City of Nelson
Greenhouse Gas Reduction Plan
Corporate Operations

May 12th, 2010

TABLE OF CONTENTS

1. Executive Summary

The purpose of this Greenhouse Gas Reduction Plan is to create a roadmap for the reduction of greenhouse gas emissions produced through the corporate operations of the City of Nelson.

KEY POINTS

- Pertains to corporate operations only, community greenhouse gas emissions are being addressed under a different plan
- Plan includes five, ten, and fifteen year reduction targets up to and including the year 2025
- Plan includes a forecast for 2050 emission reduction predictions, this is an estimated value based on current day assumptions and is not a firm commitment target
- Reduction targets should be re-evaluated and refined every five years in order to incorporate advances in technology and improvements in available data
- Greenhouse gas inventories will be completed each year in order to monitor and track progress
- Staff engagement is crucial to the implementation and ongoing success of the greenhouse gas reduction plan
- The City of Nelson has adopted Option B of the plan with a greenhouse gas emissions decrease of 25% by 2015 over 2007 levels at a cost of approximately $1.2M

The City of Nelson's Greenhouse Gas Reduction Plan presents a measured approach to the reduction of the City's corporate greenhouse gas emissions. The goals outlined is this plan are in keeping with Provincial targets and will place the City on a trajectory to achieving long-term emission reductions within the region of those agreed upon by the global scientific community.

2. Background

2.1. Community and Corporate Emissions

This action plan addresses the corporate operations consumption and emissions. Actions to reduce energy consumption and greenhouse gas emissions are frequently divided into the realm of:

Corporate emissions - those that the local government creates through its activities (and which it has control over) such as municipal building operations, recreation centres, vehicle fleets, and utility services); and

Community emissions - those that the residents and businesses in the community create through their activities. The local government cannot directly control these, but may be able to influence through planning and program activities.

2.2. Climate Change and Greenhouse Gas Emissions

Climate change can refer to any change in climate over time, whether due to natural variability or as a result of human activity. The variation in climate generally persists for extended periods of time (typically decades or longer). Greenhouse Gases (GHGs) are gases in the atmosphere that absorb and emit radiation thereby affecting the temperature of the earth. The main GHGs within the Earth's atmosphere are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O), with carbon dioxide being the most important GHG derived from human activities.

In 2007, the Intergovernmental Panel on Climate Change (IPCC) released the 4th Assessment Report on Climate Change. The report is based on a review of the most recent scientific data by thousands of scientists world-wide as it pertains to an understanding of climate change. The report concludes that "warming of the climate system is unequivocal" and that "most of the observed increase in global average temperatures since the mid-20th century is due to the observed increase in anthropogenic GHG concentrations". Human activities such as the burning of fossil fuels and the removal of carbon sinks (e.g. forests), are resulting in increased concentrations of greenhouse gases in the atmosphere, thus contributing to global climate change.

The link between energy and greenhouse gas management is straightforward. The burning of fossil fuels is resulting in increased concentrations of GHG in the atmosphere contributing to global climate change.

2.3. Partners for Climate Protection

The Partners for Climate Protection (PCP) is an umbrella program supported by the Federation of Canadian Municipalities. It is comprised of a network of Canadian municipal governments that have committed to reducing greenhouse gases and acting on climate change. The goal of the PCP is to assist municipalities with their greenhouse gas management initiatives through tools and logistical support. PCP is based on a framework of five milestones used to guide municipalities in their reduction of greenhouse gas emissions. The five milestone process is a performance-based model which remains flexible; milestones do not need to be completed in sequential order.

2.4. Climate Action Charter

Municipal governments have an important contribution to make to climate protection. Up to half of Canada's greenhouse gas (GHG) emissions are under the direct or indirect control or influence of municipal governments. The Climate Action Charter is a provincial initiative signed by the Province, the Union of BC Municipalities (UBCM), and local government in which signatories commit to a goal of becoming carbon neutral in corporate operations by 2012. The Climate Action Charter recognizes the need to take action on climate change and reduce greenhouse gas emissions.

2.5. City of Nelson Commitment to Climate Change

The City of Nelson has committed to two different climate action initiatives. It is a participatory member of the Partners for Climate Protection program and has voluntarily signed the BC Climate Action Charter.

The Partners for Climate Protection initiative entails the completion of the five milestones:

1. Complete GHG and energy use inventories;
2. Set reduction targets;
3. Develop a management plan;
4. Implement the plan; and
5. Monitor and report progress.

The City has achieved milestones one and two and is currently working towards milestone three through this greenhouse gas reduction plan.

In September 2007, the City of Nelson voluntarily signed the Climate Action Charter. In order to achieve carbon neutrality by 2012, carbon emissions will be reduced by approximately 20% of base year (2007) emissions with the remaining reductions achieved through the purchase of meaningful carbon offsets.

2.6. GHG Emissions and Reductions

The most common greenhouse gas emissions from corporate operations are methane and carbon dioxide. References to GHG emissions are generally referring to the release of these gases into the atmosphere. Currently, the simplest way to measure GHG emissions is to track energy consumption data and then convert the energy data into emissions. In reducing energy consumption, GHG emissions are also reduced to varying degrees depending on the energy source.

2.7. Carbon Offsets

Carbon offsets are an emission reduction credit from another organisation's project that results in less carbon dioxide or other greenhouse gases in the atmosphere. Like GHG emissions, carbon offsets are typically measured in tonnes of carbon dioxide equivalents (t CO2e) where one carbon offset represents the reduction of one metric tonne of carbon dioxide or its GHG equivalent. Offsets are not a replacement for direct action in carbon reduction, but they can work in tandem with operational carbon reduction initiatives to achieve carbon neutrality.

The purchase of GHG reduction credits is based on the principle that those reductions wouldn't have happened otherwise – known as additionality. Other components of carbon offsets are the validation of projects by reputable third parties and the assurance that offsets are only sold once. Types of carbon offsets include those resulting from renewable energy projects (e.g. wind power), methane capture from landfills or livestock, destruction of greenhouse gases such as halocarbons, and carbon sequestration projects (through reforestation or agriculture) that absorb carbon dioxide from the atmosphere.

Carbon offsets can be purchased from any credible offset organization. One such organization is the Pacific Carbon Trust - a provincial Crown corporation set up by the British Columbia government to acquire greenhouse gas offsets on its behalf. Another option is the Carbon Neutral Kootenays Project. As part of their "Year One Targets" to be completed by February 2010, they are exploring the feasibility of establishing a Kootenay carbon offset investment program. Although carbon offset costs vary depending on the provider, the rate set by Pacific Carbon Trust is $25 per tonne of CO2e.

2.8. Objective of the Corporate Greenhouse Gas Reduction Plan

GHG emission reductions have many local benefits including reduced operating costs, improved public transit, enhanced open spaces, improved liveability and local economic growth. The focus of this plan is on implementing opportunities to use energy more efficiently, as well as reducing the carbon intensity of fuels consumed through corporate operations in the City.

