5	$25	$34	$34	470	$28	1.2	1.2	Small Garage.
Weather-strip vehicle doors.	4	$100	$100	$200	$1,368	$1,368	12,516	$751	1.8	1.8	Small Garage, Fire Hall, Waste Management Facility 1 & Waste Management Facility 2.
Upgrade wall insulation to R-20.	2	$7,250	$6,825	$7,250	$33,060	$32,090	12,084	$726	45.6	44.2	Municipal Office Building & Fire Hall.
Upgrade roof insulation to R-40.	4	$595	$554	$551	$5,224	$5,041	8,600	$516	10.1	9.8	Municipal Shop #1, Small Garage, Fire Hall & Waterline Pumphouse.
Envelope Subtotal					**$49,553**	**$47,448**	**55,359**	**$3,324**			
HVAC											
Install new thermostat wired to light switch.	1	$300	$300	$300	$684	$684	2,115	$127	5.4	5.4	Fire Hall.
Install timer on exhaust fan.	1	$200	$200	$200	$456	$456	11,848	$711	0.6	0.6	Municipal Office Building.
Install motorized dampers	10	$300	$300	$300	$6,840	$6,840	16,666	$1,001	6.8	6.8	Municipal Shop #1, Waste Management Facility 1 & Waste Management Facility 2.
Install geothermal heating system.	1	$19,000	$19,000	$12,000	$35,340	$35,340	60,767	$3,648	9.7	9.7	Waste Management Facility 2.
Install an HRV.	1	$950	$950	$1,000	$2,223	$2,223	5,924	$356	6.3	6.3	Municipal Office Building
HVAC Subtotal					**$45,543**	**$45,543**	**97,319**	**$5,843**			
HOT WATER											
Install instantaneous water heater.*****	2	$300	$300	$500	$1,824	$1,824	1,949	$117	15.6	15.6	Municipal Office Building & Waterline Pumphouse.
Insulate hot water piping.	1	$50	$50	$50	$114	$114	465	$28	4.1	4.1	Municipal Office Building.
Install water efficient showerheads.	2	$21	$21	$50	$163	$163	611	$40	4.1	4.1	Municipal Shop #1 & Waste Management Facility 1.
Hot Water Subtotal					**$2,101**	**$2,101**	**3,025**	**$185**			

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	389,710	$26,209	11.64
Estimated Annual Savings	182,025	$10,932	5.39
Percent Savings	47%	42%	46%

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

Table E2 (b) Summary of Water Saving Opportunities for Buildings in the R.M. of Whitemouth

Description	Qty	Installed Cost/Unit ($)		Total Cost* ($)	Annual Water Savings (%)	Annual Water Savings (L)	Annual Cost Savings** ($)	Related Buildings
		Material	Labour					
Install water efficient metering faucets.	1	$309	$150	$523	80%	5,824	$2	Municipal Office Building,
Install water efficient dual flush toilets.	5	$284	$150	$2,474	66%	108,064	$28	Municipal Office Building, Municipal Shop 1, Fire Hall & Waste Management Facility 1.
Install water efficient showerheads.	3	$21	$21	$50	29%	16,988	$4	Municipal Shop 1, Fire Hall & Waste Management Facility 1.

* The total cost column includes 14% taxes.
** The cost assigned to water is 0.258 $/$m^3$.

KGS GROUP

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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

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

ACKNOWLEDGEMENTS

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

- Wendy Kozmak, Chief Administrative Officer
- Ken Barnard, Municipal Shops, Lift Stations, & Small Garage
- Paul Thomson, Fire Hall
- Gerry Pluchinski, Waterline Pumphouse
- Lorne Charney, Waste Management Facilities

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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 eight buildings and two lift stations in the R.M. of Whitemouth to determine how to reduce both energy and water consumption in each of these buildings. In addition, the water distribution and wastewater collection systems were audited to determine what opportunities exist for improving the systems' efficiencies.

1.2 OBJECTIVE

The objective of this study was to determine energy, water, and wastewater efficiency opportunities that could enable the R.M. of Whitemouth to reduce operating costs, conserve resources, and reduce greenhouse gas emissions. All eight buildings and two lift stations were analyzed separately and the results are presented in separate sections throughout this report. The water and wastewater systems are discussed in Section 15.

1.3 METHODOLOGY

The buildings were toured on April 4, 2006 by Mr. Joel Lambert and on October 24, 2005 by Mr. Tibor Takach, P.Eng, both of KGS Group Consulting Engineers and Project Managers. Mr. Takach toured the Waterline Pumphouse and the Lift Stations to study the water and wastewater systems while Mr. Lambert toured the other seven buildings to perform the water and energy efficiency audits. The water and energy efficiency audits involved a walkthrough of each of the buildings to determine the current condition of the building's envelope (walls, roof, windows, and doors), lighting, water fixtures, heating, ventilation and air conditioning (HVAC) systems, and motors.

During the building tours, the auditors met with Whitemouth's chief administrative officer, Wendy Kozmak, to discuss the study objectives for identifying energy, water, and wastewater saving opportunities, and to provide information on existing incentive programs. At this time, it was determined that there are currently no construction projects underway for this municipality. While auditing the buildings, whenever possible, on-site training was done to inform the staff on energy and/or water saving opportunities in specific buildings and to point out maintenance issues where applicable.

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

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

An environmental benefit that results from reducing energy consumption is a reduction in CO_2 emissions. CO_2 is a greenhouse gas and thus contributes to global warming. Although over 95% of Manitoba's electricity is produced by hydropower and thus emits very little CO_2, some of the electrical generating stations in Canada and the United States burn fossil fuels and emit large quantities of CO_2 into the atmosphere. By reducing the electrical energy consumption here in Manitoba, more of Manitoba Hydro's clean hydropower is available for offsetting the fossil-fuelled electrical generating stations. At the bottom of each ESO table, the total CO_2 reduction resulting from the energy savings is shown. This was calculated using a CO_2 emissions calculator produced by Natural Resources Canada.

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

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

Whitemouth's water and wastewater systems were analyzed and results and recommendations are discussed in Section 15 of this report. In addition to an overview of the water and wastewater systems, several recommendations are made to help the Town monitor water consumption and losses and reduce operating costs.

2.0 MUNICIPAL OFFICE BUILDING

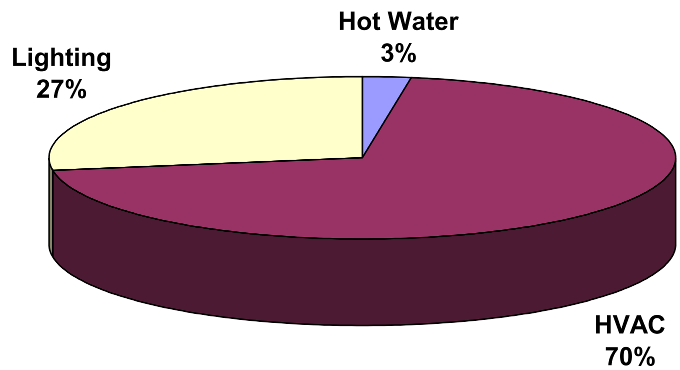
2.1 BACKGROUND

The Municipal Office Building, constructed over 70 years ago, is a 2,754 square foot building with brick and stucco exterior walls and a peaked, asphalt shingled roof. This building houses a council chamber, a library, and the municipal office.

Photo 1 – Municipal Office Building

The Municipal Office Building uses electricity exclusively for energy and shares its electrical service with both Municipal Shops 1 and 2. Based on the assumptions listed below it was determined that the portion of the electrical bill consumed by this building from October 2004 – October 2005 was 75,815 kWh. The electrical energy was used for heating, cooling, water heating, and lighting as shown in the pie chart below.

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



The washrooms in the Municipal Office Building contain a total of 2 toilets, 2 sinks, and 2 urinals. A 175-litre electric hot water heater heats the water for this facility. The energy used for hot water heating was calculated based on estimates of the current hot water consumption and includes the energy required to offset the heat losses from the storage tank.

2.2 ENERGY AND WATER SAVING OPPORTUNITIES

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

- The Municipal Office Building is occupied Monday to Friday from 8:30 am – 4:30 pm plus for 3 evenings every week.
- The temperature of the Office is maintained at 22°C (73°F).
- The outdoor incandescent lights and the exit signs are on 24 hours per day year round.
- For the purpose of water consumption the typical occupancy is assumed to be 8.

Table 1 Energy Saving Opportunities for the Municipal Office Building

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years	
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
LIGHTING										
When 4' x 4 T12 ballasts burn out replace them with T8 ballasts and tubes.	27	$32	$12	$0	$997	$382	5,476	$329	3.0	1.2
When 4' x 2 T12 ballasts burn out replace them with T8 ballasts and tubes.	2	$41	$21	$0	$94	$48	203	$12	7.7	4.0
When indoor incandescent bulbs burn out, replace them with compact fluorescents.	5	$13	$8	$0	$74	$46	936	$56	1.3	0.8
Install photocell on outdoor incandescents.	6	$25	$25	$65	$616	$616	1,577	$95	6.5	6.5
Replace incandescent exit signs with LEDs.	6	$50	$5	$80	$889	$581	1,419	$85	10.4	6.8
Lighting Subtotal					**$2,670**	**$1,673**	**9,610**	**$577**		
ENVELOPE										
Replace aluminum sliders on main floor with new triple pane sliders.	3	$800	$650	$200	$3,420	$2,907	2,829	$170	20.1	17.1
Caulk back and side pedestrian doors.	2	$5	$5	$25	$68	$68	1,209	$73	0.9	0.9
Weather-strip side and front pedestrian doors.	2	$15	$15	$50	$148	$148	3,022	$181	0.8	0.8
Upgrade wall insulation to R-20.	1	$8,500	$8,149	$8,500	$19,380	$18,980	8,065	$484	40.0	39.2
Envelope Subtotal					**$23,017**	**$22,104**	**15,125**	**$908**		
HVAC										
Install timer on exhaust fan.	1	$200	$200	$200	$456	$456	11,848	$711	0.6	0.6
Install an HRV.	1	$950	$950	$1,000	$2,223	$2,223	5,924	$356	6.3	6.3
HVAC Subtotal					**$2,679**	**$2,679**	**17,771**	**$1,067**		
HOT WATER										
Install instantaneous water heater. ****	1	$300	$300	$500	$912	$912	1,164	$70	13.1	13.1
Insulate hot water piping.	1	$50	$50	$50	$114	$114	465	$28	4.1	4.1
Motors Subtotal					**$1,026**	**$1,026**	**1,629**	**$98**		

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	75,815	$4,868	2.27
Estimated Annual Savings	44,135	$2,650	1.32
Percent Savings	58%	54%	58%

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

Table 2 Water Saving Opportunities for the Municipal Office Building

Description	Qty	Installed Cost/Unit ($)		Total Cost* ($)	Annual Water Savings (%)	Annual Water Savings (L)	Annual Cost Savings ($)
		Material	Labour				
Install water efficient metering faucets.	1	$309	$150	$523	80%	5,824	$2
Install water efficient dual flush toilets.	2	$284	$150	$990	64%	36,504	$9

* The total cost column includes 14% taxes.

2.3 GENERAL RECOMMENDATIONS

Lighting

The lighting analysis summary for the Municipal Office Building is shown in Appendix B, Table B.1.3. A large portion of the energy consumed by the lighting is used to run the T12 fluorescent lights. When the ballasts for these lights burn out, they should be replaced with T8 lamps and ballasts. T8s are slim, high efficiency lamps with better phosphors that generate more light per watt than conventional lighting. The costs shown in Table 1 for this upgrade are the cost differences in installing T8s as opposed to T12 fluorescent lamps and ballasts. Another cost-effective energy saving opportunity for indoor lighting is to replace the incandescent bulbs with compact fluorescents.

Five of the six incandescent exit signs are burnt out. Since these signs should be on for 24 hours per day, the energy saving calculations were made based on this assumption. LED exit signs use very little power compared to incandescent exit signs and would save 90% of the energy consumed by the incandescent signs.

The outdoor incandescent lights were on at the time of the visit. It is recommended that photocells be installed on these lights to ensure that they are only on throughout the night.

Envelope

The walls of the Municipal Office are assumed to have R-12 insulation. Table 1 above shows the energy savings that would result from upgrading this insulation to R-20. The high installation cost associated with this upgrade would result in a long payback period.

The frames for the back and side pedestrian doors should be caulked to reduce the cold air infiltrating through the cracks around these frames. Similarly, the side and front pedestrian doors need new weather-stripping.

The aluminum sliders on the main floor are not properly sealed. The energy savings and payback period for replacing these windows with triple pane windows are shown in Table 1 above.

HVAC

The central exhaust fan in the Municipal Office Building runs all the time. One option for reducing this building's heat losses is to install a countdown timer on the exhaust fan. This will reduce the energy required to heat the ventilation air. Another opportunity is to replace the exhaust fan with a heat recovery ventilator to pre-heat the intake air with exhaust air. This will save 50% of the current energy used for heating ventilation air.

Water

The hot water tank is continuously losing heat to the surroundings. Installing an instantaneous water heater will eliminate these heat losses and thus save energy in water heating requirements. Another benefit of an instantaneous water heater is that it has a much longer life than a hot water tank. The hot water piping should also be insulated to reduce heat losses.

Table 2 shows the water savings that would result from replacing the high flow sink faucet with a water efficient metering faucet and by replacing both toilets with dual flush toilets.

3.0 MUNICIPAL SHOP #1

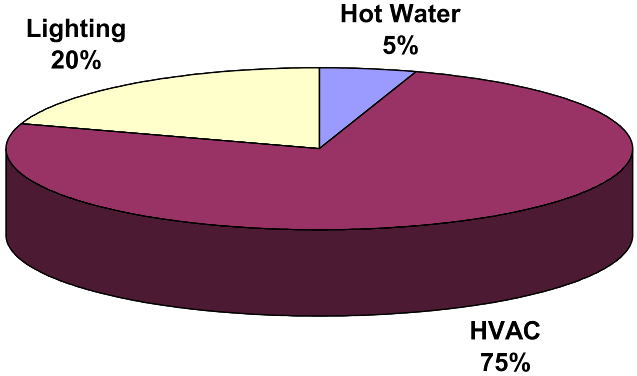
3.1 BACKGROUND

The Municipal Shop #1 was constructed in the early 1970s of 2" x 6" studs with exterior metal cladding and drywall interior walls. This 2,640 square foot building contains an office and a shop and is occupied from Monday to Friday, 7:30am – 4:00pm.

Photo 2 – Municipal Shop #1

The Municipal Shop #1 shares its electrical service with the Municipal Office Building and the Municipal Shop #2. Based on the assumptions listed below, the total electricity consumed from October 2004 to October 2005 was calculated as approximately 38,078 kWh at a cost of $2,399. The electrical energy consumption in the previous year was used for lighting, heating, and water heating. The pie chart below shows the breakdown of the total energy consumption.

Energy Breakdown (% of Total kWh)
for the Municipal Shop #1



The washroom in the Municipal Shop #1 contains 1 toilet, 1 sink, and 1 shower. A 150-litre electric hot water heater heats the water for this facility. The energy used for hot water heating was calculated based on estimates of the current hot water consumption and includes the energy required to offset the heat losses from the storage tank.

3.2 ENERGY AND WATER SAVING OPPORTUNITIES

Tables 3 and 4 show summaries of the energy and water saving opportunities for the Municipal Shop #1. The following assumptions were made in the analysis:

- The Municipal Shop #1 is occupied from Monday to Friday for 8 ½ hours per day.
- The temperature of the office is maintained at 21°C (70°F) and the shop is maintained at 16°C (61°F).
- For the purpose of water consumption the typical occupancy is assumed to be 4.

Table 3 Energy Saving Opportunities for the Municipal Shop #1

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years	
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
LIGHTING & PARKING LOT CONTROLLERS										
When 4' x 2 T12 ballasts burn out, replace them with T8 ballasts and tubes.	6	$41	$21	$0	$282	$145	517	$31	9.1	4.7
When 8' x 2 T12 ballasts burn out, replace them with T8 ballasts and tubes.	9	$47	$12	$0	$485	$126	2,466	$148	3.3	0.9
When indoor incandescents burn out replace them with compact fluorescents.	2	$13	$8	$0	$30	$18	318	$19	1.6	1.0
Install parking lot controllers.	2	$100	$75	$150	$570	$513	480	$29	19.8	17.8
Lighting & Parking Lot Controllers Subtotal					**$1,367**	**$802**	**3,782**	**$227**		
ENVELOPE										
Replace sliders in shop with triple pane windows.	2	$530	$465	$200	$1,664	$1,516	1,082	$65	25.6	23.3
Replace sliders in office with triple pane windows.	2	$530	$465	$200	$1,664	$1,516	1,272	$76	21.8	19.8
Weather-strip pedestrian doors.	2	$15	$15	$50	$148	$148	4,587	$275	0.5	0.5
Upgrade roof insulation	1	$1,201	$1,112	$1,201	$2,739	$2,637	4,466	$268	10.2	9.8
Envelope Subtotal					**$6,216**	**$5,818**	**11,407**	**$685**		
HVAC										
Replace backdraft dampers with motorized dampers.	2	$300	$300	$300	$1,368	$1,368	4,028	$242	5.7	5.7
HVAC Subtotal					**$1,368**	**$1,368**	**4,028**	**$242**		
HOT WATER										
Install water efficient showerhead.	1	$21	$21	$50	$81	$81	148	$9	9.2	9.2
Hot Water Subtotal					**$81**	**$81**	**148**	**$9**		

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	38,078	$2,399	1.11
Estimated Annual Savings	19,365	$1,163	0.58
Percent Savings	51%	48%	52%

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

Table 4 Water Saving Opportunities for the Municipal Shop #1

Description	Qty	Installed Cost/Unit ($)		Total Cost* ($)	Annual Water Savings (%)	Annual Water Savings (L)	Annual Cost Savings ($)
		Material	Labour				
Install water efficient showerheads.	1	$21	$21	$50	29%	3,937	$1
Install water efficient dual flush toilets.	1	$284	$150	$495	64%	38,413	$10

* The total cost column includes 14% taxes.

3.3 GENERAL RECOMMENDATIONS

Lighting & Parking Lot Controllers

The lighting analysis summary table for the Municipal Shop #1 is shown in Appendix B as Table B.2.3. The majority of the lights in the shop are T12 fluorescent lamps. When the ballasts for these lamps require replacement, consideration should be given to installing T8 lamps and ballasts. Similarly, when the incandescent bulbs burn out, they should be replaced with compact fluorescents.

Another option is to install parking lot controllers on the receptacles. Parking lot controllers reduce plug-in expenses by up to 50 percent. These controllers save energy by automatically adjusting the power at car plugs depending on the outside temperature.

Envelope

The windows in the shop and office are 46” x 28” two pane sliders. The energy savings associated with upgrading these windows to triple pane windows are shown in Table 3 above. Since the office is kept at a warmer temperature throughout the wintertime, the energy savings and payback period for upgrading the windows in the office are slightly better than for the windows in the shop. Another opportunity is to upgrade the roof insulation. The roof currently has R-20 insulation. Upgrading this to R-40 would result in significant energy savings with a reasonable payback period. The most cost-effective energy saving opportunity is to replace the weather-stripping on both pedestrian doors. Details of these calculations are shown in Appendix B, Table B.2.4.

HVAC

There are two wall mounted exhaust fans with backdraft dampers in the Municipal Shop #1. On windy days, these backdraft dampers tend to leak cold air into the building. Replacing these backdraft dampers with motorized dampers could eliminate this infiltration.

Water

Replacing the showerhead in the shop would reduce both water and energy consumption. Table 4 shows the water savings that would result from replacing the showerhead and toilet with water efficient fixtures. A more detailed analysis of the water consumption and savings is shown in Appendix B, Table B.2.5.

4.0 MUNICIPAL SHOP #2

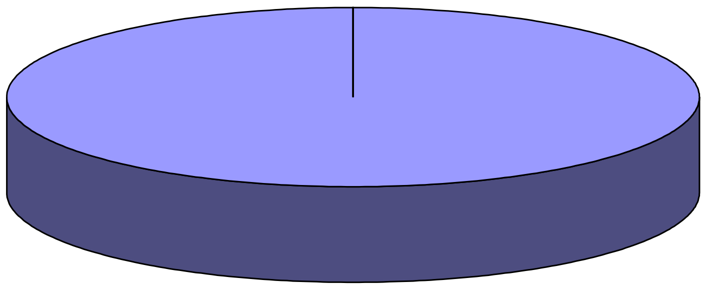
4.1 BACKGROUND

The Municipal Shop #2 was built approximately 45 years ago. The bottom 4 feet of this shop consists of concrete walls with no insulation while the rest of the walls are metal clad with spray foam insulation. There is no heat in this shop and it is only occupied for approximately 5 hours every week.