3. Overview

3.1. Carbon Emissions Inventory

In order to implement an effective strategy to reduce greenhouse gas emissions, it is necessary to develop an inventory of the emissions as a baseline measure. This baseline measure provides a starting point from which future progress can be assessed. Refer to Appendix A for an emissions inventory. This inventory pertains to corporate emissions only for City of Nelson activities and operations.

GHG emissions are measured in tonnes of carbon dioxide equivalents (t CO_2e) and are calculated from the energy consumed by the City's operations. Emissions released in a form other than carbon dioxide are converted to t CO_2e as a method for standardised reporting and comparisons. Major sources of GHG emissions include electricity, natural gas, propane, diesel fuel, and gasoline. Greenhouse gases are emitted as these fuels are burned with different fuel sources emitting varying levels of CO_2e per unit of fuel.

Fuel Source	GHG Emission Factor	Unit
Electricity	0.006106	t CO_2e/GJ
Natural Gas	0.051000	t CO_2e/GJ
Propane	0.061000	t CO_2e/GJ
Gasoline	0.002410	t CO_2e/L
Diesel	0.002760	t CO_2e/L

3.2. GHG Reductions vs. Energy Savings

Greenhouse gas emission reductions have the twofold benefit of both reducing emissions and reducing energy costs. Although these benefits are related, they are not interchangeable. Energy reductions may be associated with minimal carbon emission reductions and vice versa. The impact of energy and emissions reductions is connected to the energy source being targeted. GHG emissions from the burning of natural gas is approximately 8.5 times that of electricity, therefore initiatives that reduce the usage of natural gas will have greater impacts on emission reductions. However, natural gas is less expensive than electricity, so projects that result in a reduction of natural gas will have less of an impact on energy costs than those which decrease electricity consumption. A balanced approach is needed to maximise both the cost savings through energy reductions and emission savings through GHG reductions.

3.3. Forecasting Energy Consumption and Emissions

Completion of a GHG and energy use inventory is the first milestone in the Partners for Climate Protection program. In order for the emissions inventory to achieve this milestone, a forecast is required which projects 10 years beyond the base emissions year of 2007 to 2017. In accordance with this requirement, a forecast was estimated based on anticipated changes to the current energy consumption of City operations as well as new assets that will affect energy consumption over the 10 year forecast period. Forecasts allow us to understand future energy consumption, costs of consumption, and emissions. They play an essential role in the calculation of reduction targets. As forecasts are based on predictive assumptions, they are subject to change. Reduction targets calculated from forecasts should be re-evaluated as new information becomes available.

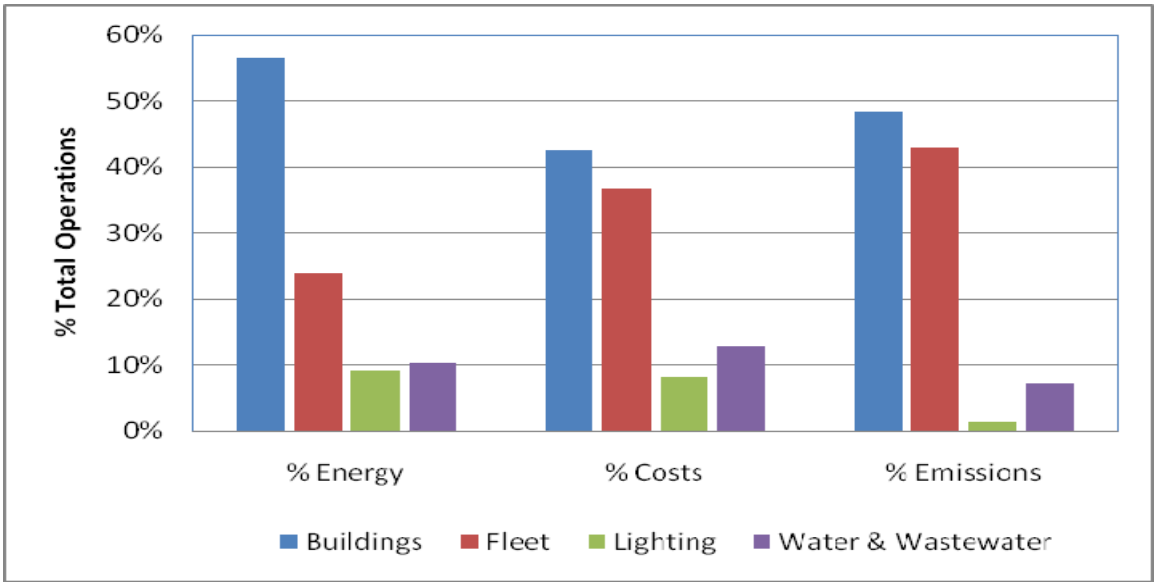
3.4. Reduction Targets and Measures

A reduction target is equal to the percent difference between the base year inventory and the forecast year inventory. Reduction targets are absolute and not based on per capita emissions. To achieve an actual reduction, the total emission reductions attained during the project period must be greater than the growth in emissions. In addition to measuring the current GHG emissions within City operations, an action list recommends specific reduction initiatives to reduce energy consumption and greenhouse gas emissions in the existing infrastructure (Appendix C). Estimates of reduction quantities are provided for energy consumption, energy cost, and GHG emissions. In addition, capital costs, simple payback, costs per kilotonne reduced, and an implementation schedule are outlined in the reduction recommendations.

4. Inventory Summary

Data collected as part of the corporate emissions inventory was summarised by both sector and energy type. The four sectors were buildings, lighting, vehicle fleet, and water & wastewater; while the energy types consisted of electricity, natural gas, stationary propane, mobile propane, gasoline, and diesel fuel. The City's total energy consumed was 34,796 GJ, total costs were $673,544, and total greenhouse gas emissions were 1,395 tonnes CO2e. The baseline year for the inventory was 2007.

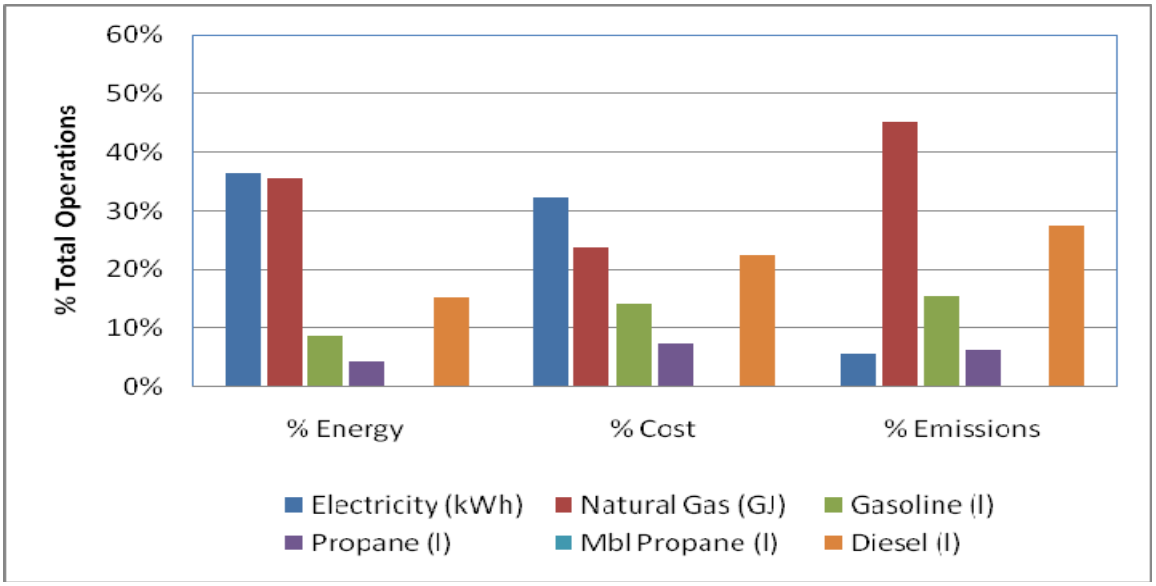
4.1. Energy Consumption, Energy Costs, and Emissions by Sector