Photo 3 – Municipal Shop #2

The Municipal Shop #2 shares it's electrical service with Municipal Shop #1 and the Municipal Office. As shown in the pie chart below, the only energy used for this building is for lighting. Based on assumptions for the lighting in this building, the electricity consumption for the previous year was calculated to be 797 kWh.

Energy Breakdown (% of Total kWh)
for the Municipal Shop #2



There is no washroom in the Municipal Shop #2 and therefore no hot water consumption.

4.2 ENERGY AND WATER SAVING OPPORTUNITIES

Since the Municipal Shop #2 is unheated and is only occupied for approximately 5 hours/week, there are no energy or water saving opportunities for this building.

4.3 GENERAL RECOMMENDATIONS

Lighting

The lighting analysis results for the Municipal Shop #2 can be found in Appendix B, Table B.3.3. The only potential for energy savings for this building is in replacing the incandescent lighting with more energy efficient lighting. Compact fluorescents do not work well in cold temperatures and, therefore, the incandescents would have to be replaced with more costly lighting such as metal halides. Since the lights are on for only 5 hours/week, the payback period for this upgrade is very long.

5.0 HOSPITAL STREET LIFT STATION

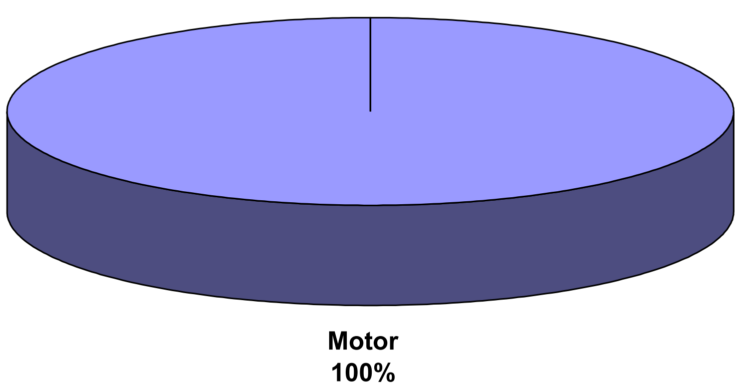
5.1 BACKGROUND

This lift station is a 100 square foot concrete manhole. This station holds one 5HP submersible pump.

Photo 4 – Hospital Street Lift Station

In the previous year, a total of 1,720 kWh of electricity was consumed to run the pump. The following pie chart shows that the pump motor consumes 100% of the electrical energy for this station.

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



5.2 ENERGY AND WATER SAVING OPPORTUNITIES

Since there is no above ground building at this site and the manhole is unheated, there are no energy saving opportunities for this station.

5.3 GENERAL RECOMMENDATIONS

Motors

When it is time to replace the sewage pump, it is recommended that it be replaced with a pump with the maximum hydraulic efficiency available and a high efficiency motor.

6.0 FRONT STREET LIFT STATION

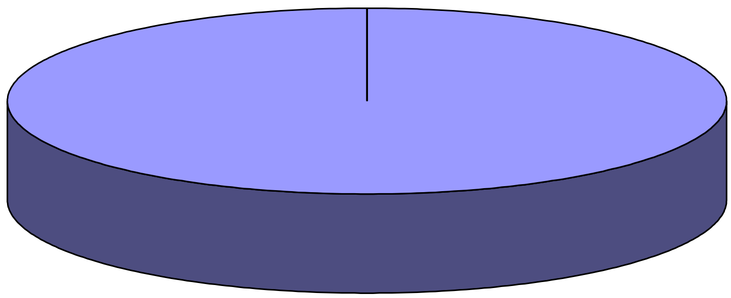
6.1 BACKGROUND

The Front Street Lift Station is a 100 square foot concrete manhole. This station holds two 3HP submersible pumps.

Photo 5 – Front Street Lift Station

In the previous year, a total of 8,060 kWh of electricity was consumed to run the two pumps at this station. As can be seen in the pie chart, the pump motors consume 100% of the electrical energy for this station.

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



6.2 ENERGY AND WATER SAVING OPPORTUNITIES

There are no energy saving opportunities for this station.

6.3 GENERAL RECOMMENDATIONS

Motors

When it is time to replace the sewage pumps, it is recommended that they be replaced with pumps with the maximum hydraulic efficiency available and high efficiency motors.

7.0 SMALL GARAGE

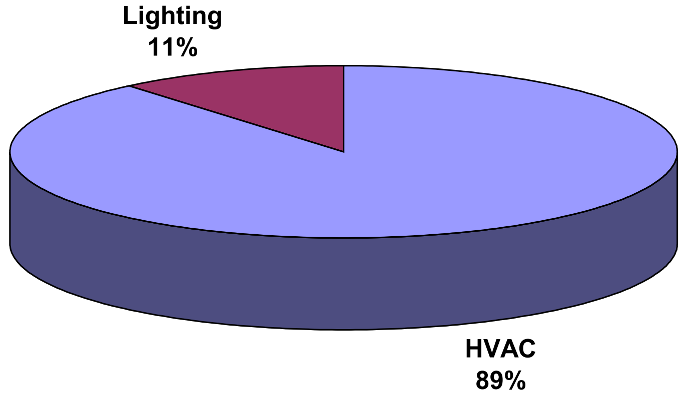
7.1 BACKGROUND

The Small Garage was constructed in 1978 of 2” x 4” studs with exterior siding and drywall interior walls. This garage is used for chemical storage and to store the sprayer truck.

Photo 6 – Small Garage

This garage consumes very little energy as it is kept at 5°C (41°F) in the winter. The total electrical energy consumption for this building in the previous year was 5,910 kWh and was consumed by the lighting and the electrical unit heaters.

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



There are no water fixtures in this facility.

7.2 ENERGY AND WATER SAVING OPPORTUNITIES

Table 5 shows the energy saving opportunities for the Small Garage. The following assumptions were made in the analysis:

- The garage is occupied for 20 hours per week.
- The garage is maintained at a temperature of 5°C (41°F).

Table 5 Energy Saving Opportunities for the Small 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										
When 8' x 2 T12 ballasts burn out, replace them with T8 ballast and tubes.	5	$47	$12	$0	$270	$70	203	$12	22.1	5.8
Lighting Subtotal					**$270**	**$70**	**203**	**$12**		
ENVELOPE										
Weather-strip vehicle door.	1	$100	$100	$200	$342	$342	1,175	$71	4.8	4.8
Weather-strip pedestrian door.	1	$15	$15	$50	$74	$74	619	$37	2.0	2.0
Caulk vehicle door.	1	$5	$5	$25	$34	$34	470	$28	1.2	1.2
Upgrade roof insulation.	1	$223	$216	$120	$391	$384	763	$46	8.5	8.4
Envelope Subtotal					**$842**	**$834**	**3,028**	**$182**		

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	5,910	$613	0.18
Estimated Annual Savings	3,230	$194	0.10
Percent Savings	55%	32%	56%

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

7.3 GENERAL RECOMMENDATIONS

Lighting

The lighting analysis summary can be found in Table B.6.3. When the 4' x 2 T12 fluorescent lamps burn out, they should be replaced with T8 ballasts and tubes. T8s are slim, energy efficient fluorescent lamps that generate more light per watt than conventional lighting.

Envelope

The walls and roof have R-12 and R-20 insulation, respectively. Since the garage is maintained at such a low temperature, upgrading the wall insulation would not result in sufficient energy savings to make this upgrade worthwhile. The roof insulation, however, could be upgraded for a much lower cost. This upgrade will involve providing an access hatch to the attic and adding R-20 insulation above the ceiling.

More cost-effective upgrades include weather-stripping and caulking the doors to reduce infiltration. The vehicle and pedestrian doors should be weather-stripped and the frame of the vehicle door should be caulked.

8.0 FIRE HALL

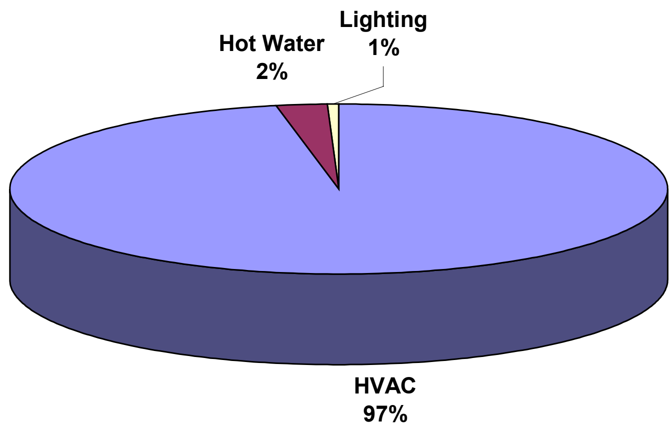
8.1 BACKGROUND

The Fire Hall was constructed in the 1940s of concrete block walls with 2" of fibreglass insulation. Half of the roof is insulated with 6" of zonolite while the other half has 6" of fibreglass insulation. The washroom and showers are located in the basement. The Fire Hall is occupied 2 to 3 hours every 2 weeks for training, and for approximately 1 hour per week for calls.

Photo 7 – Fire Hall

This building uses electricity exclusively for lighting, heating and water heating. There are two heat recovery ventilators (HRVs) for both the main floor and the basement. These HRVs preheat the intake air to the building with the building's exhaust air and thus save in energy required for heating. In the previous year, the total electrical energy consumption was 47,470 kWh. The breakdown of this energy is shown in the following pie chart.

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



The Fire Hall has a total of 1 toilet, 2 sinks, and 3 showers. A 184-litre electric hot water heater tank heats the water for this facility. The energy used for hot water heating was calculated based on estimates of the current hot water consumption and includes the energy required to offset the heat losses from the storage tank.

8.2 ENERGY AND WATER SAVING OPPORTUNITIES

Tables 6 and 7 show the energy and water saving opportunities for the Fire Hall. The following assumptions were made in the analysis:

- The Fire Hall is occupied for 2 to 3 hours every 2 weeks for training plus 1 hour per week for calls.
- The temperature of the hall is maintained at 16°C (61°F).
- For the purpose of water consumption, the typical occupancy is 8.

Table 6 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*
LIGHTING										
When 8' x 2 T12 ballasts burn out, replace them with T8 ballast and tubes.	6	$47	$12	$0	$324	$84	97	$6	55.7	14.5
Lighting Subtotal					**$324**	**$84**	**97**	**$6**		
ENVELOPE										
Replace 60" x 40" old slider with triple pane window.	1	$650	$525	$320	$1,106	$963	906	$54	20.3	17.7
Replace top half of vehicle door with insulated door.	1	$500	$500	$300	$912	$912	3,228	$194	4.7	4.7
Weather-strip vehicle door.	1	$100	$100	$200	$342	$342	7,383	$443	0.8	0.8
Upgrade wall insulation.	1	$6,000	$5,500	$6,000	$13,680	$13,110	4,019	$241	56.7	54.3
Upgrade roof insulation.	1	$800	$740	$800	$1,824	$1,756	3,058	$184	9.9	9.6
Envelope Subtotal					**$17,864**	**$17,083**	**18,594**	**$1,116**		
HVAC										
Install new thermostat wired to light switch.	1	$300	$300	$300	$684	$684	2,115	$127	5.4	5.4
HVAC Subtotal					**$684**	**$684**	**2,115**	**$127**		

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	47,470	$3,404	1.41
Estimated Annual Savings	20,807	$1,249	0.62
Percent Savings	44%	37%	44%

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

Table 7 Water Saving Opportunities for the Fire Hall

Description	Qty	Installed Cost/Unit ($)		Total Cost* ($)	Annual Water Savings (%)	Annual Water Savings (L)	Annual Cost Savings ($)
		Material	Labour				
Install water efficient dual flush toilets.	1	$284	$150	$495	70%	4,218	$1.09
Install water efficient showerheads	1	$21	$21	$50	29%	695	$0.18

* The total cost column includes 14% taxes

KGS GROUP

8.3 GENERAL RECOMMENDATIONS

Lighting

The majority of the lighting in the Fire Hall consists of T12 fluorescents. It is recommended to replace these T12s with energy efficient T8s once the T12 ballasts burn out. The lighting analysis summary for the shop is shown in Table B.7.3.

HVAC

The thermostat for the electric furnace in the shop should be replaced with a thermostat wired to the light switch. To save energy, this thermostat should be set up such that when the lights are shut off, the temperature is automatically set back to 15°C (59°F).

Envelope

The walls of the Fire Hall have only 2” of fibreglass insulation and the roof has 6” of insulation. The energy savings and payback periods for upgrading the wall and roof insulation to R-20 and R-40, respectively, are shown in Table 6 above. The capital cost for upgrading the roof insulation is much lower than for the walls resulting in a shorter payback period.

Replacing the old double pane slider with a new triple pane window would reduce heat losses through the window and reduce the infiltration by providing a better seal. The bottom half of the vehicle door is already insulated but the top half is not. It is recommended that the top half of this door be replaced with an insulated door. The most cost-effective opportunity for energy savings is to seal all the cracks around the vehicle door with new weather-stripping and caulking.

Water

Table 7 shows the water savings that would result from installing a dual flush toilet and water efficient showerheads. It was assumed that the showers are used only once a week. If the showers are used more often, the savings will increase.

KGS GROUP

9.0 WATERLINE PUMPHOUSE

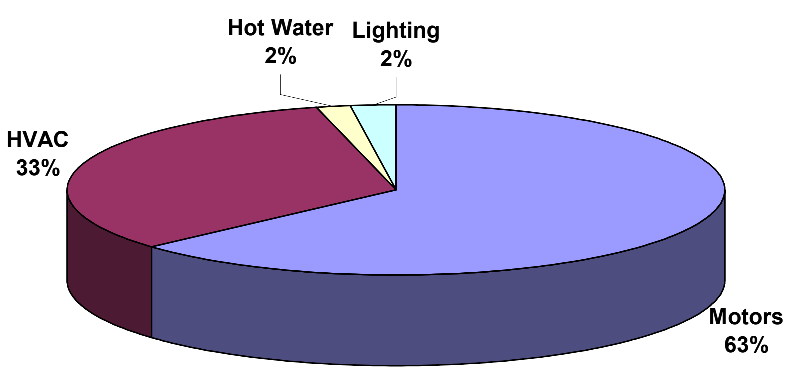
9.1 BACKGROUND

The Waterline Pumphouse is a 269 square foot building. This building was constructed approximately 10 years ago of wood studs with plywood interior sheeting and a metal clad exterior. The pumphouse holds 3 distribution pumps and one truck fill pump.

Photo 8 – Waterline Pumphouse

The Waterline Pumphouse uses electricity exclusively for lighting, heating, water heating, and to run the pump motors. In the previous year, the total electrical energy consumption was 44,930 kWh. The breakdown of this energy is shown in the following pie chart.

Energy Breakdown (% of Total kWh)
for the Waterline Pumphouse



The pumphouse has one sample sink with both hot and cold water. A 102-litre electric hot water heater tank heats the water for this facility. The energy used for hot water heating includes the energy required to offset the heat losses from the storage tank.

9.2 ENERGY AND WATER SAVING OPPORTUNITIES

Table 8 shows the energy saving opportunities for the Waterline Pumphouse. The following assumptions were made in the analysis:

- The pumphouse is occupied for approximately 1 hour every day.
- The temperature is maintained at 10°C (50°F).

Table 8 Energy Saving Opportunities for the Waterline Pumphouse

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years	
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
LIGHTING										
When 100W incandescent bulbs require replacement, replace them with compact fluorescents.	2	$13	$8	$0	$30	$18	53	$3	9.4	5.8
When 300W incandescent bulbs require replacement, replace them with compact fluorescents.	1	$15	$10	$0	$17	$11	81	$5	3.5	2.3
Lighting Subtotal					**$47**	**$30**	**134**	**$8**		
ENVELOPE										
Upgrade roof insulation to R-40.	1	$154	$149	$83	$270	$265	313	$19	14.4	14.1
Envelope Subtotal					**$270**	**$265**	**313**	**$19**	**14.4**	14.1
HOT WATER										
Install instantaneous water heater.****	1	$300	$300	$500	$912	$912	786	$47	19.3	19.3
Water Subtotal					**$912**	**$912**	**786**	**$47**		

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	44,930	$3,333	1.34
Estimated Annual Savings	1,232	$74	0.04
Percent Savings	3%	2%	3%

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

9.3 GENERAL RECOMMENDATIONS

Lighting

The lighting analysis summary for the pumphouse is shown in Appendix B, Table B.8.3. When the 100W and 300W incandescents burn out, they should be replaced with compact fluorescents to save energy.

Envelope

The insulation in the roof of the Waterline Pumphouse is assumed to have R-20 insulation. The energy savings and payback period for upgrading this to R-40 is shown in Table 8 above.

Water

The hot water tank is only used to heat the water for the sample sink. One recommendation is to replace the tank with an instantaneous water heater. This will eliminate the heat losses from the storage tank. In addition, an instantaneous water heater has a longer life than a hot water tank and will therefore save in the cost of replacement water tanks.

Water Pumps

When the water pumps require replacement, replace them with high hydraulic efficiency and high motor efficiency pumps.

10.0 WASTE MANAGEMENT FACILITY #1

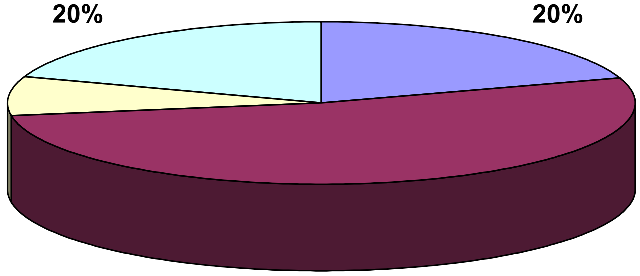
10.1 BACKGROUND

The Waste Management Facility #1, constructed in 1997, is a 4,284 square foot building. Both the interior and exterior walls of this building are metal clad with 6" of fibreglass insulation. Half of this building is heated with an electric boiler for infloor heating while the other half is unheated. This facility is occupied Monday to Friday, from 7:30am – 5:00pm in the winter and for 7 days per week throughout the summer.

Photo 9 – Waste Management Facility #1

This facility shares its electrical service with the Waste Management Facility #2. Based on the assumptions listed below, the portion of the electricity bill that was consumed by this facility in the previous year was calculated as 57,830 kWh. This energy was split between lighting, heating, water heating, and motors for the balers and conveyor as shown in the pie chart below.

Energy Breakdown (% of Total kWh)
for the Waste Management Facility #1



The washroom in the Waste Management #1 contains a total of 1 toilet, 1 urinal, 1 sink, and 1 shower. A 175-litre electric hot water heater tank heats the water for this facility. The energy used for hot water heating was calculated based on estimates of the current hot water consumption and includes the energy required to offset the heat losses from the storage tank.

10.2 ENERGY AND WATER SAVING OPPORTUNITIES

Tables 9 and 10 show the energy and water saving opportunities for the Waste Management Facility #1. The following assumptions were made in the analysis:

- In the winter, this facility is occupied Monday – Friday, 9 ½ hours per day and in the summer, this facility is occupied 7 days per week.
- The temperature of the heated area of this facility is maintained at 21°C (70°F).
- For the purpose of water consumption, the typical occupancy is 5.