Sector	Total Energy (GJ)	Total Cost ($)	Total Emissions (t CO2e)	% Energy	% Costs	% Emissions
Buildings	19,668	$286,095	675.8	57%	42%	48%
Vehicle Fleet*	8,335	$247,020	599.4	24%	37%	43%
Water & Wastewater	3,182	$54,564	19.4	9%	8%	1%
Lighting	3,611	$85,865	100.6	10%	13%	7%
Total	**34,796**	**$673,544**	**1,395.3**	**100%**	**100%**	**100%**

* GHG Inventory for Fleet does not include public transit vehicles

4.2. Energy Consumption, Energy Costs, and Emissions by Energy Type



Energy Type	Total Energy (GJ)	Total Cost ($)	Total Emissions (t CO2e)	% Energy	% Costs	% Emissions
Electricity	12,669	217,243	77.4	36%	32%	6%
Natural Gas	12,336	160,365	631.0	35%	24%	45%
Diesel Fuel	5,312	151,060	382.0	15%	22%	27%
Gasoline	2,997	95,102	215.9	9%	14%	15%
Stationary Propane	1,457	48,916	87.5	4%	7%	6%
Mobile Propane	26	859	1.5	0%	0%	0%
Total	**34,797**	**673,544**	**1,395.3**	**100%**	**100%**	**100%**

5. Corporate Operations

There are many initiatives available to the City of Nelson to reduce energy consumption and related GHG emissions throughout corporate operations. In the primary stages of this project, the focus has been on mechanical upgrades within buildings as they comprise the largest component of GHG emissions. In addition to energy reductions achieved through mechanical retrofits and upgrades, progress can also be made through cultural shifts in user practices. Education of City staff will play an important role in these cultural shifts and information sessions will be organised for each department. Technology will also continue to be pursued and implemented in future reductions. New technology that increases energy efficiency and the availability of alternative energy sources will be a pivotal part of this process. Included in the following is an overview of current and future reduction endeavours within the City. Appendix C provides a comprehensive list of proposed reduction initiatives. A complete account of energy needs and costs for each building is summarised in Appendix B.

5.1. Staff Engagement

Many of the initiatives outlined in Appendix C of the Action Plan will have an impact on the day to day operations of the City. As the more readily identifiable projects are completed, a greater level of innovation and staff involvement will be required in the reduction of corporate GHG emissions. Sessions will be held to include staff in the process and feedback mechanisms will be developed to both allow for and encourage ongoing staff input into the project. Annual workshops will be held for staff involved in long-term operations and capital planning that relates to climate action. In this way, GHG emissions and reductions can be integrated into the decision making process at a corporate level within the City.

5.2. City Hall

City Hall is the highest energy consuming building in the city. Although the City leases a large portion of the building to the Province of British Columbia, the City has operational control of the building and so the emissions are counted in the City's GHG inventory.

Completed Initiatives: According to an energy assessment by Terasen Gas, the gas usage for space heating in City Hall in 2008 was estimated to be 50% lower than the average surveyed building. Beginning in the summer of 2008, the shutdown of boilers has reduced heating intensity even further. Work spaces within City Hall already have some energy efficient measures in place such as improved lighting systems and timers. Cleaning staff are also being transitioned from an evening schedule to a daytime schedule to reduce heating and lighting needs. Over the last 3 years, emission levels have been declining. This is likely due to the cumulated effects of changes in building management.

Future Initiatives: Potential projects include heat recovery ventilators, upgrade of the HVAC system, ground source heat pumps, and modulating boilers which allow for boilers to operate at varying levels as needed. A feasibility study of a solar hot water system, energy audit, and condition review of the building are also being developed. Energy audits are a natural augmentation in the building condition review process as scheduled replacement of building components provides an excellent opportunity for energy savings.

5.3. Police/Library

The police station and library are located in the same building, with the assumption that police operations utilise 60% of the total energy and the library utilises the remaining 40%.

Completed Initiatives: Within the library, centralised multi-function devices have replaced individual printers and copiers, six public use terminals operate from a single server, thermostats are on timers and lighting systems are currently replaced with high efficiency systems on an as needed basis. Due to the nature of the police department and the fact that it is part of emergency services, there are fewer options for energy reductions. However, changes have been made where possible, to lighting requirements and more energy efficient communications systems.

Future Initiatives: The police and library building is part of an upcoming proposal to conduct a building condition review and energy audit. A review of HVAC controls is needed as the split use of the building can result in large temperature differentials between the various levels of the structure and the simultaneous operation of the boiler and air conditioning system. This is an excellent example of an instance where energy reductions can also improve user comfort. The replacement of electric heating and fuel fired rooftops with air to air heat pumps has the potential to greatly reduce carbon emissions and energy consumption.

5.4. Fire Hall

Due to the age of the Fire Hall, it provides many opportunities for energy reduction savings. The building dates back to 1913 with numerous additions and renovations since that time.

Completed Initiatives: The fire hall is currently undergoing a feasibility study by Fairbanks Architects to determine how the structure meets the needs of today's fire department. A thermal analysis is one component of this study that measures heat loss throughout the building. It has been determined that the majority of heat loss is through the brick walls of the building. Energy reduction initiatives already in place at the fire hall include the implementation of a vehicle use policy whereby smaller vehicles are used during call outs when possible, timing systems on block heaters that reduce the cost of heating fire trucks by 50%, and the upgrading of lights as they become due for replacement.

Future Initiatives: The current heating capacity of the fire hall is not sufficient for the needs of the building and provides the greatest opportunity for upgrade. The building is heated using natural gas heating units and electric baseboards. At times, both systems can be running 24 hours a day without meeting the heating requirements of the building. The insulation and sealing off of low use areas of the building is essential to reducing energy usage, in conjunction with an upgrade to the heating system. The final results of the feasibility study will help determine the next steps to be taken in energy reduction at the fire hall.

5.5. Public Works

The City Works Complex is one of the larger energy consumers within City operations. The building consists of office space and several vehicle bays heated with a combination of gas/radiant heat and electric heat.

Completed Initiatives: The roof and walls of the vactor shed at public works have been insulated to account for the change in usage of the building from a non-heated to a heated facility. A project is underway to install insulation which should significantly improve the heating efficiency of the structure. The lighting systems of the main areas within the City Works Complex (approximately 50%) are on either timer systems or motion sensors. For those areas with manual controls, good user practices have been implemented to ensure that lights are turned off when the area is not in use. The installation of additional occupancy sensors will also be completed in the near future.

Future Initiatives: Like other buildings within City operations, conversion of gas and electric roof-top units to a heat pump would have a large impact on energy costs with a simple payback of only two years. There is also a plan in place to upgrade the bay doors with new weather stripping and insulation – completing two doors a year over the next five years.

5.6. Civic Centre

As the second highest energy consuming facility in Nelson, this building is a facet of city operations in which significant progress can be made towards energy reduction. The building is a concrete slab construction from the 1930s with an ice rink, gymnasiums, senior's lounge and movie theatre.

Completed Initiatives: There are very few control points within the Civic Centre from which HVAC systems can be regulated. The majority of thermostats are manual and are regulated mostly by user groups within the building. Monitoring of the thermostats has confirmed that systems are being turned down when not in use and that user practices to reduce energy use are in effect. The overall GHG emissions of this building have been decreasing since 2005. The senior's lounge within the facility was recently upgraded to a high efficiency furnace when the old unit reached the end of its life.

Future Initiatives: One of the largest gains to be made in energy efficiency within this building is the replacement of the boiler with a high efficiency modulating boiler, which should result in a 20% decrease in natural gas consumption. Although the capital cost for this project is larger, the energy savings would offset the cost of the system over 6 years. Other opportunities to consider for GHG reductions include heat recovery systems and solar hot water systems for domestic hot water needs.

5.7. Youth Centre

The Youth Centre building houses both the Nelson District Youth Centre and the Youth Employment Resources office. The employment office is a federal program and the space is rented from the City of Nelson. The building is made up of offices on the second floor and a large open concept space on the first floor that is used for Youth Centre programs. The space is heated with a combination of electric baseboard heaters and two natural gas furnaces.

Completed Initiatives: Emergency lights must be on at all times, but have been upgraded to LED technology. The thermostat that controls heat to the office space is on a timer system and some windows have been upgraded to a reflective material that filters light and allows for less air conditioning in the summer months. All computers and printers are on a system that goes into sleep mode when not in use and appliances are being upgraded to Energy Star systems as they become due for replacement, including an Energy Star hot water tank that was installed in 2007. Due to the nature of the Youth Centre, use of the building is concentrated to specific times of the day and so systems are either turned off or kept at low levels when the building is not in use.

Future Initiatives: The open concept space on the first floor is heated to a minimal level as it's used for physical activities, but the space is large and requires a large amount of lighting. A complete retrofit of the current lighting system would significantly reduce the energy needs of the building. Heating of the structure is the other main contributor to greenhouse gas emissions and could be upgraded to warm air furnace and replacement of rooftop units with a heat pump. Insulation of the cinder block walls on the first floor is another energy reducing measure to consider. A basic insulation of the space would not be adequate to withstand the high use of the area as an indoor skate/bike park, so more research is needed to determine the feasibility of the project.

5.8. Other Buildings

Smaller buildings within the City operations include the Parkade, Capitol Theatre, Curling Club, BC Gas Building, Airport Terminal, Old Museum, Lakeside Park Field House, and the Rowing Club and Tramway. Although smaller structures don't have as large an impact on energy reduction and carbon emission, their cumulative effect can still have a considerable bearing on overall operations.

Completed Initiatives: The lighting system in the Parkade was recently upgraded from a T12 system to a higher efficiency T8 lighting system. With the annual savings in operation costs, the expense of the upgrade will be recouped in just over a year.

Future Initiatives: An upgrade of the furnace system at the Curling Club, and replacement of electric heating systems with air to air heat pumps at the Capitol Theatre will have a combined impact on energy use and carbon emissions.

5.9. Vehicle Fleet

Vehicles make up 57% of energy costs within City operations and contribute to 48% of greenhouse gas emissions.

Completed Initiatives: Established energy reduction programs include an idle control policy for City buses, replacement schedules to minimize the number of outdated and inefficient vehicles within the fleet, downsizing of vehicles as they come due for replacement, specified emissions control equipment in tenders for medium to heavy trucks, and the recent purchase of a hybrid SUV for the planning/building department. The City also made a recent attempt to purchase a hybrid line truck for Nelson Hydro. Unfortunately, it was found that the transmission of the hybrid truck could not accommodate the road grade in Nelson, but this technology could be improved in the future and should be monitored.

Future Initiatives: In 2010, all diesel fuel used in City vehicles will contain a 5% biodiesel mix. It is estimated that this will reduce GHG emissions from diesel consumption by approximately 4%. User practices will also be targeted through energy aware driver training for staff members. Additional reduction initiatives include alternative transportation and improved trip planning. To measure the effect of reduction measures, improved data tracking measures will be implemented through new fleet management software. Within the realm of fleet emissions, a continued awareness and tracking of new technologies can have a particularly large impact on GHG reductions.

5.10. Outdoor Lighting

The City of Nelson is somewhat unique in that it owns all of the streetlights in the community and does not lease them from BC Hydro like most municipalities.

Future Initiatives: Streetlights are the largest component of outdoor lighting and contribute approximately 10 tonnes of carbon dioxide equivalents to emissions. Although replacement of the streetlights with LED lights would reduce emissions, there is no immediate plan to upgrade the system. At an estimated cost of $425,000, this project would have a simple payback of more than 35 years and a capital cost of more than $100,000/t$CO_2$e. At this point in the carbon reduction process, funds can be directed more efficiently towards other initiatives. Nelson Hydro will consider installing a small pilot project of LED streetlights to become more experienced with this technology in preparation for a time when LED systems may be more cost effective. User operated timer systems can also be installed in areas where lights are not required to be on at all times. In 2010, the lighting system at the tennis courts will be upgraded to this type of system.

5.11. Water and Wastewater

Many water and wastewater accounts are not metered, so energy, costs, and emissions in this sector are based on estimates rather than detailed account data. Metering of accounts would allow for more accurate tracking and an improvement in reduction measure estimates. The water and wastewater system is comprised of a sewage treatment plant, sanitary lift stations, pressure reducing valve stations, chlorination stations, water reservoirs, and a pump house. The largest energy consumer is the sewage treatment plant.

Completed Initiatives: The majority of electrical pumps at lift stations, with the exception of the airport lift station, will need upgrading in the next 5 to 10 years. As pump stations are upgraded, they are retrofitted with high efficiency motors, where applicable. The new Willow PRV station is in the process of being built and has been designed to allow for the future addition of a micro hydro system at the site. At the sewage treatment plant, approximately 50% of the methane produced is used to heat the digester.

Future Initiatives: Water-saving devices such as low-flow toilets, tap sensors, and waterless urinals could be added to corporate buildings. In addition, metering of corporate facilities would provide a measure of water use and potentially reduce unnecessary water loss. Although there is not enough methane by-product at the sewage treatment plant for the generation of electricity, the methane not currently used to heat the digester could be captured and burned as a biofuel to assist in the heating of the plant.