Table 9 Energy Saving Opportunities for the Waste Management Facility #1

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years	
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
LIGHTING										
When 8' x 2 T12 ballasts burn out, replace them with T8 ballasts and tubes.	8	$47	$12	$0	$431	$112	2,752	$165	2.6	0.7
When 4' x 2 T12 ballasts burn out, replace them with T8 ballasts and tubes.	6	$41	$21	$0	$282	$145	649	$39	7.2	3.7
Replace 300W incandescents with metal halides.	4	$300	$225	$300	$2,736	$2,394	1,881	$113	24.2	21.2
Replace 150W incandescents with compact fluorescents.	1	$15	$10	$13	$32	$26	336	$20	1.6	1.3
Lighting Subtotal					**$3,481**	**$2,677**	**5,618**	**$337**		
ENVELOPE										
Replace, caulk, and weather-strip pedestrian door.	1	$350	$350	$100	$513	$513	1,619	$97	5.3	5.3
Weather-strip vehicle door.	1	$100	$100	$200	$342	$342	2,698	$162	2.1	2.1
Envelope Subtotal					**$855**	**$855**	**4,317**	**$259**		
HVAC										
Replace backdraft damper and manual wood door on exhaust and inlet with motorized dampers.	2	$300	$300	$300	$1,368	$1,368	6,319	$379	3.6	3.6
HVAC Subtotal					**$1,368**	**$1,368**	**6,319**	**$379**		
HOT WATER										
Replace showerhead with water efficient showerhead.	1	$21	$21	$50	$81	$81	463	$31	2.6	2.6
Water Subtotal					**$81**	**$81**	**463**	**$31**		

TOTALS	Energy (kWh)	Cost ($)	CO_2 (Tonnes)
Existing Annual Consumption/Cost/Emissions	57,830	$3,541	1.72
Estimated Annual Savings	16,717	$1,007	0.50
Percent Savings	29%	28%	29%

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

Table 10 Water Saving Opportunities for Waste Management Facility #1

Description	Qty	Installed Cost/Unit ($)		Total Cost* ($)	Annual Water Savings (%)	Annual Water Savings (L)	Annual Cost Savings ($)
		Material	Labour				
Install water efficient dual flush toilets.	1	$284	$150	$495	70%	28,929	$7
Install water efficient showerheads.	1	$21	$21	$50	29%	12,356	$3

* The total cost column includes 14% taxes.

10.3 GENERAL RECOMMENDATIONS

Lighting

The lighting analysis summary is shown in Appendix B, Table B.9.3. The 8' and 4' T12 fluorescent lights consume a large amount of energy. When the ballasts for these lights burn out, they should be replaced with T8 fluorescent ballasts and tubes. T8s consume less energy than T12s and T12s are expected to become obsolete by 2010. Other opportunities for lighting upgrades include replacing the 300W incandescent bulbs with metal halides and replacing the 150W incandescent bulbs with compact fluorescents.

Envelope

The pedestrian door to this facility has a large gap where the top of the door meets the frame. This door also has two holes near the top and does not close properly. It is recommended to replace and weather-strip this door. The overhead door between the heated and unheated portions of this building also needs new weather-stripping. The energy savings and payback periods for these upgrades are shown in Table 9 above.

HVAC

The manual exhaust fan in this facility has a leaky backdraft damper that allows cold air to flow into the building on windy days. Similarly, the fresh air inlet has a manual wood door that doesn't seal tightly. Both the backdraft damper and the manual door should be replaced with a motorized damper to reduce the cold air infiltration into the building.

Water

In order to save both water and energy required for water heating, the high-flow showerhead should be replaced with a water efficient showerhead. From Table 10 it can be seen that installing a water efficient dual flush toilet would save 70% of the current water consumed by this fixture.

11.0 WASTE MANAGEMENT FACILITY #2

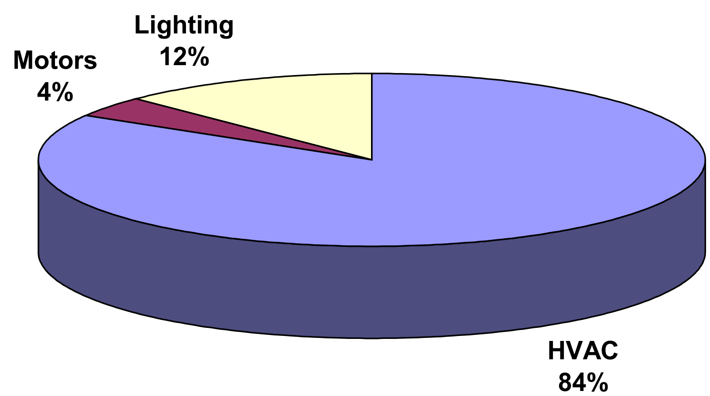
11.1 BACKGROUND

The Waste Management Facility #2 was constructed in 1998. This 5,544 square foot building has metal clad interior and exterior walls and 6" of fibreglass insulation. Similar to the Waste Management Facility #1, this facility uses an electric boiler for infloor heating. In the winter, this building is occupied Monday to Friday, 7:30am – 5:00pm and in the summer it is occupied for 7 days a week.

Photo 10 – Waste Management Facility #2

This facility shares its electrical service with Waste Management Facility #1. The total electrical energy consumed by this building in the previous year was approximately 109,100 kWh. This energy was used for lighting, heating, and the conveyor and rotary drum motors as shown in the following pie chart.

**Energy Breakdown (% of Total kWh)
for the Waste Management Facility #2**



There are no water fixtures in this facility.

11.2 ENERGY AND WATER SAVING OPPORTUNITIES

Table 11 shows the energy saving opportunities for the Waste Management Facility #2. The following assumptions were made in the analysis:

- This facility is occupied Monday to Friday, 7:30am – 5:00pm throughout the winter and for 7 days per week throughout the summer.
- The temperature of this facility is maintained at 21°C (70°F).

Table 11 Energy Saving Opportunities for the Waste Management Facility #2

Description	Qty	Installed Cost/Unit ($)			Total Cost** ($)		Estimated Annual Savings		Simple Payback Years	
		Material (NI*)	Material (WI*)	Labour	NI*	WI*	kWh	$***	NI*	WI*
LIGHTING										
When 8' x 2 T12 ballasts burn out, replace them with T8 ballasts and tubes.	20	$47	$12	$0	$1,078	$280	6,880	$413	2.6	0.7
Lighting Subtotal					**$1,078**	**$280**	**6,880**	**$413**		
ENVELOPE										
Weather-strip pedestrian doors.	2	$15	$15	$50	$148	$148	1,315	$79	1.9	1.9
Weather-strip vehicle doors.	1	$100	$100	$200	$342	$342	1,259	$76	4.5	4.5
Envelope Subtotal					**$490**	**$490**	**2,575**	**$155**		
HVAC										
Replace backdraft dampers and manual door on exhaust and air intakes with motorized dampers.	6	$300	$300	$300	$4,104	$4,104	6,319	$379	10.8	10.8
Install geothermal heating system.	1	$19,000	$19,000	$12,000	$35,340	$35,340	60,767	$3,648	9.7	9.7
HVAC Subtotal					**$39,444**	**$39,444**	**67,085**	**$4,028**		

TOTALS	**Energy (kWh)**	**Cost ($)**	**CO_2 (Tonnes)**
Existing Annual Consumption/Cost/Emissions	109,100	$6,680	3.25
Estimated Annual Savings	76,540	$4,595	2.28
Percent Savings	70%	69%	70%

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

11.3 GENERAL RECOMMENDATIONS

Lighting

The lighting analysis summary table is shown in Appendix B, Table B.10.3. A good opportunity for energy savings in terms of lighting is to replace the T12 fluorescent lights with T8s when the T12 ballasts burn out.

Envelope

The walls and roof of this building have good insulation and there are no windows. The only opportunities for energy savings are to weather-strip the pedestrian and vehicle doors. This will help to reduce the cold air infiltrating into the building in the winter.

HVAC

The backdraft dampers on the exhaust fans and fresh air intakes to the building allow cold air to leak into the building on windy days. The recommendation is to replace these backdraft dampers with motorized dampers and install motorized dampers in the fresh air intakes that will provide a better seal when they are closed.

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

12.0 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 12.1 to 12.5) and maintenance activities (Section 12.6) that will result in energy / water savings for all the buildings.

12.1 LIGHTING AND ELECTRICAL

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

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

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

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

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

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

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

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

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

12.2 BUILDING ENVELOPE

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

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

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

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

12.3 HEATING, VENTILATION, AND AIR CONDITIONING

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

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

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

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

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

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

Vehicle Emission Sensors – For garages and fire halls, a vehicle emission sensor will monitor the level of vehicle emissions in the air and could be set up to control the ventilation such that the room is ventilated only when required. This is an energy saving feature and provides increased safety for occupants.

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

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

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

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

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

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

12.4 WATER CONSUMPTION

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

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

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

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

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

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

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

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

12.5 ICE RINKS

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

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

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

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

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

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

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

12.6 MAINTENANCE

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

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

Heating/Ventilation Systems

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

Air Conditioning/Ice Plant Systems

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

13.0 IMPLEMENTATION OF ENERGY AND WATER SAVING OPPORTUNITIES

13.1 IMPLEMENTATION

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

In-House Implementations

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

Contractor Implementations

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

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

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

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

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

Consulting Engineer Implementations

The only energy saving opportunity for the R.M. of Whitemouth that requires a consultant to implement is the geothermal heating system in the Waste Management Facility #2. This system will require a detailed site investigation, bore hole testing, and energy modeling of the building to properly size the geothermal system.

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

13.2 FINANCING

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

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

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

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

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

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

13.3 POLITICAL FRAMEWORK

General Municipal Environment in Manitoba

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

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

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

Political Environment in the R.M. of Whitemouth

The Chief Administrative Officer of the R.M. of Whitemouth expressed an interest in this study and in using the results from this study to implement some of the more cost-effective measures in the future. One concern that was expressed by the R.M. throughout the visit was in the light quality/quantity given by the energy efficient light fixtures. Mr. Joel Lambert reassured the people with concerns that the light quality/quantity from T5 and T8 fixtures and LED exit signs is excellent.

Whitemouth has already shown an interest in energy efficient systems as was proven by the installation of two heat recovery ventilators in the Fire Hall and infloor heating systems in the Waste Management Facilities.

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

14.0 PERFORMANCE VERIFICATION

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

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

Following the implementation of the measures discussed in this report, the energy consumption should be recorded. The year headings may need to be re-entered, depending on when the implementations are completed. The monthly energy consumption in kWh taken from the building's hydro bill should be recorded in the "Billed Energy Consumption" column. The monthly 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 Winnipeg, Manitoba 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.

15.0 WATER DISTRIBUTION AND WASTEWATER COLLECTION SYSTEM AUDITS

15.1 WATER DISTRIBUTION SYSTEM OVERVIEW

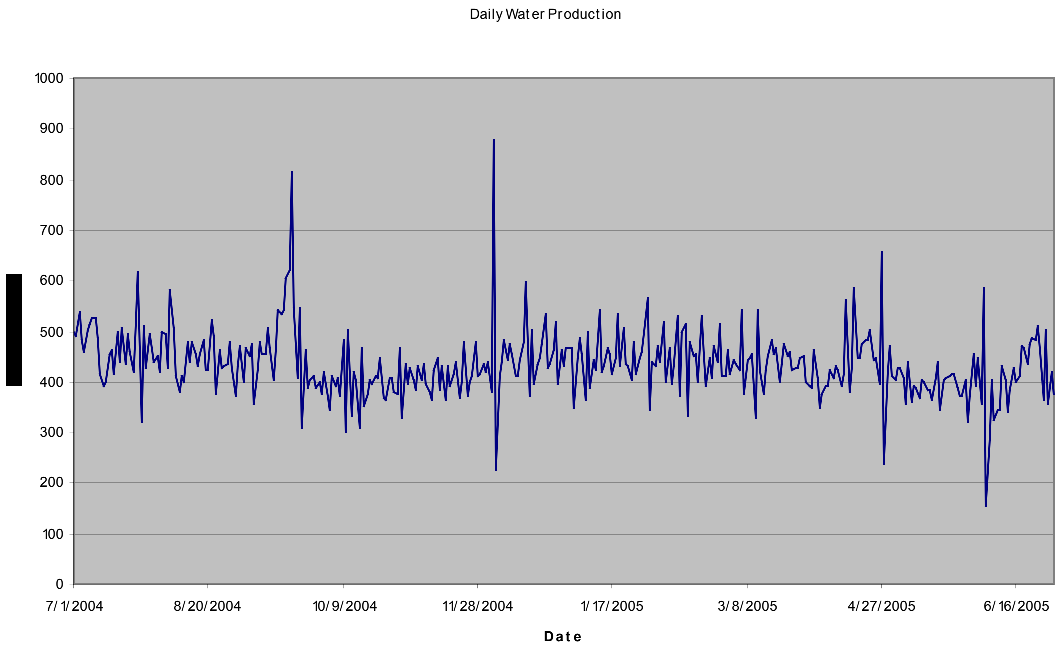
The R.M. of Whitemouth constructed a water treatment and distribution system in 1992. The plant supplies water to the R.M., as well as to some dairy and beef operators, and a Hutterite colony.

Raw water is drawn from Natalie Lake and pumped to a reservoir with a storage capacity of 6.82 m^3 (1,500 imperial gallons). Water entering the raw water reservoir is measured by a 4-inch Sensus water meter, which sends a signal to the chlorine pump after every 100 liters of measured water flows into the plant. After chlorination, the water is pumped into the distribution system by one of the three distribution pumps, which maintain the distribution system pressure at approximately 50 psi.

Based on data provided, the average amount of water produced from July 2004 through June 2005 was approximately 435.3 m^3 per day with a maximum daily flow of approximately 877.4 m^3. Based on 775 people served, the average water produced per capita is approximately 561.7 lpcd. This is higher than typical; however, there are a significant number of agricultural operations supplied by the waterworks, which use a large amount of water for agricultural operations. Therefore, the average water produced per capita is supplied in this report for informational purposes only.

Chart 1 shows the amount of treated water entering the distribution system on a daily basis for the period from July 2004 through June 2005. Previous to late 2004/early 2005, a bypass was present after the meter that directed water back to the wet well. However, the bypass was relocated to before the meter and water passing through this line no longer passes through the meter.

Chart 1 Daily Water Production



According to information provided by the municipality, the distribution system is approximately 68,397 m (42.5 miles) in length. However, Agriculture and Agri-food Canada indicated that the total length of the distribution system was 91,500 m. All of the piping in the distribution system is PVC pipe. Table 12 shows the breakdown of distribution piping by diameter as supplied by Agriculture and Agri-food Canada.

Table 12 Length of Distribution Piping by Pipe Diameter

Pipe Diameter (mm)	Length of Pipe (m)
200	23,200
150	9,000
100	13,800
75	36,000
50	9,500

Every service connection along the distribution system has a flow restrictor installed. There are three sizes of restrictors currently being used by the R.M. of Whitemouth; a 3 imperial gallon per minute restrictor, a 5 imperial gallon per minute restrictor, and one connection has a 25 imperial gallon per minute restrictor.

The annual maintenance costs for the water treatment and distribution system is approximately $33,900. $23,600 of this budget goes towards parts and contract labour, while the remaining $10,300 is used to pay staff.

Water Meters

The main water meter in the water treatment plant is a 4-inch Sensus impulse contactor meter. The meter was tested in late 2004 or early 2005 and found to be reading approximately 10% too low at low flows. The meter was not re-calibrated. In the past, there was a bypass that allowed metered water to continually flow back to the wet well, however, when the meter was tested, this line was relocated so that the recirculating water would not be metered. There is also a 3-inch Class W-350 Sensus water meter used to measure the amount of water flowing through the truck fill line.

Meters are read and clients are charged quarterly. Three times per year, customers call in their own readings and once per year, at the start of July, the R.M. sends out a worker to take meter readings. There are 135 client water meters along the distribution system. 111 of the connections have 3-gpm flow restrictors, 23 of the connections have 5-gpm flow restrictors, and one connection has a 25-gpm flow restrictor. Table 13 shows the breakdown by meter size.

Table 13 Water Meter Breakdown by Size

Meter Size	5/8"	1"	2"	Total
Number	131	3	1	135

Pumps

There are three distribution pumps that supply water to the distribution system, as well as a truck fill pump that supplies the bulk sales line. All four of the pumps are located in the water treatment plant. Table 14 lists the available relevant pump data.

Table 14 Water Distribution Pump Data

Function	Model Number	Motor Size (hp)	Pump Manufacturer	Motor Manufacturer
Truck Fill Pump	Unknown	7.5	Grundfos	Franklin
Distribution Pump #1	80S50	5	Grundfos	Franklin
Distribution Pump #2	80S50	5	Grundfos	Franklin
Distribution Pump #3	40S30	3	Grundfos	Franklin

Water Rates

Every service connection has either a 3-gpm or 5-gpm restrictor, with the exception of one connection, which has a 25-gpm flow restrictor. The minimum quarterly charge for water service for a connection with a 3-gpm restrictor is $37.65, which includes 3,000 imperial gallons of water. If the client uses more than 3,000 imperial gallons, the extra water is charged at a rate of $4.55 per thousand imperial gallons up to 15,000 imperial gallons of water consumed per quarter. If the client uses more than 15,000 imperial gallons, the amount over 15,000 imperial gallons is charged at a rate of $1.75 per 1,000 imperial gallons. The minimum quarterly charge for water service for a connection with a 5-gpm restrictor is $108.25, which includes 15,000 imperial gallons of water. If the client consumes more than 15,000 imperial gallons of water in a quarter, the excess water is charged at a rate of $1.75 per thousand imperial gallons. Bulk water is also available, and it is charged at a rate of $7.00 per 1,000 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.

The distribution system is flushed approximately once per year, and swabbed every second flushing.

15.2 WATER DISTRIBUTION SYSTEM AUDIT RESULTS

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

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

A program for checking client water meter accuracy can also increase revenues for the R.M. 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 R.M. to bill for the correct amount and recover production costs that would otherwise be attributed to unaccounted-for water loss.

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

15.2.1 Unaccounted-For Water Loss

As calculated from the data supplied by the R.M. of Whitemouth, the R.M. has an unaccounted-for water loss of approximately 20.1% over the period from July 2004 through June 2005. If a 2 gpm recirculation flow is assumed (until the end of 2005), the unaccounted for water loss will drop to approximately 19%. This recirculation line was relocated near the end of 2005 so that the recirculating water does not pass through the meter.

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

Leakage

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

Meter Accuracy

It is important to check the accuracy of not only client water meters, but the water meter at the treatment plant as well. The production meter was tested in late 2004/early 2005 and shown to be inaccurate at low flows, therefore the R.M. will not have reliable data on the amount of water it is treating and sending to the distribution system. This can lead to problems when trying to assess the amount of unaccounted-for water leaving the system, as more water would be leaving the system than would actually be recorded. The inaccuracy of the meter at low flows will result in the actual percentage of unaccounted for losses being higher than the calculated value.

As for the client water meters, ensuring client water meters are accurate will increase revenues for the R.M. if these meters had previously been under reading. Accurate client meters will also allow the R.M. to better assess the amount of unaccounted-for water leaving the system, since water that would be unaccounted-for if the meters were inaccurate would actually be included in water consumption data.

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

Other

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

15.2.2 Maintenance Program

It is recommended that the R.M. develop a program for testing the accuracy of client water meters. One cost-effective method would be to hire a summer student that would test the accuracy of the meters.

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

15.2.3 Possible Cost Savings

The R.M. of Whitemouth's water treatment and distribution system is experiencing a large unaccounted-for water loss, according to information provided. For the period under review, the treatment and distribution system experienced a loss of 19% of the total amount of water that had been treated.

It is recommended that the R.M. conduct a feasibility study into ways of reducing the unaccounted-for water loss through methods such as leak detection and prevention programs, and replacing sections of pipe prone to leakage or breakage. The R.M. should be able to reduce the unaccounted-for water loss to within 10-15% of the total treated water produced. Though it would be possible to reduce the unaccounted-for water loss even more, Environment Canada states that it is not usually economically feasible to do so. If the R.M. were able to reduce their unaccounted-for water loss, chemical costs associated with treating the water and electrical costs associated with pumping the treated water would be reduced. For example, if the Town were to reduce unaccounted-for water loss to 15% from the current 19%, there would be a reduction in the amount of chemicals needed for treating the water of approximately 4%. This 4% reduction in chemical cost would, according to information provided, correspond to annual savings of approximately $280 in chemicals and $70 in electricity to run the pumps.

15.3 WASTEWATER COLLECTION SYSTEM OVERVIEW

The R.M. of Whitemouth's wastewater collection and treatment system was constructed in 1971 and is located in the Village of Whitemouth. According to operation staff, the collection system is approximately 6,064 m (19,894 ft) in length. There are 51 manholes located throughout the collection system, which allow access for any maintenance that is required. Table 15 gives a breakdown of the collection system piping by type of pipe and pipe diameter.