6. GHG Reduction Targets and Forecasts

A variety of opportunities exist within City of Nelson corporate operations for GHG reductions which are closely associated with energy reductions. Short term reduction objectives have been identified with target years of 2015, 2020, and 2025. In order to place this project within a long-term perspective, a forecast has also been included for 2050.

6.1. Long-Range Planning & Reduction Forecasts

With the recent conclusion of COP15, the United Nations conference on climate change, and the resulting Copenhagen Accord, climate change policy has taken a central role in the political thinking of countries around the world. The Copenhagen Diagnosis, released prior to COP15, is the most recent review of scientific findings to date and builds on the results of the IPCC Fourth Assessment Report. It identifies the importance of limiting global warming to a maximum of 2C above pre-industrial levels. Although the Copenhagen Accord recognises this critical threshold for temperature rise, the WWF estimates that the agreement puts the world on a trajectory of temperature rises in the range of 3C and more. According to the data reviewed in the Copenhagen Diagnosis, global emissions must peak between 2015 and 2020 in order to achieve a maximum temperature rise of 2C. In addition, the average annual per-capita emissions must shrink to under 1 metric CO2 by 2050. For developed nations, this translates to an 80% reduction of per-capita emissions below 2000 levels by 2050. If warming continues in a business-as-usual way throughout this century, a number of vulnerable elements within the climate system could reach a tipping point, beyond which changes in the system become irreversible. The Copenhagen Diagnosis raises the concern that the risk of exceeding critical thresholds significantly increases with ongoing climate change and that waiting for greater scientific certainty could result in the crossing of tipping points before they are even recognised.

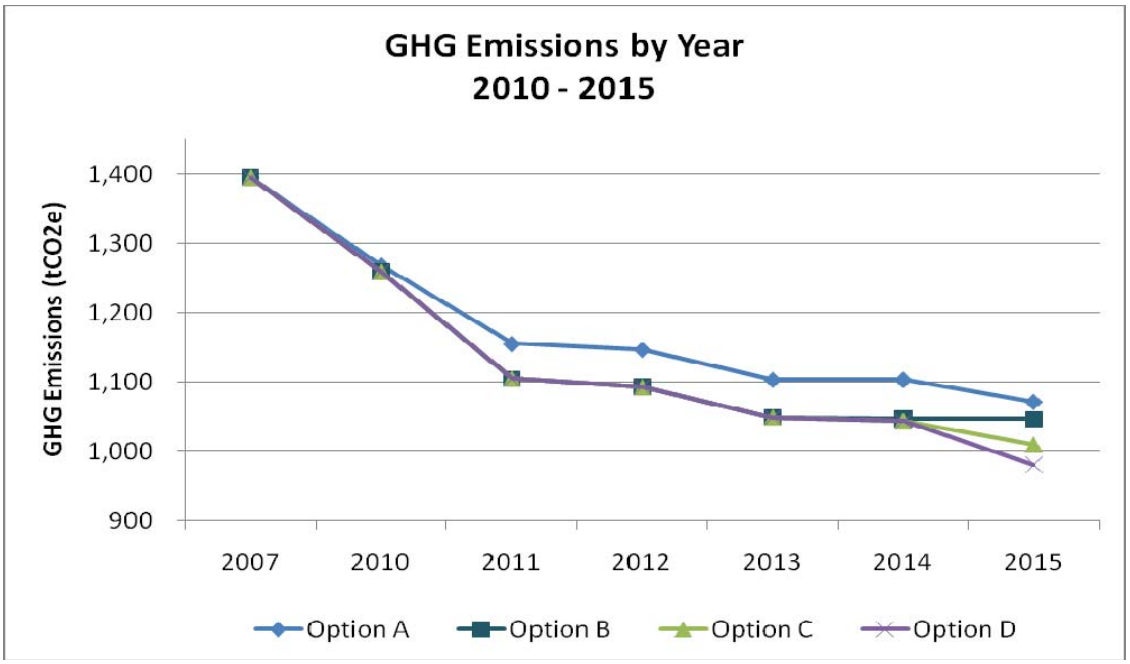
With the failure of COP15 to produce a legally-binding agreement on the international stage, attention will shift to the building of low carbon economies from the ground up. The focus will be on initiatives by countries, cities, companies and communities to address the reduction and stabilisation of carbon emission levels. The IPCC Fourth Assessment Report states that many impacts on the climate system can be reduced, delayed, or avoided through mitigation. There is also high agreement and evidence that stabilisation levels examined by the IPCC report can be achieved using technologies that are either currently available or expected to be commercialised in the coming decades.

6.2. Five Year Reduction Target Options (2015)

In implementing all of the recommendations outlined in Appendix C, the City could potentially reduce emissions by as much as 28 percent or 391 tonnes CO2e by the year 2015. The following is a comparison of five year reduction plan options using a baseline year of 2007:

		FIVE YEAR REDUCTION TARGETS (2010 - 2015)				
Scenario	**2007 Base Year Emissions (tCO2e)**	**2015 GHG Reductions (tCO2e)**	**2015 GHG Reductions[a] (%)**	**2010-2015 Total Capital Costs[b] ($)**	**Capital Cost/tCO2e ($)**	**2010-2015 Total O&M Savings ($)**
Option A GHG reductions for planned projects where capital cost/tCO2e < $3000	1,395	297	21%	$840,750	$2,835	$313,332
Option B GHG reductions for planned projects where capital cost/tCO2e < $4000	1,395	354	25%	$1,244,746	$3,515	$462,226
Option C GHG reductions for planned and considered projects where capital cost/tCO2e < $5000	1,395	391	28%	$1,712,346	$4,381	$473,537
Option D GHG reductions for projects to be identified at future date in achieving 30% reduction target	1,395	419	30%	$2,416,239	$5,774	>$475,000

[a] Percent GHG reductions are relative to the baseline year of 2007
[b] Capital cost estimates include the purchase of carbon offsets



6.3. Ten and Fifteen Year Reduction Targets (2020 and 2025)

In terms of energy consumption, energy costs, and total emissions, buildings and vehicle fleet are the two primary contributors and will be the primary areas of focus within the five year plan. Building on Option B of the five year plan, ten and fifteen year reduction targets could be achieved based on the assumptions outlined below.