Table 15 Wastewater Collection Pipe Breakdown

Type of Pipe	Pipe Diameter (mm)	Length of Pipe (m)
Asbestos Cement	200	627
Asbestos Cement	300	2,732
PVC	200	886
PVC	250	600
PVC	50	1,219

The sewage collection system is restricted to sewage only. The R.M. has a by-law that restricts the flow from sump pumps being discharged into the sewer system. However, operation staff mentioned that this by-law is difficult to enforce. The major advantage of a sewer system for strictly sanitary sewage flows is that the amount of infiltration and inflow into the sewer system will be limited, thus saving the R.M. money on pumping costs, as well as reducing the lagoon capacity required to treat and store the wastewater.

There are two lift stations located in manholes that collect the wastewater and pump it to the sewage lagoon. The lift station on 1st Street has a Flygt 3085 pump, while the lift station on Front Street has two Flygt 3085 pumps. The lagoon has two cells. The primary cell has a storage capacity of approximately 22,730 m^3 (5,000,000 imperial gallons), while the secondary cell has a storage capacity of approximately 18,184 m^3 (4,000,000 imperial gallons). After treatment, the secondary cell of the lagoon discharges to the Whitemouth River, which occurs approximately three times per year.

The annual operating and maintenance cost for the sewer system was $8,200 in 2005, of which approximately $1,100 is for electrical costs from running the pumps at the sewage lift stations.

Pumps

There are three pumps used to collect wastewater and pump it to the sewage lagoon. The pumps are located within their respective lift stations. Table 16 lists the available relevant pump data.

Table 16 Lift Station Pump Data

Function	Model Number	Motor Size (hp)	Manufacturer
Front Street Lift Station Pumps (2)	3085	3	Flygt
1st Street Lift Station Pump	3085	3	Flygt

Sewer Rates

Businesses throughout Whitemouth are charged based on their wastewater production as compared to a typical household. The amount of wastewater produced at a typical household is considered 1 "Residential Equivalent Unit." In order to calculate the amount a business should pay for sewer service, their calculated "Residential Equivalent Units" are multiplied by the base sewer commodity charge of $9.50 per quarter. There is also a service charge of $6.80 per quarter that every client must pay, regardless of his or her "Residential Equivalent Units." Table 17 provides the sewer billing rate structure.

Table 17 Sewer Billing Rate Structure

Residential Equivalent Units	Customer Service Charges	Sewer Commodity Charges	Total Quarterly Charges
1	$6.80	$9.50	$16.30
1.5	$6.80	$14.25	$21.05
2	$6.80	$19.00	$25.80
3	$6.80	$28.50	$35.30
3.5	$6.80	$33.25	$40.05
11	$6.80	$104.50	$111.30
17	$6.80	$161.50	$168.30
30	$6.80	$351.50	$358.30
37	$6.80	$370.50	$377.30

Maintenance Programs

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

15.4 WASTEWATER COLLECTION SYSTEM AUDIT RESULTS

Due to the fact that the R.M. of Whitemouth has a by-law in place that minimizes the amount of storm water that enters the sewer system, there should not be a large discrepancy in the volume of water pumped to the lagoon over the course of a year.

The information required in order to perform a sewer system audit was not available. In order to determine the amount of infiltration and inflow into the system, daily flows through the system would be required. With at least a year's worth of daily flows, average dry and wet weather flows could be determined; and using these two numbers, the infiltration and inflow into the system can be determined.

Data received indicates that the R.M. has started to record pump run times, as of 2006. This is a good first step towards being able to estimate the sewer flows. However, using pump hours to estimate flows can be very inaccurate and will be affected by: pump plugging, worn impellers, and other conditions, which result in a reduced volume of sewage actually pumped than would be expected for the recorded time frame. This will result in an exaggerated volume of sewage pumped. It is recommended that the R.M. install a flow meter, such as a magnetic flow meter, at the sewage lift station and record the daily meter reading so that the amount of wastewater flowing through the system can be more accurately determined.

Through measures such as sealing manholes and lining pipes, the municipality could potentially decrease infiltration and inflows to the sewer system. Further studies should be conducted to determine the feasibility of these infiltration reduction options, since they may not be cost effective in the R.M. of Whitemouth's specific case. Since information on the amount of infiltration and inflow into the system is unavailable, the actual potential savings cannot be calculated, but reducing infiltration will reduce pumping costs and extend the effective life of the lagoon.

It is recommended that the R.M. conduct a study in order to determine feasible options to deal with extraneous storm water sources. This should be done once a flow meter has been installed and meter readings have been recorded for a sufficient length of time to determine the infiltration and inflow into the system. This study would likely include a detailed review of the manholes within the system and the televising of the sewage collection system.

Maintenance Program

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

15.5 PUBLIC EDUCATION

Providing public education will create a better understanding of the water and wastewater treatment systems. If residents are aware of the processes and costs involved with treating and distributing drinking water and collecting and treating sewage, they will be more accepting of cost reduction efforts. A program that highlights the environmental and monetary benefits of water use reduction can help the community gain support for initiatives such as the following:

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

15.6 RECOMMENDATIONS

The following is a list of recommendations for both the water and wastewater collection systems in the R.M. of Whitemouth:

1. Develop a program for assessing the accuracy of client water meters.
2. Develop a program for scheduled leak detection of the water distribution system.
3. Develop a leak detection and prevention program.
4. Develop a routine maintenance program for the lift station pumps to ensure they continue to work at an efficient level.

5. Calibrate the main water meter for low flows or replace the measuring chamber.

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

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

8. Provide public education on the wastewater collection and water treatment systems as discussed in Section 15.5.

APPENDIX A

INVENTORY SHEETS

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BUILDING INSPECTION INVENTORY

Revision 2

Municipality: R.M. of Whitemouth	**Date: April 4, 2006**
Toured By: Joel Lambert	**Construction Date: At least 70 years old**
Building: Municipal Office	**Renovations: None**
Address: 49 Railway Avenue	
L x W x H: 54' x 51' x 15'9" **Area: 2,754 ft^2**	
Building Capacity:	
Building Floor Plan: Office, council, and library.	**Occupied Times: 8:30 – 4:30 Mon – Fri plus 3 evenings/week.**

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: Brick and Stucco (assume R-12). ½ of basement is full, ½ of basement is crawlspace. ¼ of basement is uninsulated, crawlspace has R10 (2" rigid).
Roof Type/R-value: Apshalt shingles (peaked roof). R40 (12" of fibreglass).
Door Type/weather stripping: Back **–** metal 3' x 6'8" – needs caulking – w/s is good. West side – metal 6' x 6' 8" – needs caulking and weather-stripping. Front Office Door (vestibule) – storefront type door, double pane, aluminum frame – door closer should be adjusted to hold door closed (is loose).
Window type/caulking: Basement – 2 x 30" x 30" double pane PVC – Caulk is good, 30" x 30" condemned – plywood, 26" x 32" condemned – plywood, 25" x 18" condemned – plywood, 30" x 30" condemned – styrofoam (under deck), 30" x 32" double PVC – caulk is good. Main Floor – 3 x 44" x 72" PVC (bottom 24" is awning type, the rest is fixed) – triple pane. 2 x 44" x 72" condemned – plywood (insulated). 3 x 44" x 72" aluminum frame (bottom 24" are leaky sliders), one was replaced in 1999 (front of building). 2 x 44" x 72" fixed PVC triple pane (back of library).
Other:
MECHANICAL
Heating System: Baseboard electric heaters with 9 stats, 1 unit heater in basement with built in stat. Kept at 22 C all the time.
Cooling System: Split system – Samsung condensing unit US24A2RC in R.M. office only.
Ventilation System: Central exhaust fan for bathroom and kitchen on all the time (has humidistat but it is set to on)
HVAC Controls: In clothing storage it is very hot but stat says 10 C – stat is defective or needs recalibration. Temperature is manually setback in council chamber when unoccupied.
HVAC Maintenance/Training:
Water Supply System: Whitemouth water co-op.
Domestic Hot Water System: 175 L, 3 kW electric domestic hot water tank with no pipe insulation.
Water Fixtures: 1 low flow lavatory, 1 3.8L urinal, 1 6L toilet. 1 high flow lavatory, 1 low flow urinal, 1 16L toilet.

ELECTRICAL
Indoor Lighting: 27 - 4' x 4 T12s. 2 – 4' x 2 T12s. 5 incandescents – 2 are on a lot, 3 are off most of the time.
Outdoor Lighting: 6 incandescent flood lamps (60W) under library's canopy – on during visit (noon). 1 HPS or MH - off during visit.
Exit Signs: 6 incandescent exit signs (5 are burn out).
Motors:
Parking Lot Plugs: 2 receptacles (4 plugs). 2 cars plug in occasionally.
OTHER BUILDING SYSTEMS
Ceiling fan in council chamber on rheostat.
PROCESS SYSTEMS
Hydro, Water.
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
NOTES

BUILDING INSPECTION INVENTORY
Revision 2

Municipality: R.M. of Whitemouth		**Date: April 4, 2006**
Toured By: Joel Lambert		**Construction Date: 1972 – 1973**
Building: Municipal Shop #1		**Renovations: No**
Address: 51 Railway Ave		
L x W x H: 44' x 60' x	**Area:2,640 ft^2**	
Building Capacity: 3 – 4 on average.		
Building Floor Plan:		**Occupied Times: 7:30 – 4:00 Mon-Fri**

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: 2 x 6 studs with fibreglass R20. Metal clad exterior, GWB interior.
Roof Type/R-value: R20 metal clad exterior, GWB interior.
Door Type/weather stripping: 2 x 36" x 6'8" man door – insulated steel needs weather-stripping badly. Caulk is good. 2 x 16' x 13' overhead doors in good condition c/w 24" x 12" double pane windows.
Window type/caulking: 4 x 46" x 28" slider 2 single panes with PVC slides (2 in shop, 2 in office).
Other: One ceiling fan.
MECHANICAL
Heating System: 4 Unit heaters with built in stat. 2 Baseboard electric heaters with built in stat.
Cooling System: None
Ventilation System: 2 wall mounted exhaust fans with backdraft damper.
HVAC Controls: Office is kept at 20 C, shop is kept at 16C.
HVAC Maintenance/Training:
Water Supply System: Whitemouth Water Co-op.
Domestic Hot Water System: 40 gallon, 3000W DHWT – barely any exposed pipe to insulate.
Water Fixtures: 1 kitchen sink in bathroom, 1 shower (high flow), 1- 13.25 LPF toilet.

ELECTRICAL
Indoor Lighting: 6 - 4' x 2 T12s. 9 – 8' x 2 T12s. 2 incandescents.
Outdoor Lighting: 1 metal halide.
Exit Signs: None
Motors:
Parking Lot Plugs: 2 receptacles (4 plugs).
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
Hydro, water.
NOTES

BUILDING INSPECTION INVENTORY
Revision 2

Municipality: R.M. of Whitemouth	**Date: April 4, 2006**
Toured By: Joel Lambert	**Construction Date: Late 1950s or early 1960s**
Building: Municipal Shop #2	**Renovations: No**
Address: Lot 8 Block 2	
L x W x H: 60' x 32' x 14' — **Area: 1920 ft^2**	
Building Capacity:	
Building Floor Plan:	**Occupied Times: Approximately 5 hours/week.**

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: 4' high concrete (no insulation), the rest is metal with spray foam (approx. 1.5").
Roof Type/R-value: Metal with 1.5" of spray foam but foam is falling off in places.
Door Type/weather stripping: 14' 8" x 12' 6" sliding vehicle doors. Metal with 1.5" spray foam.
Window type/caulking: 4 x 44" x 32" metal frame single pane.
Other:
MECHANICAL
Heating System: Unheated
Cooling System: none
Ventilation System: none
HVAC Controls: none
HVAC Maintenance/Training:
Water Supply System: none
Domestic Hot Water System: none
Water Fixtures: none

ELECTRICAL
Indoor Lighting: 9 x 200W incandescents but only 3 are typically used. Lights are on for 1 hour/day unless they are left on.
Outdoor Lighting: 1 metal halide
Exit Signs: None
Motors:
Parking Lot Plugs:
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
NOTES
This shop is used as a cold storage shed. Vehicles are parked inside and plugged in.

BUILDING INSPECTION INVENTORY
Revision 2

Municipality: Whitemouth	**Date:** October 24, 2005
Toured By: Ken Barnard	**Construction Date:**
Building: Hospital St. Lift Station	**Renovations:** None
Address: Lot 12, Block 1	
L x W x H: 11.3 ' diameter / **Area: 100 ft^2**	
Building Capacity:	
Building Floor Plan:	**Occupied Times:** None

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: • Not Applicable.
Roof Type/R-value: • Not Applicable.
Door Type/weather stripping: • Not Applicable.
Window type/caulking: • Not Applicable.
Other: • Lift station consists of concrete manhole type installation. Accessed from above ground surface.
MECHANICAL
Heating System: • Manhole cover insulated with 2: styrofoam
Cooling System: • Not Applicable
Ventilation System: • Not Applicable
HVAC Controls: • Not Applicable
HVAC Maintenance/Training: • Not Applicable
Water Supply System: • Not applicable
Domestic Hot Water System: • Not Applicable
Water Fixtures: • Not Applicable

ELECTRICAL
Indoor Lighting: • Not Applicable
Outdoor Lighting: • Not Applicable
Exit Signs: • Not Applicable
Motors: • Not applicable
Parking Lot Plugs: • Not Applicable
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
Sewage Pumps: • 1 – Flygt; 5 hp; submersible pumps
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
• Main power supply and control panel mounted on pole outside of lift station.
NOTES

BUILDING INSPECTION INVENTORY
Revision 2

Municipality: Whitemouth		**Date:** October 24, 2005
Toured By: Ken Barnard		**Construction Date:**
Building: Front St. Lift Station		**Renovations:** None
Address: Railway Ave Lot 2 B3		
L x W x H:	**Area: 100 ft^2**	
Building Capacity:		
Building Floor Plan:		**Occupied Times:** None

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: • Not Applicable.
Roof Type/R-value: • Not Applicable.
Door Type/weather stripping: • Not Applicable.
Window type/caulking: • Not Applicable.
Other: • Lift station consists of concrete manhole type installation. Accessed from above ground surface.
MECHANICAL
Heating System: • Manhole cover insulated with 2: styrofoam
Cooling System: • Not Applicable
Ventilation System: • Not Applicable
HVAC Controls: • Not Applicable
HVAC Maintenance/Training: • Not Applicable
Water Supply System: • Not applicable
Domestic Hot Water System: • Not Applicable
Water Fixtures: • Not Applicable

ELECTRICAL
Indoor Lighting: • Not Applicable
Outdoor Lighting: • Not Applicable
Exit Signs: • Not Applicable
Motors: • Not applicable
Parking Lot Plugs: • Not Applicable
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
Sewage Pumps: • 2 – Flygt; model 3085.182.0938; 2.2 kW (3hp); 3 phase; 60 hz; 1700 rpm; 230 V; 8.7 Amp; submersible pumps
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
• Main power supply and control panel mounted on pole outside of lift station.
NOTES

BUILDING INSPECTION INVENTORY

Revision 2

Municipality: R.M. of Whitemouth		**Date: April 4, 2006**
Toured By: Joel Lambert		**Construction Date: 1978**
Building: Small Garage		**Renovations:**
Address: Railway Ave Lot 1		
L x W x H: 26' x 15' x 9'8"	**Area: 390 ft^2**	
Building Capacity:		
Building Floor Plan:		**Occupied Times:**

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: 2x4 studs with R12 fibreglass and GWB on inside. Exterior siding.
Roof Type/R-value: Peaked roof with asphalt shingles. No access. Ken thinks it's R20.
Door Type/weather stripping: 1 Overhead door 10' x 9' – damaged – frame needs to be caulked – needs w/s. 1 man door – 3' x 6'8" – needs w/s.
Window type/caulking: None
Other:
MECHANICAL
Heating System: Electrical unit heaters with built-in stat – don't know if it's heated.
Cooling System: None
Ventilation System: No ventilation – used for chemical storage and sprayer truck storage**.**
HVAC Controls: None
HVAC Maintenance/Training:
Water Supply System: None
Domestic Hot Water System: None
Water Fixtures: None

ELECTRICAL
Indoor Lighting: 5 – 4'x2 T12s.
Outdoor Lighting: None
Exit Signs: None
Motors: None
Parking Lot Plugs: 1 plug
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
Hydro (not a demand meter)
NOTES

BUILDING INSPECTION INVENTORY
Revision 2

Municipality: R.M. of Whitemouth		**Date: April 4, 2006**
Toured By: Joel Lambert		**Construction Date: Approx. 1940s**
Building: Fire Hall		**Renovations: Sealing cracks on basements, water infiltration – recommended re-insulating on outside foundation wall and protecting insulation with tin flashing.**
Address: CPR RW Whitemouth 6		
L x W x H: 37' x 40' + (40' x 14')/2	**Area: 1760 ft^2**	
Building Capacity:		
Building Floor Plan:		**Occupied Times: 2 – 3 hours every 2 weeks for training plus 1 hour/week.**

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: Stucco – concrete block walls strapped with 2" x 2" and has 2" of fibreglass. Assume R-7.
Roof Type/R-value: Peaked roof with asphalt shingles. Inside has GWB over plywood. ½ of building is 6" of Zonolite, ½ is 6" of fibreglass. Assume R-20.
Door Type/weather stripping: 1 insulated steel door – 32" x 6'8" – new. 16' x 12' Overhead door with 24" x 12" double pane (1/4" air gap) – top section is likely not insulated, bottom section has 2" of fibreglass. 1 solid wood door – 34" x 7' with no weatherstripping.
Window type/caulking: 1 - 60" x 40" old double pane (2 single panes) wood frame with plastic slides. 2 – 72" x 48" triple panes with wood frame (1985 & 1994).
Other: 3 ceiling fans
MECHANICAL
Heating System: Electric furnace, 1 baseboard heater, 2 electric heaters in basement with stats built in.
Cooling System: None
Ventilation System: HRV (DCS 300 Lifebreath) on main floor runs on low and humidistat makes it run on high. Basement HRV is 200 MAX.
HVAC Controls: 1 stat for furnace (approx. 16 C in shop), 1 stat for baseboard heater (approx 18C).
HVAC Maintenance/Training:
Water Supply System: Whitemouth Water Co-op. 2" meter.
Domestic Hot Water System: 3 kW electric DWH, 184 Litres – new. No pipe insulation.
Water Fixtures: 1 high flow toilet, 3 high flow showers, 2 kitchen sinks. Showers have not been used in the past but now that the floor is fixed they may start using them.

ELECTRICAL
Indoor Lighting: 6 – 8'x2 T12s, 3 – 4'x2 T12s. Basement: 4 – 4'x2 T12s and 1 Compact fluorescent.
Outdoor Lighting: 1 – quartz halogen (500w) only on when there is a fire call.
Exit Signs: None
Motors:
Parking Lot Plugs: None
OTHER BUILDING SYSTEMS
One clothes washer used intermittently
PROCESS SYSTEMS
Hydro – not a demand meter. Municipal sewer – gravity.
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
Furnace fan runs continuously.
NOTES

BUILDING INSPECTION INVENTORY
Revision 2

Municipality: Whitemouth		**Date:** October 24, 2005
Toured By: Ken Barnard		**Construction Date:** 1994/1995
Building: Waterline Pumphouse		**Renovations:** No building renovations since building
Address:		
L x W x H: 5m x 5m x 2.5m	**Area: 25 m²**	
Building Capacity:		
Building Floor Plan: Square open floor plan		**Occupied Times:** Approx. 1 hour on daily basis

ARCHITECHTURAL/STRUCTURAL

Wall type/R-value:

- 2x4 wood construction; fiberglass batt insulation; vapour barrier; plywood interior sheeting; metal cald exterior and roofing

Roof Type/R-value:

- 2x4 framed roof contruction; insulated; Ashalt shingles

Door Type/weather stripping:

- 36” metal insulated exterior door with weather stripping
- 36” solid wood core interior door with weather stripping

Window type/caulking:

- 38” x 14” double pane casement window; PVC frame

Other:

MECHANICAL

Heating System:

- 2 – Westcan; model WFA; 5 kw 3 phase; 60 hz; 600 V; 48A; suspended coil type unit heaters

Cooling System:

Ventilation System:

- existing doors and windows

HVAC Controls:

- temperature control on unit heaters
- Temperature maintained at approximately 50°F during winter months

HVAC Maintenance/Training:

Water Supply System:

- Line pressure

Domestic Hot Water System:

- 1 – 4500W, 208/240 V; single element; single phase; 102 L capacity

Water Fixtures:

- 1 – sample sink with hot/cold fixture

ELECTRICAL
Indoor Lighting: • 2 – 100W incandescent fixtures • 1 – 300 W incandescent fixture
Outdoor Lighting: • 1 sodium or metal halide unit • 1 – 100W incandescent fixture
Exit Signs: • none
Motors:
Parking Lot Plugs: • None
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
Distribution Pumps: • 2 – 5 hp; Grundfos; model 80S50; submersible pumps • 1 – 3 hp; Grundfos; model 40S30; submersible pump; 3 phase; 575 V • 1 – 7 hp; Grundfos; model 135S75-4; 3 phase; 575 V; submersible pump
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
• 600V; 100A; 3 phase main power supply
NOTES
• System pressure maintained at approximately 42 psi.

BUILDING INSPECTION INVENTORY
Revision 2

Municipality: R.M. of Whitemouth	**Date: April 4, 2006**
Toured By: Joel Lambert	**Construction Date: 1997**
Building: Waste Management Facility #1	**Renovations: No**
Address: NW 21 11 12 E Whitemouth	
L x W x H: 102' x 42' x 16' **Area: 4284 ft^2**	
Building Capacity: 4 in winter, 7 in summer	
Building Floor Plan:	**Occupied Times: Winter: Monday – Friday 7:30am – 5:00pm, 7 days per week in the summer.**

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: Metal clad interior and exterior – vapor barrier throughout. 6" fibreglass - R20 (6" posts and 2" purlans)
Roof Type/R-value: Metal clad interior and exterior. Peaked roof with attic. Likely 12" of fibreglass insulation - R40.
Door Type/weather stripping: 10' x 10' overhead door between heated and unheated portions – no w/s, 2" of ? 1 man door – 3' x 6'8" – metal – has big gap at top and needs spray foam or caulking between frame and door, has 2 holes at top where door closer or spring used to be – does not close well – replace. 14' x 14' overhead door – well sealed – seems well insulated.
Window type/caulking: 60" x 28" double pane PVC, 30" x 30" double pane PVC.
Other:
MECHANICAL
Heating System: Electric boiler 600V, 30 kW – In floor heat (2" styrofoam under floor) – boiler glycol out at 98 F at time of visit. Grundfos circulating pump (245 W) UP 26-99 F – small portable electric heater in bathroom.
Cooling System: None
Ventilation System: 2 wall fans – no ceiling fans + bathroom fan. 1 Manual wall exhaust fan – propeller BDD (leaky) – fresh air inlet with manual wood door. No weather-stripping and nothing to keep it closed.
HVAC Controls: 1 wall stat – not programmable (20C). Do not setback due to slow recovery.
HVAC Maintenance/Training: None
Water Supply System: Well and septic ejector. Well pump – 1/3 HP, Septic pump – 1/3 HP.
Domestic Hot Water System: Electric DHWT 240V, 3000W, 175 L.
Water Fixtures: 1 13lpf toilet, 1 low flow urinal, 1 low flow sink, 1 high flow shower (2 showers/day), 1 kitchen sink.

ELECTRICAL
Indoor Lighting: 8 – 8'x2 T12s, 6 – 4' x 2 T12s, 7 – 300W incandescents in unheated portion (off throughout the summer), 1 – 150W incandescent in shower area.
Outdoor Lighting: 2 white lights (HPS or MH).
Exit Signs: None
Motors:
Parking Lot Plugs: 3 x (2 receptacle plugs) – rarely used.
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
2 balers, 10HP each (600V) - 1 is approximately 15 years old, 1 is 9 years old - each run 2 hrs/day. 1 5 HP conveyor runs 1 hour/day (max).
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
Hydro with demand meter.
NOTES
Overhead doors maintained every year.

BUILDING INSPECTION INVENTORY
Revision 2

Municipality: R.M. of Whitemouth	**Date: April 4, 2006**
Toured By: Joel Lambert	**Construction Date: 1998**
Building: Waste Management Facility #2	**Renovations: None**
Address:	
L x W x H:132' x 42' x 19' **Area: 5,544 ft^2**	
Building Capacity: 4 in winter, 7 in summer.	
Building Floor Plan:	**Occupied Times: Winter: Mon-Fri, 7:30am – 5:00pm. Summer: 7 days/week.**

ARCHITECHTURAL/STRUCTURAL
Wall type/R-value: Metal clad interior and exterior – vapor barrier throughout. 6" fibreglass - R20 (6" posts and 2" purlans)
Roof Type/R-value: Metal clad interior and exterior. Peaked roof with attic. Likely 12" of fibreglass insulation - R40.
Door Type/weather stripping: North part: 1 overhead door – 18' x `6', 1 ped door – 3' x 6'8" doesn't seal - replace. South part: 1 overhead door – 14' x 14' needs w/s, 1 ped door – 3' x 6'8" needs w/s.
Window type/caulking: None
Other:
MECHANICAL
Heating System: In-floor heating – Electric boiler 30 kW, 600V glycol. 3 Taco circ. Pumps. 90F LWT at time of visit.
Cooling System: None
Ventilation System: North part: 1 exhaust fan propeller w/ BDD and air intake is the same as building #1 but plugged with insulation. South part: 2 exhaust fans w/ BDD and air intake.
HVAC Controls: 3 wall stats (non-programmable) 20C.
HVAC Maintenance/Training:
Water Supply System: Shared with building #1.
Domestic Hot Water System: None
Water Fixtures: None

ELECTRICAL
Indoor Lighting: 5 – 8'x2 T12s in south part, 15 – 8' x 2 T12s.
Outdoor Lighting: 2 HPS or MHs.
Exit Signs: None
Motors: 4 x 5HP for 3 conveyors and 1 rotary drum – runs approx. 6 hrs/week.
Parking Lot Plugs: 2 – not used.
OTHER BUILDING SYSTEMS
PROCESS SYSTEMS
Hydro shared with building #1.
BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)
- In north part the door was open at the time of visit and heat was still on. **- Needs motorized dampers in all exhaust fans and air intakes.**
NOTES

APPENDIX B

TABLES TO CALCULATE ENERGY SAVINGS

TABLE OF CONTENTS – APPENDIX B

Table B.1.1 Annual Energy Consumption for Municipal Office Building

	Energy Consumption (kWh)	% of Total Energy Consumption
Hot Water	1,991	3%
HVAC	52,908	70%
Lighting	20,916	28%
Total	**75,815**	

Table B.1.2 - Electricity Usage for Municipal Office Building

	Consumption Data			Calculated Costs		
Month (2004-2005)	**Maximum KVA**	**Billed KVA**	**Energy (kWh)**	**Demand Charge**	**Energy Charge**	**Total Charge**
October	0	0	2,380	$0	$139	$195
November	0	0	9,150	$0	$536	$647
December	0	0	10,650	$0	$624	$747
January	0	0	22,690	$0	$1,050	$1,323
February	0	0	18,820	$0	$947	$810
March	0	0	13,260	$0	$733	$430
April	0	0	15,140	$0	$806	$762
May	0	0	7,020	$0	$421	$402
June	0	0	7,810	$0	$469	$699
July	0	0	2,650	$0	$159	$315
August	0	0	1,930	$0	$116	$720
September	0	0	3,190	$0	$192	$324
TOTALS		**0**	**114,690**	**$0**	**$6,193**	**$7,375**

* The electrical energy is shared with the Municipal Shop #1 and #2. The portion of electricity consumed by the office building is approximately 75,815 kWh at a cost of $4,868.

Notes

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

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

Table B.1.3 - Lighting Analysis Summary for Municipal Office Building

Description	Quantity	Current Conditions		After Improvements	
		Annual Energy Consumption (kWh)	Annual Cost	Annual Energy Consumption (kWh)	Annual Cost
4' T12 fluorescents - Convert to T8s (27x4).	108	13,759	$826	8,284	$497
4' T12 fluorescents - Convert to T8s (2x2).	4	510	$31	307	$18
5 Incandescent bulbs - Convert to compact fluorescents.	5	1,300	$78	364	$22
Outdoor High Pressure Sodium - No upgrade recommended.	1	329	$20	329	$20
Outdoor Incandescents - put on photocell.	6	3,154	$189	1,577	$95
Incandescent exit signs - convert to LEDs.	6	1,577	$95	158	$9
Car plugs - install parking lot controllers.	2	288	$17	144	$9
TOTALS		**20,916**	**$1,256**	**11,161**	**$670**

Annual Energy Savings (kWh)	**9,754**
Annual Cost Savings	**$586**
Percent Annual Energy Savings	**47%**

These calculations are assuming that the Municipal Office Building is occupied for 50 hours/week.

The exit signs and the outdoor incandescents are assumed to be on 24 hours/day.

The outdoor hps lights are assumed to be on for 12 hours/day.

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

Description	Existing				New			Savings	
	Area (ft^2)	R-Value ($^oF\ ft^2hr/BTU$)	Annual Heat Loss (kWh)	Cost	R-Value ($^oF\ ft^2hr/BTU$)	Annual Heat Loss (kWh)	Cost	Energy (kWh)	Cost
Replace double pane 30" x 30" windows in basement with triple pane windows (2).	12.50	2.00	457	$27	6.25	146	$9	311	$19
Replace double pane 30" x 32" windows in basement with triple pane windows (2).	13.33	2.00	488	$29	6.25	156	$9	332	$20
Replace aluminum sliders on main floor with new triple pane sliders (3 - 44" x 72")	66.00	2.000	2,414	$145	6.25	772	$46	1,641	$99
TOTALS			**3,359**	**$202**		**1,075**	**$65**	**2,284**	**$137**

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

Description	Crack Length (ft)	Crack Width (in)	Leakage on typical door (cfm)	Leakage on these doors (cfm)	Annual Heat Loss (BTU)	Annual Heat Loss (kWh)	Cost
Back pedestrian door (1 - 3' x 6'8")	4.85	0.025	50	7	1,786,214	523	$31
Side pedestrian door (1 - 6' x 6'8") - caulking	6.35	0.025	50	9	2,338,651	685	$41
Side pedestrian door (1 - 6' x 6'8") - weather-stripping	6.35	0.05	125	22	5,846,627	1,713	$103
Front pedestrian door (1 - 3' x 6'8")	4.85	0.05	125	17	4,465,534	1,309	$79
Aluminum sliders on main floor.	11	0.025	50	15	4,051,206	1,187	$71
TOTALS						**5,418**	**$325**

Table B.1.4 (c) Wall/Roof Insulation Upgrade for Municipal Office Building

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 to R-20.	3307.5	12.000	20,162	$1,211	20	12,097	$726	8,065	$484
TOTALS			**20,162**	**$1,211**		**12,097**	**$726**	**8,065**	**$484**

The Municipal Office Building is assumed to be kept at 70 F.

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

The R value for the walls is assumed to be R12.

Table B.1.5 - Water Usage for Municipal Office Building

Fixtures	Qty	Est. # of Uses/Hr/ Fixture	Est. # of Uses/Yr	Current Flow (LPF or LPC)	Current Water Usage (L/Yr)	New Flow (LPF or LPC)	New Water Usage (L/Yr)	Water Saved (L/Yr)	Hot Water Savings (kWh)	Cost Savings
Low flow sink	1	1.8	4,550	0.32	1,456	0.32	1,456	0	0	$0
High flow sink	1	1.8	4,550	1.60	7,280	0.32	1,456	5,824	218	$13
Low flow toilet	1	1.0	2,600	6.00	15,600	3.98	10,348	5,252	NA	NA
High flow toilet	1	1.0	2,600	16.00	41,600	3.98	10,348	31,252	NA	NA
Urinals	2	0.3	1,733	3.8	6,587	3.80	6,587	0	NA	NA
Total					**72,523**		**30,195**	**42,328**	**218**	**$13**

Frequency at Which Fixtures are Used			
	Females	Males	Totals
Number of People	4	4	
Number of Toilet Uses/day	3	1	
Number of Toilets	2	2	
Toilet Uses/hour/fixture	0.75	0.25	1
Number of Sinks	2	2	
Number of Sink Uses/day	3	4	
Sink Uses/hr/fixture	0.75	1	1.75
Number of Urinal Uses/day	0	3	
Number of Urinals	0	2	
Urinal Uses/hour/fixture	0	0.33	0.33

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

The high flow toilets consume 1.6 and 4.2 gallons per flush and the new dual flush toilets use 1.6 or 0.8 gallons per flush

The high flow faucets are assumed to consume 2.5 gpm and the low flow faucets are 0.5 gpm

The current urinals consume 1.0 gallons per flush.

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

Description	% of Time Unoccupied	Flow Rate (cfm)	Heating Degree Days below 64 F	Heating Efficiency	Current Heat Loss (kWh)	Heat Savings (kWh)
Install timer on exhaust fan.	70%	150	10,400	100%	11,848	8,331
Install HRV.	70%	150	10,400	100%	11,848	5,924

Table B.2.1 Annual Energy Consumption for Municipal Shop #1

	Energy Consumption (kWh)	% of Total Energy Consumption
Hot Water	1,929	5%
HVAC	28,489	75%
Lighting	7,660	20%
Total	**38,078**	

Table B.2.2 - Electricity Usage for Municipal Shop #1

This shop shares electrical service with the Municipal Office Building.

From October 2004 to October 2005, the total electrical energy consumption was approximately 38,078 kWh at a cost of $2,399.

Table B.2.3 - Lighting Analysis Summary for Municipal Shop #1

Description	Quantity	Current Conditions		After Improvements	
		Annual Energy Consumption (kWh)	Annual Cost	Annual Energy Consumption (kWh)	Annual Cost
4' T12 fluorescents - Replace with T8s (6 x 2)	12	1,299	$78	782	$47
8' T12 fluorescents - Replace with T8s (9 x 2)	18	4,630	$278	2,164	$130
2 indoor incandescents - replace with compact fluorescents.	2	442	$27	124	$7
Outdoor metal halide - no upgrade recommended.	1	329	$20	329	$20
Car plugs - install parking lot controllers.	4	960	$58	480	$29
TOTALS		**7,660**	**$460**	**3,879**	**$233**

Annual Energy Savings (kWh)	**3,782**
Annual Cost Savings	**$227**
Percent Annual Energy Savings	**49%**

These calculations are assuming that the Municipal Shop #1 is occupied for 8 1/2 hours a day, Mon-Fri.

The outdoor light is assumed to be on 12 hours per day, 365 days per year.

Table B.2.4 (a) Window and Door Replacement Calculations for Municipal Shop #1

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 sliders in shop with triple pane windows (2 - 46"x28")	17.89	2.00	556	$33	6.25	178	$11	378	$23
Replace sliders in office with triple pane windows (2 - 46"x28")	17.89	2.00	654	$39	6.25	209	$13	445	$27
TOTALS			**556**	**$33**		**178**	**$11**	**378**	**$23**

Table B.2.4 (b) Window and Door Infiltration Calculations for Municipal Shop #1

Description	Crack Length (ft)	Crack Width (in)	Leakage on typical door (cfm)	Leakage on these doors (cfm)	Annual Heat Loss (BTU)	Annual Heat Loss (kWh)	Cost
Pedestrian doors (2)	20.00	0.05	125	68	15,652,387	4,587	$275
Sliders in shop (2)	7.67	0.025	50	10	2,400,033	703	$42
Sliders in office (2)	7.67	0.025	50	10	2,823,568	828	$50
TOTALS						**4,587**	**$275**

Table B.2.4 (c) Wall/Roof Insulation Calculations for Municipal Shop #1

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	2,640	20.00	8,932	$536	40.00	4,466	$268	4,466	$268
TOTALS			**8,932**	**$536**		**4,466**	**$268**	**4,466**	**$268**

The shop is assumed to be kept at 50 F and the office is kept at 70 F.

The crack lengths are taken as half of the perimeter of the door

Table B.2.5 - Water Usage for Municipal Shop #1

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
Sink	1	1.9	4,144	1.60	6,630	1.60	6,630	0	0	$0
Toilet	1	1.9	4,144	13.25	54,905	3.98	16,492	38,413	NA	NA
Shower	1	0.1	208	66.3	13,780	47.32	9,843	3,937	148	$9
Total					**75,315**		**32,965**	**42,350**	**148**	**$9**

Frequency at Which Fixtures are Used			
	Females	**Males**	**Totals**
Number of People	1	3	
Number of Toilet Uses/day	3	4	
Number of Toilets	1	1	
Toilet Uses/hour/fixture	0.375	1.5	1.875
Number of Sinks	1	1	
Number of Sink Uses/day	3	4	
Sink Uses/hr/fixture	0.375	1.5	1.875

Current Hot Water Usage (kWh)		
Fixture	**L/Yr**	**kWh**
Sinks	20,410	765
Total		**765**

The high flow toilets consume 3.5 gallons per flush and the new dual flush toilets use 1.6 or 0.8 gallons per flush

The high flow faucets are assumed to consume 2.5 gpm

The high flow showers consume 3.5 gpm and the low flow showerheads consume 2.5 gpm.

Table B.2.6 Energy Savings with Heating, Ventilating, and Air Conditioning for Municipal Shop #1

Description	Quantity	Leakage (cfm)	Heating Degree Days below 60 F	Heating Efficiency	Current Heat Loss (kWh)	Heat Savings (kWh)
Replace backdraft dampers with motorized dampers.	2	30	8,840	100%	2,014	4,028

Table B.3.1 Annual Energy Consumption for Municipal Shop #2

	Energy Consumption (kWh)	% of Total Energy Consumption
Lighting	797	100%
Total	**797**	

Table B.3.2 - Electricity Usage for the Municipal Shop #2

This shop shares electrical service with the Municipal Office Building.

From October 2004 to October 2005, the total electrical energy consumption was approximately 797 kWh at a cost of $108.

Table B.3.3 - Lighting Analysis Summary for the Municipal Shop #2

Description	Quantity	Current Conditions		After Improvements	
		Annual Energy Consumption (kWh)	Annual Cost	Annual Energy Consumption (kWh)	Annual Cost
200W Incandescents - Convert to metal halides.	9	468	$28	234	$14
Outdoor metal halide - no upgrade recommended.	1	329	$20	329	$20
TOTALS		**797**	**$48**	**563**	**$34**

Annual Energy Savings (kWh)	**234**
Annual Cost Savings	**$14**
Percent Annual Energy Savings	**29%**

These calculations are assuming that the Municipal Shop #2 is occupied for 5 hours per week.