2020 – 36% Emissions Reduction (over 2007 levels)

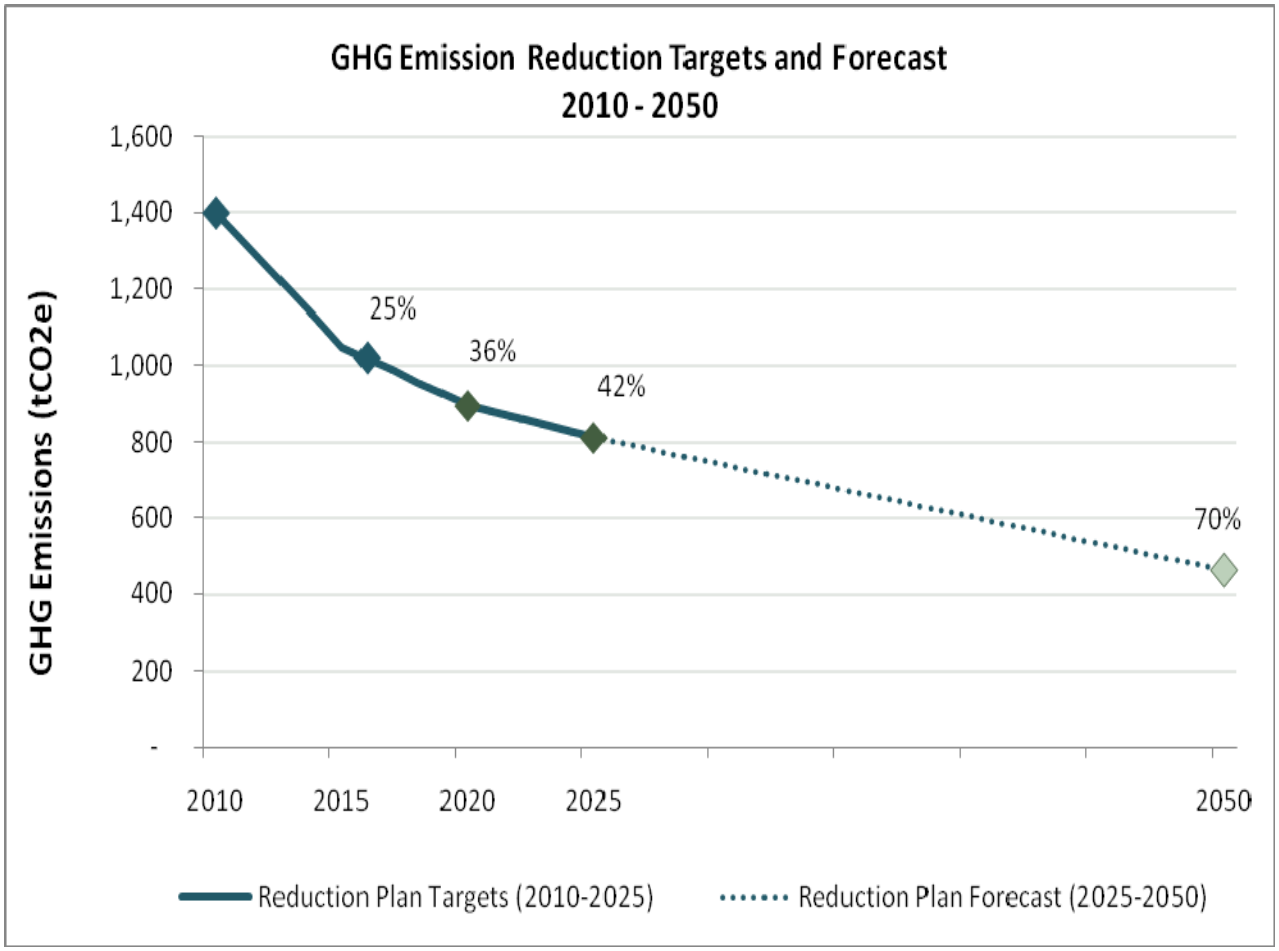
0.5% Reduction	10% of all energy consumed will be from on-site renewable sources and/or clean district energy systems
1.4% Reduction	5% reduction in fleet emissions through improved trip planning and driver awareness
3.4% Reduction	8% reduction in fleet emissions due to a 10% renewable fuel content as mandated by the BC Renewable Fuel Requirement Regulation (RFRR)
4.3% Reduction	10% reduction in fleet emissions due to improvements in fleet efficiency and down-sizing
0.8% Reduction	2% reduction in fleet emissions through vehicle right-sizing
0.8% Reduction	5% reduction in fleet emissions through driver training and awareness
0.3% Reduction	5% reduction in electricity usage through user practices
11.5% Reduction	**Total reduction in emissions from 2015 to 2020**

2025 – 43% Emissions Reduction (over 2007 levels)

2.4% Reduction	5% reduction in building emissions through retrofits and improved efficiency
1.5% Reduction	10% reduction in fleet emissions through improved vehicle efficiency technology and increased use of diesel over gasoline
2.2% Reduction	8% reduction in fleet emissions due to the use of a B20 blend of biodiesel fuel
6.1% Reduction	**Total reduction in emissions from 2020 to 2025**

6.4. Long-Range Forecast (2050)

Following the emission reduction trajectory described in the 2010 to 2025 action plan, an emissions reduction of almost 70% could be forecast for 2050. This is based on the assumption that, through the ongoing implementation of new reduction measures, GHG emission reductions will continue at a rate of 1% from 2025 to 2050. This is the same rate of emission reduction achievements predicted in the 2020 to 2025 period of the action plan.



6.5. Monitoring of Action Plan and Reduction Targets

In order to measure the progress and impact of reduction measures on GHG emissions, a yearly GHG inventory will be completed. The action plan will also be revised and updated on an ongoing basis. In addition, reduction targets will be re-evaluated every five years from 2010 onwards. This will provide the opportunity for the incorporation and accounting of new technologies and scientific findings into the ongoing target setting process. It is expected that future recommended targets will be refined as more data and information becomes available.

As part of the ongoing monitoring of this project, it is important to integrate an awareness of climate action opportunities into the City's yearly planning process. Leasing, rather than the purchase, of vehicles within the fleet is one example of a policy shift that would allow for the introduction of new advances in vehicle efficiencies. Flexibility in purchasing policies and capital planning is needed so that the City will be well positioned to take advantage of future innovations.

7. Financing

This plan takes the view that, at this time, a reduction in carbon emissions would not be done solely for economic reasons. The purpose of this plan, and indeed the Nelson Carbon Neutral Commitment, is altruistic rather than financial.

7.1. Financing Options

The undertaking of many of the individual action items will provide an economic incentive, as they will result in energy savings to the facility. There are many other projects that will make significant contributions to reducing GHG emissions but do not have a reasonable economic payback. This situation arises because the projects with the best payback typically are those that result in electrical energy reductions but electricity has a very low carbon footprint hence these projects may be worthwhile from a financial viewpoint but don't help in a great way with reducing carbon emissions.

In general, larger GHG reductions require greater investment, but it is also possible to achieve more moderate carbon emission reductions while offsetting a substantial proportion of project costs with O&M savings over time.

The following table is based on a financial model in which the principal amount is borrowed at an interest rate of 5% over a 15 year term. It summarises the costs and savings for each of the five-year reduction target options:

Scenario	2015 Emission Reduction (%)	Principal Amount	Total Payment	O&M Savings	Additional Funding Required
Option A GHG reductions for planned projects where capital cost/tCO2e < $3000	21%	$ 840,750	$ 1,260,382	$ 1,090,473	$ 169,909
Option B GHG reductions for planned projects where capital cost/tCO2e < $4000	25%	$ 1,244,746	$ 1,866,019	$ 1,587,384	$ 278,635
Option C GHG reductions for planned and considered projects where capital cost/tCO2e < $5000	28%	$ 1,712,346	$ 2,567,006	$ 1,820,942	$ 746,064
Option D GHG reductions for projects to be identified at future date in achieving 30% reduction target	30%	$ 2,416,239	$ 3,622,224	$ 1,820,942	$ 1,801,282

7.2. Grant Opportunities

Many grants are available through various organisations for projects relating to energy efficiency and greenhouse gas reductions. At the federal level, grants are offered through Natural Resources Canada's ecoEnergy program. Funding from this program can be used to retrofit existing buildings and to install solar air and/or water heating systems. The Green Municipal Fund under the Federation of Canadian Municipalities can also be accessed for grant money to support feasibility studies and low interest loans to support green building projects. At the provincial level, SolarBC has partnered with the ecoEnergy Renewable Heat fund to match grant money awarded by the federal program. FortisBC is also supporting energy efficient projects through their boiler retrofit program and an incentive program that offers $0.05 per kWh that is saved above and beyond a standard operating system. In general, grants will cover up to 50% of project costs. Grant funding is currently not incorporated into the action plan as it isn't guaranteed, however, assuming that not all projects will be eligible for funding, it can be estimated that 30% of the cost for the proposed initiatives could be covered through the grant system. Grant funding will be reviewed on an annual basis and will play a role in project planning.

7.3. Council Decision

The City of Nelson has adopted Option B of the five-year plan with a GHG emission reduction of 25% at an approximate cost of $1.2M. This option is ambitious enough to put the City of Nelson on the path towards long-term meaningful reductions, but with enough operations and maintenance savings over a 15 year period to offset up to 85% of estimated project costs.