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

Table B.4.1 Annual Energy Consumption for the Hospital Street Lift Station

	Energy Consumption (kWh)	% of Total Energy Consumption
Motor	1,720	100%
Total	**1,720**	

Table B.4.2 - Electricity Usage for the Hospital Street Lift Station

	Consumption Data			Calculated Costs		
Month (2004-2005)	**Maximum KVA**	**Billed KVA**	**Energy (kWh)**	**Demand Charge**	**Energy Charge**	**Total Charge**
October	0	0	330	$0	$19	$47
November	0	0	40	$0	$2	$28
December	0	0	210	$0	$12	$39
January	0	0	50	$0	$3	$28
February	0	0	80	$0	$5	$30
March	0	0	40	$0	$2	$28
April	0	0	100	$0	$6	$32
May	0	0	40	$0	$2	$28
June	0	0	360	$0	$22	$50
July	0	0	40	$0	$2	$28
August	0	0	380	$0	$23	$51
September	0	0	50	$0	$3	$29
TOTALS		**0**	**1,720**	**$0**	**$102**	**$417**

Notes

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

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

Table B.4.3 Energy Consumption for Motor in Hospital Street Lift Station

Description	Rated HP	Required HP	# of hours	Current Motors			
				Eff.	Actual HP	kW	kWh
Flygt Pump	5	4	520	90%	4.44	3.31	1723
TOTAL							**1,723**

Table B.5.1 Annual Energy Consumption for Front Street Lift Station

	Energy Consumption (kWh)	% of Total Energy Consumption
Motors	8,060	100%
Total	**8,060**	

Table B.5.2 - Electricity Usage for Front Street Lift Station

	Consumption Data			Calculated Costs		
Month (2004-2005)	**Maximum KVA**	**Billed KVA**	**Energy (kWh)**	**Demand Charge**	**Energy Charge**	**Total Charge**
October	0	0	1,290	$0	$76	$111
November	0	0	230	$0	$13	$40
December	0	0	850	$0	$50	$82
January	0	0	380	$0	$22	$50
February	0	0	270	$0	$16	$43
March	0	0	250	$0	$15	$42
April	0	0	570	$0	$33	$63
May	0	0	210	$0	$13	$39
June	0	0	1,570	$0	$94	$133
July	0	0	610	$0	$37	$67
August	0	0	1,370	$0	$82	$119
September	0	0	460	$0	$28	$57
TOTALS		**0**	**8,060**	**$0**	**$478**	**$846**

Notes

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

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

Table B.5.3 Energy Consumption for Motors in Front Street Lift Station

Description	Rated HP	Required HP	# of hours	Current Motors			
				Eff.	Actual HP	kW	kWh
Flygt Pump 1	3	3	1,533	85%	3.53	2.63	4,035
Flygt Pump 2	3	3	1,533	85%	3.53	2.63	4,035
TOTAL							**8,069**

Table B.6.1 Annual Energy Consumption for Small Garage

	Energy Consumption (kWh)	% of Total Energy Consumption
HVAC	5,256	89%
Lighting	654	11%
Total	**5,910**	

Table B.6.2 - Electricity Usage for Small Garage

	Consumption Data			Calculated Costs		
Month (2004-2005)	**Maximum KVA**	**Billed KVA**	**Energy (kWh)**	**Demand Charge**	**Energy Charge**	**Total Charge**
October	0	0	0	$0	$0	$36
November	0	0	0	$0	$0	$0
December	0	0	1,340	$0	$79	$125
January	0	0	0	$0	$0	$0
February	0	0	1,950	$0	$114	$166
March	0	0	0	$0	$0	$0
April	0	0	1,780	$0	$104	$156
May	0	0	0	$0	$0	$0
June	0	0	0	$0	$0	$0
July	0	0	0	$0	$0	$0
August	0	0	840	$0	$50	$130
September	0	0	0	$0	$0	$0
TOTALS		**0**	**5,910**	**$0**	**$348**	**$613**

Notes

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

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

Table B.6.3 - Lighting Analysis Summary for Small Garage

Description	Quantity	Current Conditions		After Improvements	
		Annual Energy Consumption (kWh)	Annual Cost	Annual Energy Consumption (kWh)	Annual Cost
4' T12 Fluorescents - Convert to T8s (5x2).	10	510	$31	307	$18
Parking lot plugs - Install parking lot controllers.	1	144	$9	72	$4
TOTALS		**654**	**$39**	**379**	**$23**

Annual Energy Savings (kWh) **275**
Annual Cost Savings **$16**
Percent Annual Energy Savings **42%**

These calculations are assuming that the small garage is occupied for 20 hours per week.

Table B.6.4 (a) Window and Door Infiltration Calculations for Small 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
Weather-strip overhead door.	9.5	0.05	125	32	4,010,969	1,175	$71
Caulk overhead door.	9.5	0.025	50	13	1,604,387	470	$28
Weather-strip pedestrian door.	5	0.05	125	17	2,111,036	619	$37
TOTALS						**2,264**	**$136**

Table B.6.4 (b) Wall/Roof Insulation Upgrade Calculations for Small Garage

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 roof insulation	390	12.00	1,090	$65	40.00	327	$20	763	$46
TOTALS			**1,090**	**$65**		**327**	**$20**	**763**	**$46**

The small garage is assumed to be kept at 41 ^oF.

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

Table B.7.1 Annual Energy Consumption for Fire Hall

	Energy Consumption (kWh)	% of Total Energy Consumption
HVAC	46,061	97.0%
Hot Water	1,109	2.3%
Lighting	300	0.6%
Total	**47,470**	

Table B.7.2 - Electricity Usage for the Fire Hall

	Consumption Data			Calculated Costs		
Month (2004-2005)	**Maximum KVA**	**Billed KVA**	**Energy (kWh)**	**Demand Charge**	**Energy Charge**	**Total Charge**
October	0	0	910	$0	$53	$79
November	0	0	3,590	$0	$210	$258
December	0	0	5,820	$0	$341	$407
January	0	0	8,670	$0	$508	$597
February	0	0	8,730	$0	$512	$601
March	0	0	5,480	$0	$321	$384
April	0	0	6,850	$0	$401	$480
May	0	0	1,960	$0	$118	$152
June	0	0	2,120	$0	$127	$163
July	0	0	1,030	$0	$62	$89
August	0	0	1,100	$0	$66	$93
September	0	0	1,210	$0	$73	$101
TOTALS		**0**	**47,470**	**$0**	**$2,792**	**$3,404**

Notes

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

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

Table B.7.3 - Lighting Analysis Summary for the Fire Hall

Description	Quantity	Current Conditions		After Improvements	
		Annual Energy Consumption (kWh)	Annual Cost	Annual Energy Consumption (kWh)	Annual Cost
8' T12 Fluorescents - Convert to 8' T8s (6x2)	12	181	$11	84	$5
4' T12 Fluorescents - Convert to 8' T8s (7x2)	14	89	$5	54	$3
Indoor compact fluorescent - no upgrade recommended.	1	4	$0	4	$0
Quartz halogen - no upgrade recommended.	1	26	$2	26	$2
TOTALS		**300**	**$18**	**168**	**$10**

Annual Energy Savings (kWh)	**132**
Annual Cost Savings	**$8**
Percent Annual Energy Savings	**44%**

These calculations are assuming that the fire hall is occupied for 2 1/2 hours/week.

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

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

Description	Existing				New			Savings	
	Area (ft^2)	R-Value ($^oF\ ft^2hr/BTU$)	Annual Heat Loss (kWh)	Cost	R-Value ($^oF\ ft^2hr/BTU$)	Annual Heat Loss (kWh)	Cost	Energy (kWh)	Cost
Replace double pane sliders with triple pane sliders.	16.6667	2.00	579	$35	6.25	185	$11	394	$24
Replace top half of vehicle door.	96	1.578	4,229	$254	6.67	1,000	$60	3,228	$194
TOTALS			**579**	**$35**		**185**	**$11**	**394**	**$24**

Table B.7.4 (b) Window and Door Infiltration Calculations for the 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
Vehicle Door (1)	12	0.25	300	98	25,191,136	7,383	$443
Old sliders (1)	5	0.025	50	7	1,749,384	513	$31
TOTALS						**7,895**	**$474**

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

Description	Existing				New			Savings	
	Area (ft^2)	R-Value ($^oF\ ft^2hr/BTU$)	Annual Heat Loss (kWh)	Cost	R-Value ($^oF\ ft^2hr/BTU$)	Annual Heat Loss (kWh)	Cost	Energy (kWh)	Cost
Upgrade roof insulation to R40	1760	20.00	6,115	$367	40.00	3,058	$184	3,058	$184
Upgrade wall insulation to R20	1735	12.00	10,048	$603	20.00	6,029	$362	4,019	$241
TOTALS			**16,163**	**$970**		**9,086**	**$546**	**7,077**	**$425**

The fire hall is assumed to be kept at 62.6 F

The crack lengths are taken as a quarter the perimeter of the pedestrian doors and an eighth of the perimeter of the vehicle doors.

Table B.7.5 - Water Usage for the Fire Hall

Fixtures	Qty	Est. # of Uses/Hr/ Fixture	Est. # of Uses/Yr	Current Flow (LPF or LPC)	Current Water Usage (L/Yr)	New Flow (LPF or LPC)	New Water Usage (L/Yr)	Water Saved (L/Yr)	Hot Water Savings (kWh)	Cost Savings
Sinks	2	1.8	455	1.60	728	1.60	728	0	0	$0
Toilet	1	3.5	455	13.25	6,029	3.98	1,811	4,218	NA	NA
Showers	3	0.1	37	66.3	2,432	47.32	1,737	695	26	$2
Total					**9,189**		**4,276**	**4,913**	**26**	**$2**

Frequency at Which Fixtures are Used			
	Females	**Males**	**Totals**
Number of People	4	4	
Number of Toilet Uses/day	3	4	
Number of Toilets	1	1	
Toilet Uses/hour/fixture	1.5	2	3.5
Number of Sinks	2	2	
Number of Sink Uses/day	3	4	
Sink Uses/hr/fixture	0.75	1	1.75

Current Hot Water Usage (kWh)		
Fixture	**L/Yr**	**kWh**
Sinks	728	27
Showers	2,432	91
Total		**27**

The high flow toilets consume 3.5 gallons per flush and the new dual flush toilets use 1.6 or 0.8 gallons per flush

The high flow faucets are assumed to consume 2.5 gpm

The high flow showers consume 3.5 gpm and the low flow showerheads consume 2.5 gpm.

Table B.7.6 Energy Savings with Heating, Ventilating, and Air Conditioning for the Fire Hall

Description	% of Time Unoccupied	Heating Degree Days below 60.8 F	Heating Degree Days below 59 F	Current Energy Used to Heat (kWh)	Heat Savings (kWh)
Setback Thermostats to 59 F	98.52%	9,360	8,841	38,691	2,115

Table B.8.1 Annual Energy Consumption for the Waterline Pumphouse

	Energy Consumption (kWh)	% of Total Energy Consumption
Motors	28,423	63%
HVAC	14,772	33%
Hot Water	786	2%
Lighting	949	2%
Total	**44,930**	

Table B.8.2 - Electricity Usage for the Waterline Pumphouse

	Consumption Data			Calculated Costs		
Month (2004-2005)	**Maximum KVA**	**Billed KVA**	**Energy (kWh)**	**Demand Charge**	**Energy Charge**	**Total Charge**
October	0	0	3,380	$0	$198	$251
November	0	0	4,990	$0	$292	$358
December	0	0	3,120	$0	$183	$233
January	0	0	4,020	$0	$236	$294
February	0	0	4,920	$0	$288	$354
March	0	0	5,200	$0	$305	$372
April	0	0	3,830	$0	$224	$287
May	0	0	1,990	$0	$119	$161
June	0	0	1,270	$0	$76	$112
July	0	0	6,590	$0	$396	$476
August	0	0	2,590	$0	$156	$202
September	0	0	3,030	$0	$182	$232
TOTALS		**0**	**44,930**	**$0**	**$2,655**	**$3,333**

Notes

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

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

Table B.8.3 - Lighting Analysis Summary for the Waterline Pumphouse

Description	Quantity	Current Conditions		After Improvements	
		Annual Energy Consumption (kWh)	Annual Cost	Annual Energy Consumption (kWh)	Annual Cost
100W indoor incandescents - convert to compact fluorescents.	2	73	$4	20	$1
300W indoor incandescent - convert to compact fluorescent.	1	110	$7	28	$2
Outdoor high pressure sodium - no upgrade recommended.	1	329	$20	329	$20
Outdoor 100W incandescent - convert to high pressure sodium.	1	438	$26	219	$13
TOTALS		**949**	**$57**	**596**	**$36**

Annual Energy Savings (kWh)	**353**
Annual Cost Savings	**$21**
Percent Annual Energy Savings	**37%**

These calculations are assuming that the pumphouse is occupied for only 1 hour/day.

The outdoor lights are assumed to be on for 12 hours/day.

Table B.8.4 (a) Window and Door Replacement Calculations for the Waterline Pumphouse

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
38" x 14" double pane window - replace with triple pane.	3.69	2.00	86	$5	6.25	28	$2	58	$4
TOTALS			**86**	**$5**		**28**	**$2**	**58**	**$4**

Table B.8.4 (b) Wall/Roof Insulation Upgrade for the Waterline Pumphouse

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	269.00	20.00	626	$38	40	313	$19	313	$19
TOTALS			**626**	**$38**		**313**	**$19**	**313**	**$19**

The pumphouse is assumed to be kept at 50 F

Table B.8.5 Energy Consumption and Savings Calculations for Motors in Waterline Pumphouse

Description	Rated HP	Required HP	# of hours	Current, 85 % Efficient Motor			Energy Savings of Premium Efficiency Versus Standard Efficiency Motor		
				Actual HP	kW	kWh	Actual HP	kW	kWh
5HP Pump	5.00	4.00	2,920	4.70	3.51	10,243	0.12	0.09	261
5HP Pump	5.00	4.00	2,920	4.70	3.51	10,243	0.12	0.09	261
3HP Pump	3.00	2.40	2,920	2.82	2.10	6,146	0.07	0.05	157
7HP Pump	7.00	5.60	365	6.59	4.91	1,792	0.17	0.13	46
TOTALS						**28,423**			**725**

Table B.9.1 Annual Energy Consumption for the Waste Management Facility #1

	Energy Consumption (kWh)	% of Total Energy Consumption
Motors	11,523	19.9%
HVAC	30,383	52.5%
Hot Water	4,479	7.7%
Lighting	11,444	19.8%
Total	**57,830**	

Table B.9.2 - Electricity Usage for Waste Management Facility #1

	Consumption Data			Calculated Costs		
Month (2004-2005)	**Maximum KVA**	**Billed KVA**	**Energy (kWh)**	**Demand Charge**	**Energy Charge**	**Total Charge**
October	32	0	2,330	$0	$137	$181
November	72	22	7,790	$183	$456	$754
December	78	28	22,410	$233	$1,043	$1,480
January	68	18	32,660	$150	$1,283	$1,658
February	77	27	30,780	$225	$1,239	$1,693
March	78	28	28,420	$233	$1,184	$1,640
April	76	26	26,000	$216	$1,127	$1,558
May	0	0	5,850	$0	$351	$425
June	0	0	3,630	$0	$218	$274
July	0	0	2,490	$0	$149	$196
August	0	0	2,140	$0	$128	$172
September	0	0	2,430	$0	$146	$191
TOTALS		**149**	**166,930**	**$1,240**	**$7,462**	**$10,221**

The electicity is shared with Waste Management Facility #2. The electricity consumed by this building from October 2004 - October 2005 was approximately 57,830 kWh at a cost of $3,541.

Notes

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

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

Table B.9.3 - Lighting Analysis Summary for Waste Management Facility #1

Description	Quantity	Current Conditions		After Improvements	
		Annual Energy Consumption (kWh)	Annual Cost	Annual Energy Consumption (kWh)	Annual Cost
8' T12 Fluorescents - Convert to 8' T8s (8x2)	16	5,149	$309	2,397	$144
4' T12 Fluorescents - Convert to 8' T8s (6x2)	12	1,631	$98	982	$59
300W Incandescents - Convert to metal halides.	7	3,591	$216	1,710	$103
150W Incandescent - Convert to compact fluorescent.	1	416	$25	80	$5
Outdoor high pressure sodium - no upgrade recommended.	2	657	$39	657	$39
TOTALS		**11,444**	**$687**	**5,826**	**$350**

Annual Energy Savings (kWh)	**5,618**
Annual Cost Savings	**$337**
Percent Annual Energy Savings	**49%**

These calculations are assuming that this facility is occupied from Mon-Fri, 7:30am-5pm throughout the winter and 7 days per week throughout the summer.

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

Table B.9.4 (a) Window and Door Replacement Calculations for Waste Management Facility #1

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
60" x 28" double pane window - replace with triple pane.	11.67	2.00	427	$26	6.25	137	$8	290	$17
30" x 30" double pane window - replace with triple pane.	6.25	2.00	229	$14	6.25	73	$4	155	$9
TOTALS			**427**	**$26**		**137**	**$8**	**290**	**$17**

Table B.9.4 (b) Window and Door Infiltration Calculations for Waste Management Facility #1

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
10' x 10' overhead door between heated and unheated areas.	10	0.05	125	34	9,207,287	2,698	$162
3' x 6'8" pedestrian door.	3	0.075	250	20	5,524,372	1,619	$97
TOTALS						**4,317**	**$259**

The temperature of this facility is assumed to be 70 F

Table B.9.5 - Water Usage for Waste Management Facility #1

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
Sink	1	2.3	6,242	0.32	1,997	0.32	1,997	0	0	$0
Toilet	1	1.1	3,121	13.25	41,350	3.98	12,421	28,929	NA	NA
Urinals	1	0.1	347	3.80	1,318	3.80	1,318	0	NA	NA
Shower	1	0.2	653	66.3	43,242	47.32	30,886	12,356	463	$28
Total					**87,907**		**46,622**	**41,285**	**463**	**$28**

Frequency at Which Fixtures are Used			
	Females	Males	Totals
Number of People	2	3	
Number of Toilet Uses/day	3	1	
Number of Toilets	1	1	
Toilet Uses/hour/fixture	0.75	0.375	1.125
Number of Sinks	1	1	
Number of Sink Uses/day	3	4	
Sink Uses/hr/fixture	0.75	1.5	2.25
Number of Urinal Uses/day	0	3	
Number of Urinals	0	1	
Urinal Uses/hour/fixture	0	0.13	0.13

Current Hot Water Usage (kWh)		
Fixture	L/Yr	kWh
Sink	45,239	1,695
Shower	43,242	1,620
Total		**3,316**

The high flow toilets consume 3.5 gallons per flush and the new dual flush toilets use 1.6 or 0.8 gallons per flush

The low flow faucet consumes 0.5 gpm

The high flow showers consume 3.5 gpm and the low flow showerheads consume 2.5 gpm.

Table B.9.6 Energy Savings with Heating, Ventilating, and Air Conditioning for Waste Management Facility #1

Description	Quantity	Leakage (cfm)	Heating Degree Days below 70 F	Heating Efficiency	Current Heat Loss (kWh)	Heat Savings (kWh)
Replace backdraft dampers and manual wood door with motorized dampers.	2	40	10,400	100%	3,159	6,319

Table B.9.7 Energy Consumption and Savings Calculations for Motors in Waste Management Facility #1

Description	Rated HP	Required HP	# of hours	Current, 85 % Efficient Motor			Energy Savings of Premium Efficiency Versus Standard Efficiency Motor		
				Actual HP	kW	kWh	Actual HP	kW	kWh
10HP Baler	10.00	8.00	730	9.41	7.02	5,121	0.24	0.18	131
10HP Baler	10.00	8.00	730	9.41	7.02	5,121	0.24	0.18	131
5HP Conveyor	5.00	4.00	365	4.70	3.51	1,280	0.12	0.09	33
TOTALS						**11,523**			**294**

Table B.10.1 Annual Energy Consumption for the Waste Management Facility #2

	Energy Consumption (kWh)	% of Total Energy Consumption
HVAC	91,150	84%
Motors	4,378	4%
Lighting	13,573	12%
Total	**109,100**	

Table B.10.2 - Electricity Usage for the Waste Management Facility #2

This facility shares electrical service with the Waste Management Facility #1.

From October 2004 to October 2005, the total electrical energy consumption was approximately 109,100 kWh at a cost of $6,680.

Table B.10.3 - Lighting Analysis Summary for the Waste Management Facility #2

Description	Quantity	Current Conditions		After Improvements	
		Annual Energy Consumption (kWh)	Annual Cost	Annual Energy Consumption (kWh)	Annual Cost
8' T12 fluorescents - convert to T8s (20x2).	40	12,916	$775	6,036	$362
Outdoor high pressure sodiums - no upgrade recommended.	2	657	$39	657	$39
TOTALS		**13,573**	**$815**	**6,693**	**$402**

Annual Energy Savings (kWh)	**6,880**
Annual Cost Savings	**$413**
Percent Annual Energy Savings	**51%**

These calculations are assuming that this facility is occupied from Mon-Fri, 7:30am-5pm throughout the winter and 7 days per week throughout the summer.

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

Table B.10.4 (a) Window and Door Infiltration Calculations for the Waste Management Facility #2

Description	Crack Length (ft)	Crack Width (in)	Leakage on typical door (cfm)	Leakage on these doors (cfm)	Annual Heat Loss (BTU)	Annual Heat Loss (kWh)	Cost
Pedestrian door 1	9.75	0.05	125	33	2,992,368	877	$53
Pedestrian door 2	4.875	0.05	125	17	1,496,184	438	$26
14' x 14' overhead door	14	0.05	125	48	4,296,734	1,259	$76
TOTALS						**2,575**	**$155**

This facility is assumed to be kept at 70 F

Table B.10.5 Energy Savings with Heating, Ventilating, and Air Conditioning for the Waste Management Facility #2

Description	Quantity	Leakage (cfm)	Heating Degree Days below 70 F	Heating Efficiency	Current Heat Loss (kWh)	Heat Savings (kWh)
Replace backdraft dampers and manual wood door with motorized dampers.	6	40	10,400	300%	1,053	6,319

Description	Annual Energy Savings (kWh)	Annual Cost Savings ($)	Installation Cost	Simple Payback Years
Install Geothermal Heating System	60,767	$3,648	$35,340	9.69

Table B.10.6 Energy Consumption and Savings Calculations for Motors in Waste Management Facility #2

Description	Rated HP	Required HP	# of hours	Current, 85 % Efficient Motor			Energy Savings of Premium		
				Actual HP	kW	kWh	Actual HP	kW	kWh
5HP Conveyor 1	5.00	4.00	312	4.70	3.51	1,094	0.12	0.09	28
5HP Conveyor 2	5.00	4.00	312	4.70	3.51	1,094	0.12	0.09	28
5HP Conveyor 3	5.00	4.00	312	4.70	3.51	1,094	0.12	0.09	28
5HP Conveyor 4	5.00	4.00	312	4.70	3.51	1,094	0.12	0.09	28
TOTALS						**4,378**			**112**

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
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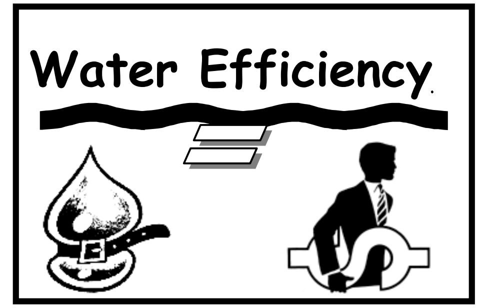
Publication Number: 98-06E

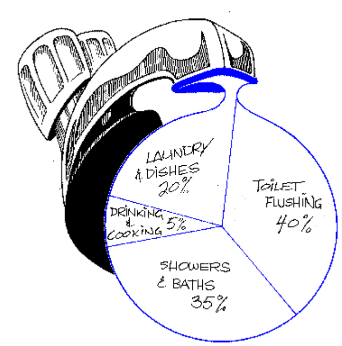
Pollution Prevention
Manitoba Conservation



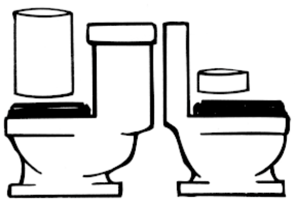
Water Use

How you can reduce yours!

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



Bathroom



- Replace toilets that flush 13 to 26 litres of water with 6 litre or dual flush toilets, cutting water used by toilets by half or more. See www.cwwa.ca for toilet performance ratings. In the mean time, reduce water per flush in toilets by up to 35% by installing early closure devices (don't use bricks – as they break down, pieces interfere with the flapper seal).

- Refrain from using the toilet to dispose of trash.

- A partially filled tub uses less water than a long shower; a short shower uses less than a full tub.

- Replace your 20 litre per minute showerhead with a low-flow 9.5 litre per minute showerhead. You'll use less than half the water.

- Make it a habit to be finished your shower in less than 5 minutes.

- Install a water conserving 3.5 litre per minute aerator on your bathroom tap.

- When shaving, rinse the razor in a cup or a partially filled sink instead of letting the tap run.

- Brush teeth using a glass of water to rinse.

Kitchen & Laundry

- Install a water saving 9 litre per minute aerator on the kitchen tap.

- Rinse dishes in a stoppered sink or basin, not with running water.

- Wash vegetables in a basin or stoppered sink, then quickly rinse using running water.

- Keep drinking water in the fridge. Wash the container and change the water every few days.

- Thaw food in the fridge rather than under a running tap. This conserves both energy and water.

- Compost organic wastes instead of using a sink garbage disposal.

- Buy a low water use dishwasher to save on energy, water and detergent costs.

- Wash only full loads of laundry and dishes.

- Front loading washing machines use less water than top-loading washers do. If unavailable, choose a clothes washer with a suds saver, and water saving cycle.

General Water Use

- Only use water treatment or softening systems, if required. If possible, only use softened water for bathing and cleaning – use unsoftened water for cooking, drinking and watering plants.

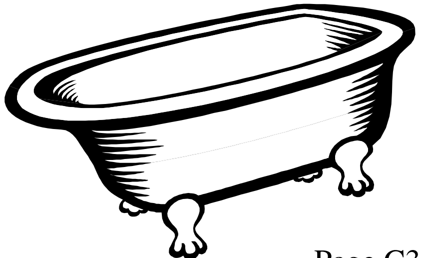
- Ensure a water softener regenerates only when the resin is exhausted.

- Turn the system off if you will be away for more than a few days.

- Insulate hot water tank and pipes to reduce the need to run water until it is hot. Install a heat trap on the pipe above your water heater to save energy and water.

- Know location of sink, toilet and main shut off valves in case a pipe or water heater blows, or so you can turn off your water when you are away.

- If your water pipes tend to freeze, do not let the tap run continuously. This wastes water, and overloads sewer systems. Instead, install heat tape or connect a pump-back reservoir system (discuss options with your plumber, electrician or call Manitoba Conservation).



APPENDIX D

INCENTIVE PROGRAMS

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Table D.1 Manitoba Hydro Power Smart Incentives

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

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

Table D.2. Other Incentive Programs

Program Name	Eligibility	What Type of Projects are Available	Ref. Page	Available Funding	Funding Maximums	Deadline For Applications	Prospect of Funding	Project Sponsor	Contact	Email	Website
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

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Table F.1 - Energy Consumption Monitoring Data for Municipal Office Building, Municipal Shop #1 & Municipal Shop #2

	2004-2005			2005-2006			2006-2007			2007-2008			2008-2009			2009-2010		
Month	**Billed Energy Consumption (kWh)**	**HDD (°C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Energy Consumption (kWh)**	**HDD (°C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Energy Consumption (kWh)**	**HDD (°C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Energy Consumption (kWh)**	**HDD (°C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Energy Consumption (kWh)**	**HDD (°C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Energy Consumption (kWh)**	**HDD (°C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**
October	2,380	340.7	2,380			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
November	9,150	525.4	9,150			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
December	10,650	970.3	10,650			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
January	22,690	1115.6	22,690			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
February	18,820	816.7	18,820			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
March	13,260	735.1	13,260			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
April	15,140	293.2	15,140			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
May	7,020	214.9	7,020			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
June	7,810	41.3	7,810			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
July	2,650	12	2,650			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
August	1,930	20.5	1,930			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
September	3,190	89.5	3,190			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
TOTAL	114,690	5175.2	114,690	0	0	#DIV/0!	0	0	#DIV/0!	0	0	#DIV/0!	0	0	#DIV/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 Energy Consumption" (in kWh) taken from the hydro bill 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

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 F16) 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 Municipal Office Building, Municipal Shop #1, and Municipal Shop #2

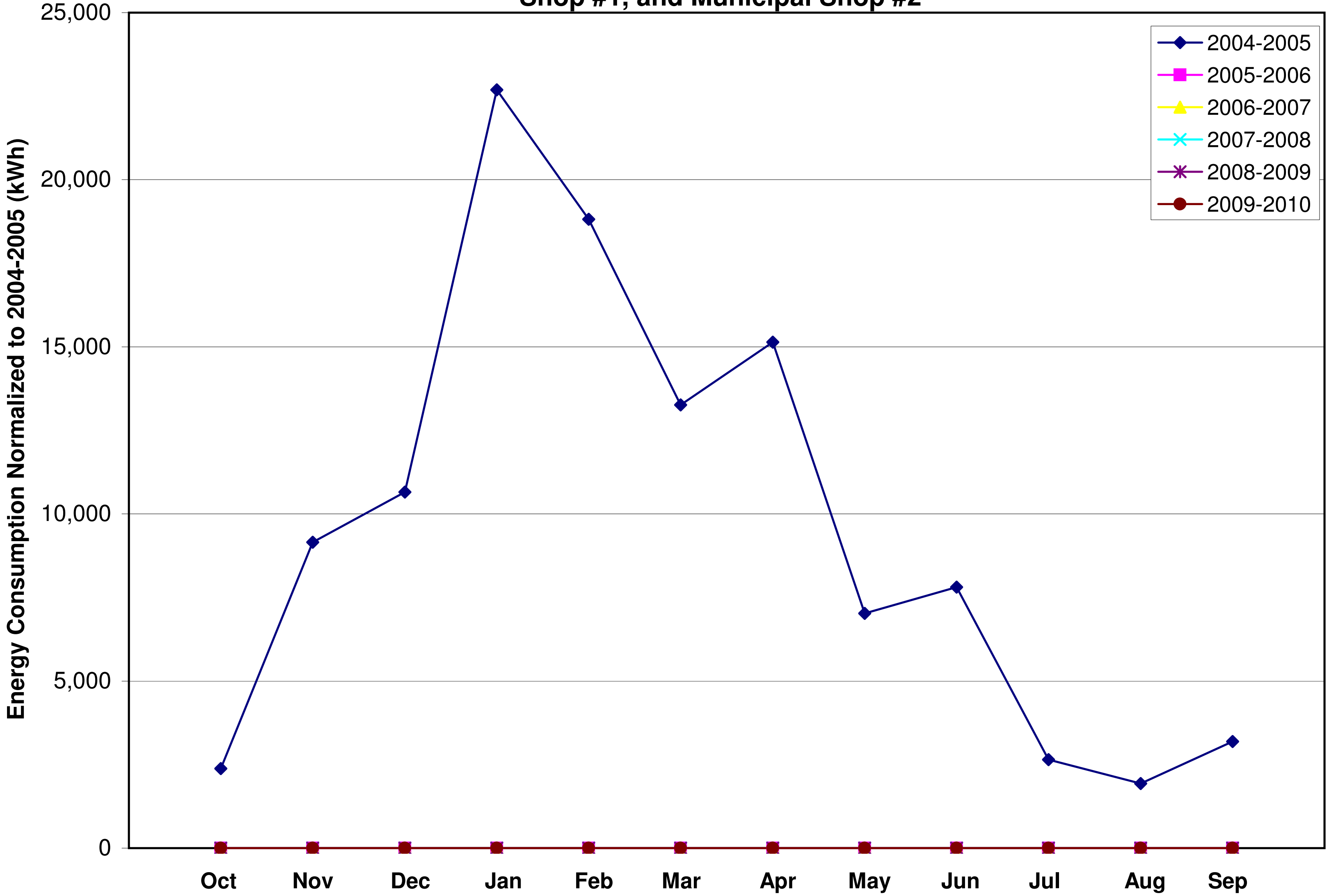


Table F.2 - Energy Consumption Monitoring Data for Hospital Street Lift Station

	2004-2005			2005-2006			2006-2007			2007-2008			2008-2009			2009-2010		
Month	**Billed Energy Consumption (kWh)**	**HDD (°C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Energy Consumption (kWh)**	**HDD (°C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Energy Consumption (kWh)**	**HDD (°C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Energy Consumption (kWh)**	**HDD (°C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Energy Consumption (kWh)**	**HDD (°C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Energy Consumption (kWh)**	**HDD (°C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**
October	330	340.7	330			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
November	40	525.4	40			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
December	210	970.3	210			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
January	50	1115.6	50			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
February	80	816.7	80			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
March	40	735.1	40			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
April	100	293.2	100			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
May	40	214.9	40			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
June	360	41.3	360			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
July	40	12	40			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
August	380	20.5	380			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
September	50	89.5	50			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
TOTAL	1,720	5175.2	1,720	0	0	#DIV/0!	0	0	#DIV/0!	0	0	#DIV/0!	0	0	#DIV/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 Energy Consumption" (in kWh) taken from the hydro bill 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

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 F16) 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 Hospital Street Lift Station

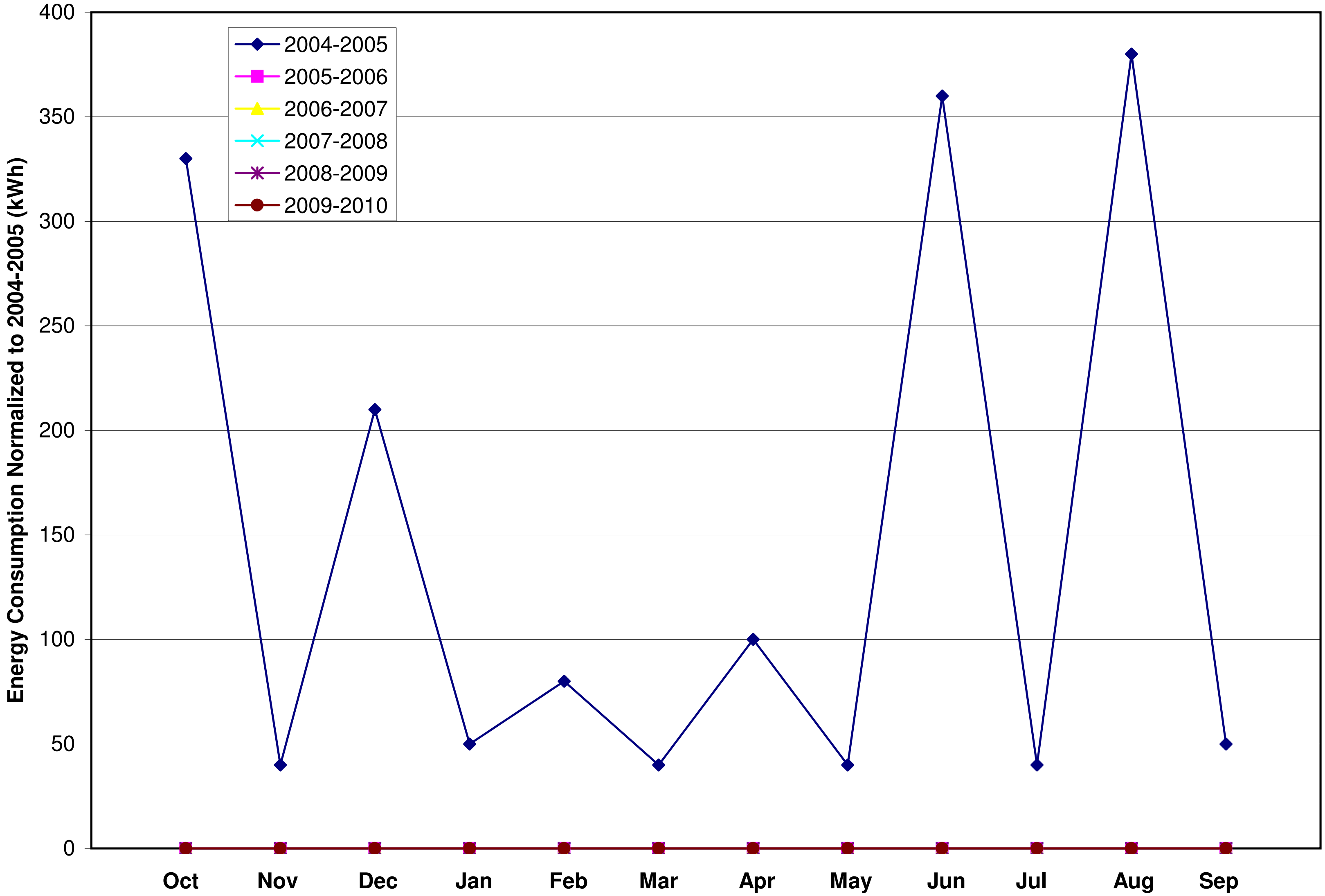


Table F.3 - Energy Consumption Monitoring Data for Front Street Lift Station

	2004-2005			2005-2006			2006-2007			2007-2008			2008-2009			2009-2010		
Month	**Billed Energy Consumption (kWh)**	**HDD (°C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Energy Consumption (kWh)**	**HDD (°C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Energy Consumption (kWh)**	**HDD (°C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Energy Consumption (kWh)**	**HDD (°C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Energy Consumption (kWh)**	**HDD (°C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Energy Consumption (kWh)**	**HDD (°C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**
October	1,290	340.7	1,290			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
November	230	525.4	230			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
December	850	970.3	850			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
January	380	1115.6	380			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
February	270	816.7	270			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
March	250	735.1	250			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
April	570	293.2	570			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
May	210	214.9	210			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
June	1,570	41.3	1,570			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
July	610	12	610			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
August	1,370	20.5	1,370			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
September	460	89.5	460			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
TOTAL	8,060	5175.2	8,060	0	0	#DIV/0!	0	0	#DIV/0!	0	0	#DIV/0!	0	0	#DIV/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 Energy Consumption" (in kWh) taken from the hydro bill 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

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 F16) 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 Front Street Lift Station

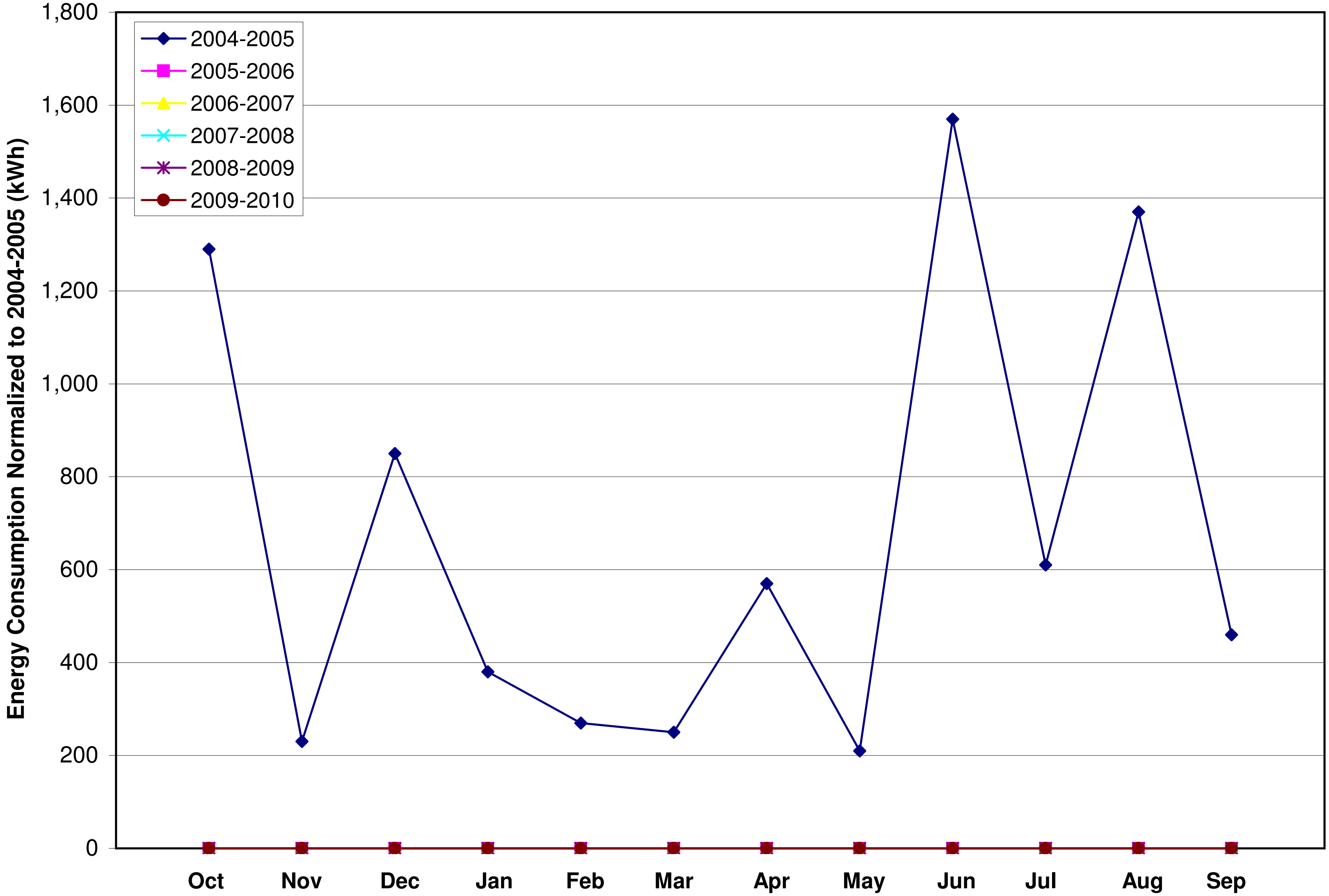


Table F.4 - Energy Consumption Monitoring Data for Small Garage

	2004-2005			2005-2006			2006-2007			2007-2008			2008-2009			2009-2010		
Month	**Billed Energy Consumption (kWh)**	**HDD (°C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Energy Consumption (kWh)**	**HDD (°C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Energy Consumption (kWh)**	**HDD (°C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Energy Consumption (kWh)**	**HDD (°C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Energy Consumption (kWh)**	**HDD (°C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Energy Consumption (kWh)**	**HDD (°C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**
October	0	340.7	0			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
November	0	525.4	0			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
December	1,340	970.3	1,340			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
January	0	1115.6	0			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
February	1,950	816.7	1,950			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
March	0	735.1	0			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
April	1,780	293.2	1,780			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
May	0	214.9	0			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
June	0	41.3	0			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
July	0	12	0			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
August	840	20.5	840			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
September	0	89.5	0			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
TOTAL	5,910	5175.2	5,910	0	0	#DIV/0!	0	0	#DIV/0!	0	0	#DIV/0!	0	0	#DIV/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 Energy Consumption" (in kWh) taken from the hydro bill 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

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 F16) 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 Small Garage

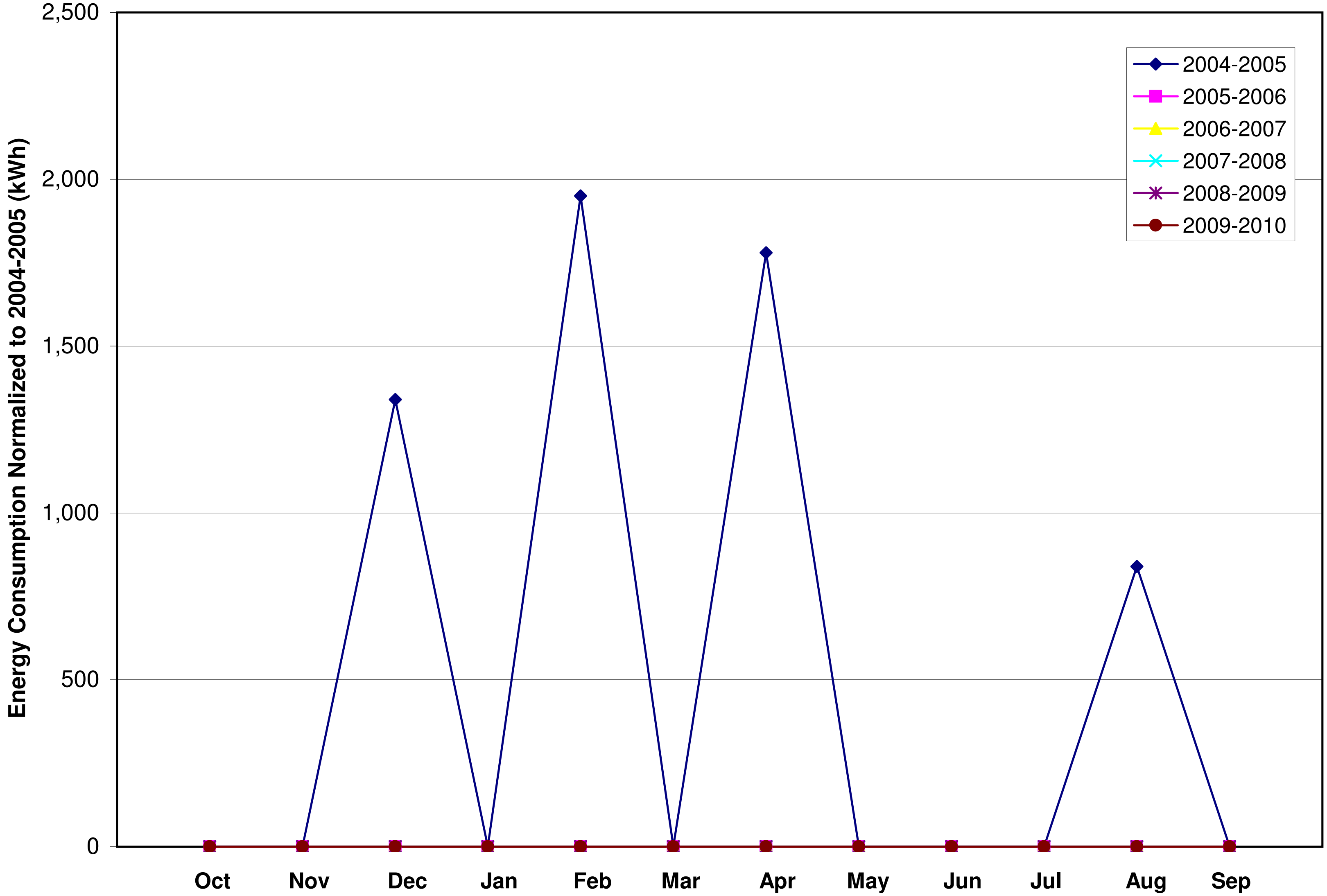


Table F.5 - Energy Consumption Monitoring Data for Fire Hall

	2004-2005			2005-2006			2006-2007			2007-2008			2008-2009			2009-2010		
Month	Billed Energy Consumption (kWh)	HDD (°C days/mo)	Energy Normalized to 2004-2005 (kWh)	Billed Energy Consumption (kWh)	HDD (°C days/mo)	Energy Normalized to 2004-2005 (kWh)	Billed Energy Consumption (kWh)	HDD (°C days/mo)	Energy Normalized to 2004-2005 (kWh)	Billed Energy Consumption (kWh)	HDD (°C days/mo)	Energy Normalized to 2004-2005 (kWh)	Billed Energy Consumption (kWh)	HDD (°C days/mo)	Energy Normalized to 2004-2005 (kWh)	Billed Energy Consumption (kWh)	HDD (°C days/mo)	Energy Normalized to 2004-2005 (kWh)
October	910	340.7	910			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
November	3,590	525.4	3,590			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
December	5,820	970.3	5,820			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
January	8,670	1115.6	8,670			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
February	8,730	816.7	8,730			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
March	5,480	735.1	5,480			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
April	6,850	293.2	6,850			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
May	1,960	214.9	1,960			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
June	2,120	41.3	2,120			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
July	1,030	12	1,030			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
August	1,100	20.5	1,100			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
September	1,210	89.5	1,210			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
TOTAL	47,470	5175.2	47,470	0	0	#DIV/0!	0	0	#DIV/0!	0	0	#DIV/0!	0	0	#DIV/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 Energy Consumption" (in kWh) taken from the hydro bill 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

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 F16) 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 Fire Hall

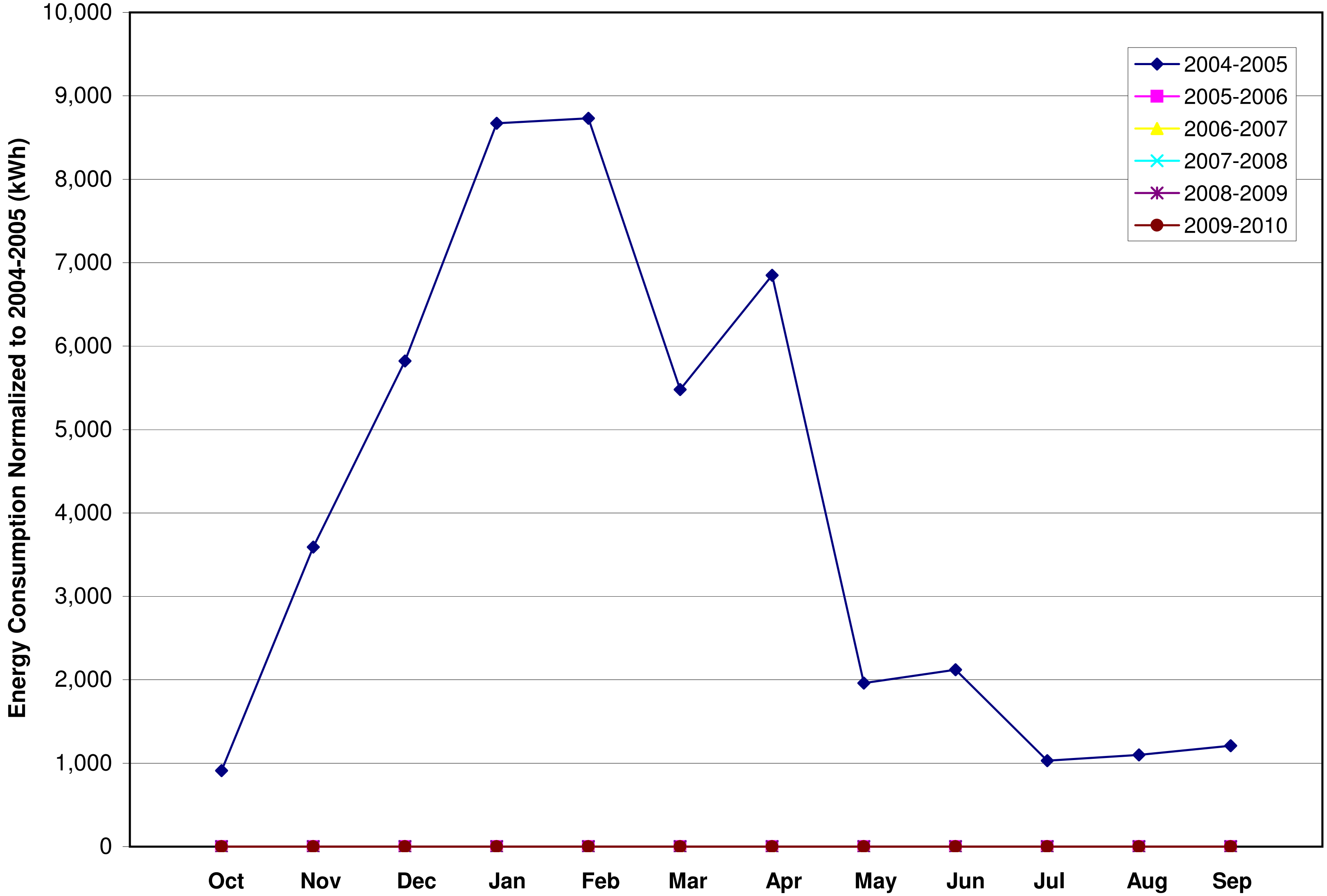


Table F.6 - Energy Consumption Monitoring Data for Waterline Pumphouse

	2004-2005			2005-2006			2006-2007			2007-2008			2008-2009			2009-2010		
Month	Billed Energy Consumption (kWh)	HDD (°C days/mo)	Energy Normalized to 2004-2005 (kWh)	Billed Energy Consumption (kWh)	HDD (°C days/mo)	Energy Normalized to 2004-2005 (kWh)	Billed Energy Consumption (kWh)	HDD (°C days/mo)	Energy Normalized to 2004-2005 (kWh)	Billed Energy Consumption (kWh)	HDD (°C days/mo)	Energy Normalized to 2004-2005 (kWh)	Billed Energy Consumption (kWh)	HDD (°C days/mo)	Energy Normalized to 2004-2005 (kWh)	Billed Energy Consumption (kWh)	HDD (°C days/mo)	Energy Normalized to 2004-2005 (kWh)
October	3,380	340.7	3,380			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
November	4,990	525.4	4,990			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
December	3,120	970.3	3,120			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
January	4,020	1115.6	4,020			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
February	4,920	816.7	4,920			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
March	5,200	735.1	5,200			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
April	3,830	293.2	3,830			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
May	1,990	214.9	1,990			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
June	1,270	41.3	1,270			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
July	6,590	12	6,590			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
August	2,590	20.5	2,590			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
September	3,030	89.5	3,030			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
TOTAL	44,930	5175.2	44,930	0	0	#DIV/0!	0	0	#DIV/0!	0	0	#DIV/0!	0	0	#DIV/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 Energy Consumption" (in kWh) taken from the hydro bill 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

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 F16) 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 Waterline Pumphouse

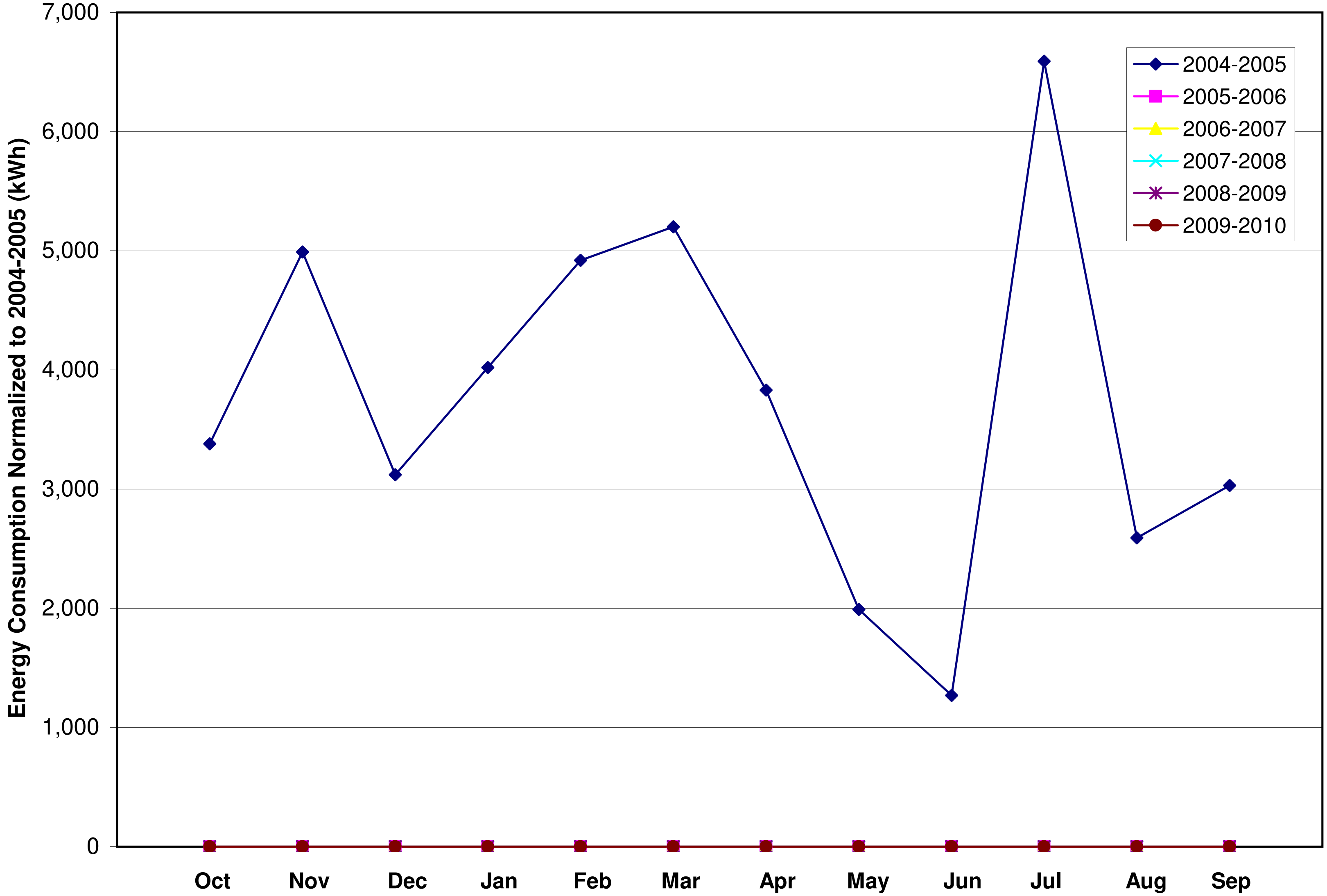


Table F.7 - Energy Consumption Monitoring Data for Waste Management Facilities #1 & #2

	2004-2005			2005-2006			2006-2007			2007-2008			2008-2009			2009-2010		
Month	**Billed Energy Consumption (kWh)**	**HDD (°C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Energy Consumption (kWh)**	**HDD (°C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Energy Consumption (kWh)**	**HDD (°C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Energy Consumption (kWh)**	**HDD (°C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Energy Consumption (kWh)**	**HDD (°C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**	**Billed Energy Consumption (kWh)**	**HDD (°C days/mo)**	**Energy Normalized to 2004-2005 (kWh)**
October	2,330	340.7	2,330			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
November	7,790	525.4	7,790			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
December	22,410	970.3	22,410			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
January	32,660	1115.6	32,660			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
February	30,780	816.7	30,780			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
March	28,420	735.1	28,420			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
April	26,000	293.2	26,000			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
May	5,850	214.9	5,850			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
June	3,630	41.3	3,630			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
July	2,490	12	2,490			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
August	2,140	20.5	2,140			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
September	2,430	89.5	2,430			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!			#DIV/0!
TOTAL	166,930	5175.2	166,930	0	0	#DIV/0!	0	0	#DIV/0!	0	0	#DIV/0!	0	0	#DIV/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 Energy Consumption" (in kWh) taken from the hydro bill next to the appropriate month.

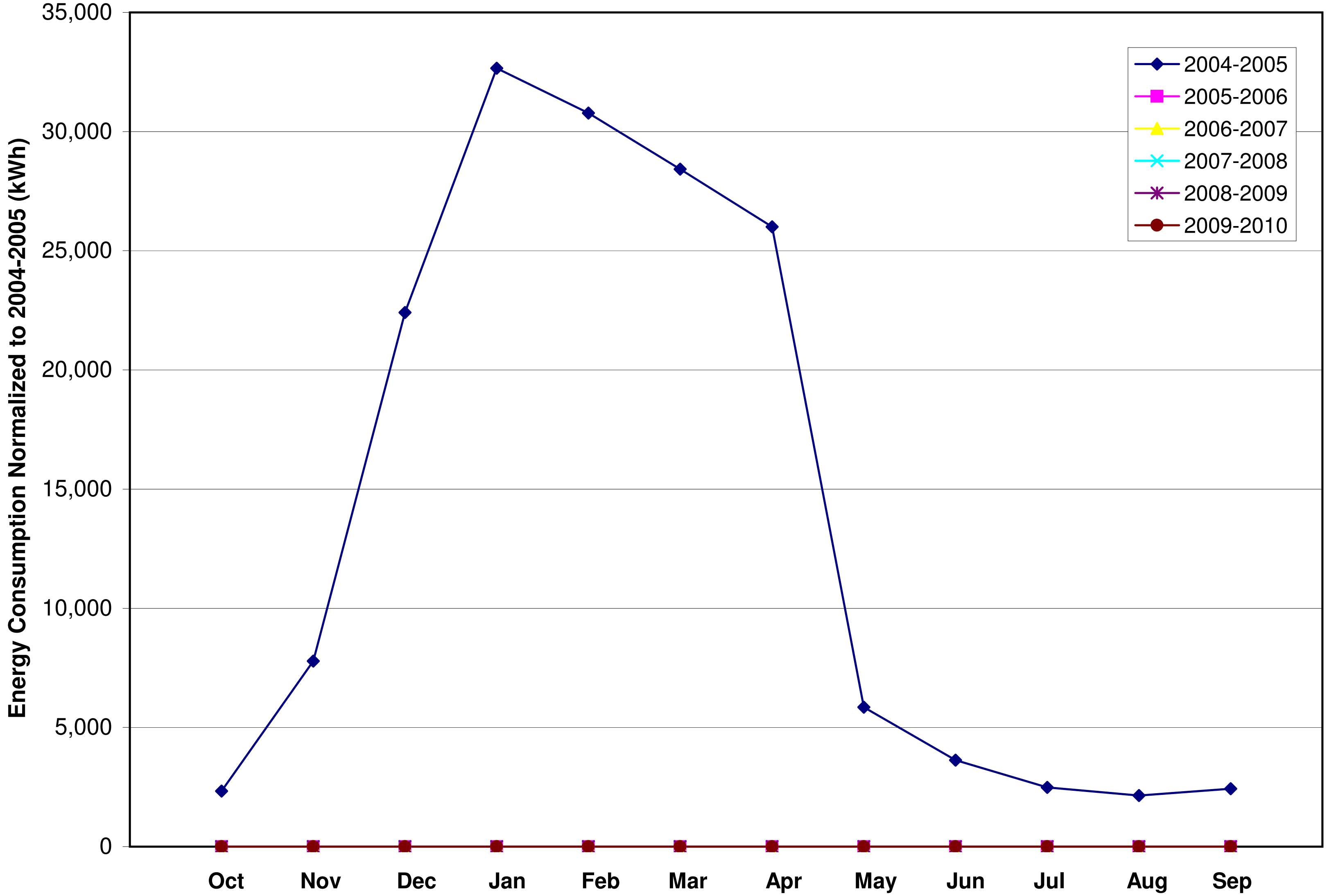
3. Go to the following website to collect information on the Heating Degree Days for Winnipeg, Manitoba: http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=CA&StationID=28051&Year=2005&Month=11&Day

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 F16) 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 Waste Management Facilities #1 & #2



Environment Canada Environnement Canada

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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

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.