8. Appendices

8.1. Appendix A – 2007 GHG Emissions Inventory

See Attached

8.2. Appendix B – GHG Emissions Building Summary

See Attached

8.3. Appendix C – Greenhouse Gas Reduction Plan Project List

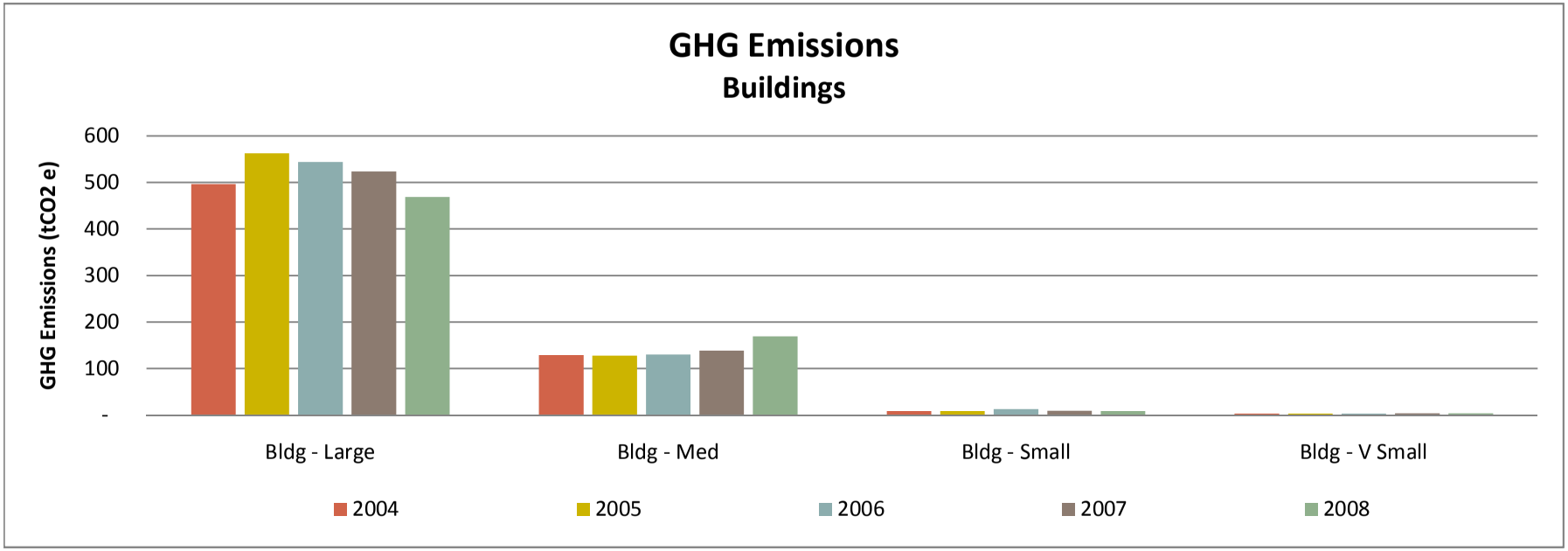
See Attached

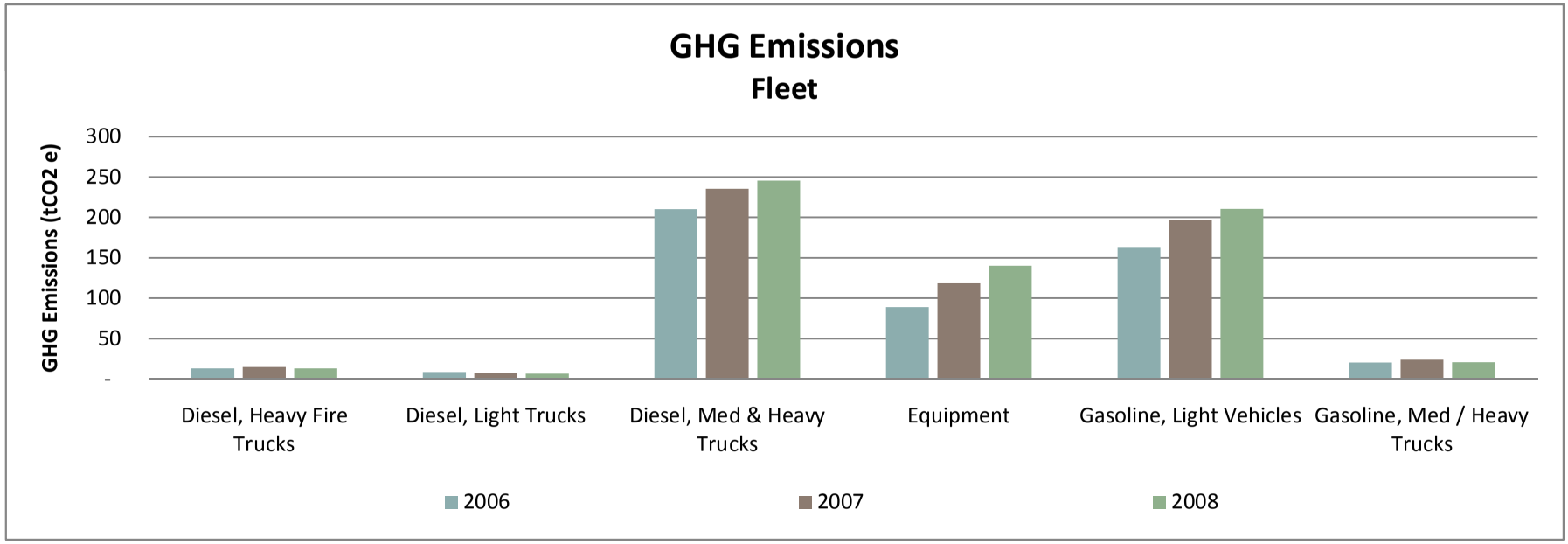
APPENDIX A

GHG Inventory Summary

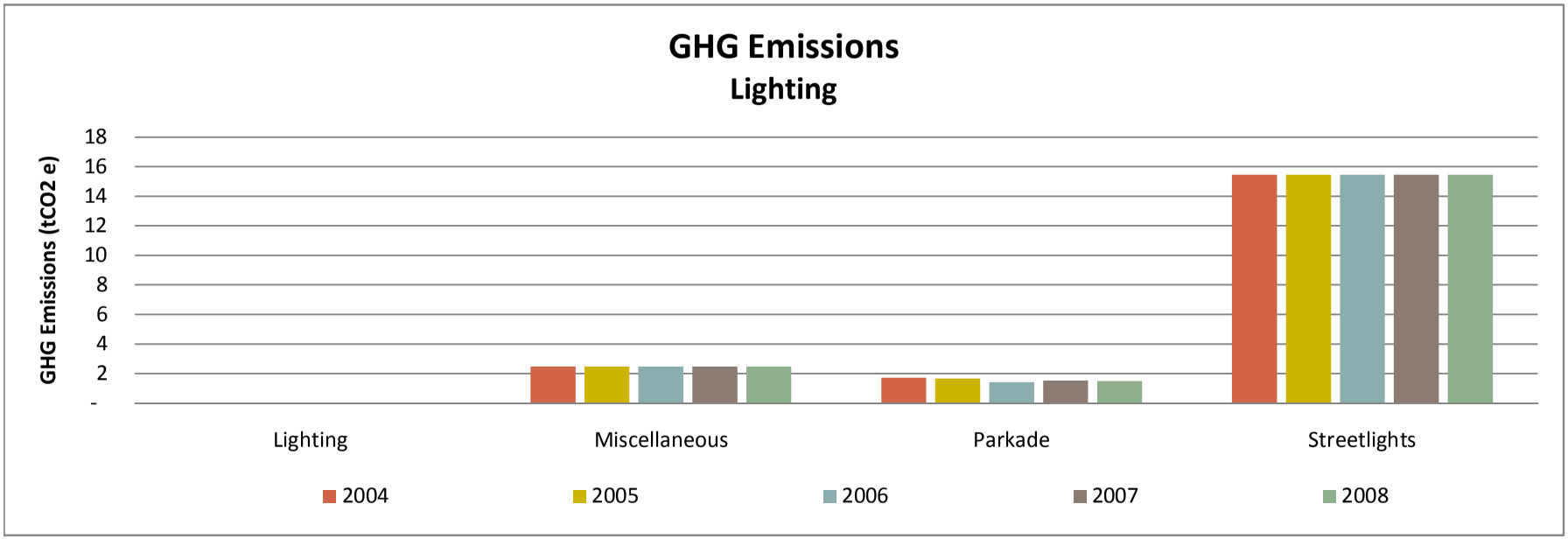
Facility Type	Category	Energy & Emissions	2004	2005	2006	2007	2008
Buildings	Bldg - Large	GHG (t CO_2e)	496	562	544	524	469
		Energy Cost Est. ($)	217,599	229,059	217,897	209,434	192,938
		Energy (GJ)	14,868	15,858	15,133	14,548	13,332
Buildings	Bldg - Med	GHG (t CO_2e)	129	128	130	139	169
		Energy Cost Est. ($)	50,567	51,294	51,149	55,634	62,825
		Energy (GJ)	3,525	3,561	3,565	3,863	4,427
Buildings	Bldg - Small	GHG (t CO_2e)	9	9	13	9	9
		Energy Cost Est. ($)	11,305	12,250	12,903	11,757	10,980
		Energy (GJ)	684	738	796	713	665
Buildings	Bldg - V Small	GHG (t CO2e)	3	3	3	4	4
		Energy Cost Est. ($)	9,208	8,605	8,601	9,270	8,989
		Energy (GJ)	537	503	503	544	528
Fleet	Diesel, Heavy Fire Trucks	GHG (t CO_2e)	-	-	13	15	13
		Energy Cost Est. ($)	-	-	5,152	5,937	5,199
		Energy (GJ)	-	-	181	209	183
Fleet	Diesel, Light Trucks	GHG (t CO_2e)	-	-	9	8	6
		Energy Cost Est. ($)	-	-	3,406	3,175	2,580
		Energy (GJ)	-	-	120	112	90
Fleet	Diesel, Med & Heavy Trucks	GHG (t CO_2e)	-	-	210	236	246
		Energy Cost Est. ($)	-	-	83,581	93,162	97,435
		Energy (GJ)	-	-	2,924	3,276	3,415
Fleet	Equipment	GHG (t CO_2e)	-	-	89	119	140
		Energy Cost Est. ($)	-	-	35,533	46,885	55,704
		Energy (GJ)	-	-	1,242	1,649	1,954
Fleet	Gasoline, Light Vehicles	GHG (t CO_2e)	-	-	163	196	210
		Energy Cost Est. ($)	-	-	72,333	86,728	91,986
		Energy (GJ)	-	-	2,278	2,732	2,928
Fleet	Gasoline, Med / Heavy Trucks	GHG (t CO_2e)	-	-	21	24	21
		Energy Cost Est. ($)	-	-	9,008	10,280	8,909
		Energy (GJ)	-	-	286	331	290
Fleet	Small Tools	GHG (t CO_2e)	-	-	3	2	3
		Energy Cost Est. ($)	-	-	1,114	854	1,506
		Energy (GJ)	-	-	35	27	48
Lighting	Lighting	GHG (t CO_2e)	-	0	0	0	-
		Energy Cost Est. ($)	-	9	6	6	-
		Energy (GJ)	-	1	0	0	-
Lighting	Miscellaneous	GHG (t CO_2e)	2	2	2	2	2
		Energy Cost Est. ($)	6,923	6,923	6,923	6,923	6,923
		Energy (GJ)	404	404	404	404	404
Lighting	Parkade	GHG (t CO_2e)	2	2	1	2	1
		Energy Cost Est. ($)	4,799	4,662	3,961	4,268	4,159
		Energy (GJ)	280	272	231	249	243
Lighting	Streetlights	GHG (t CO_2e)	15	15	15	15	15
		Energy Cost Est. ($)	43,367	43,367	43,367	43,367	43,367
		Energy (GJ)	2,529	2,529	2,529	2,529	2,529
Water & Wastewater	Lift Station	GHG (t CO_2e)	2	2	2	2	2
		Energy Cost Est. ($)	4,430	4,430	4,430	4,430	4,430
		Energy (GJ)	258	258	258	258	258
Water & Wastewater	Sewage Treatment Plant	GHG (t CO_2e)	64	92	98	97	134
		Energy Cost Est. ($)	59,953	73,711	75,978	76,526	108,726
		Energy (GJ)	2,640	2,996	3,011	3,067	4,439
Water & Wastewater	PRV	GHG (t CO_2e)	2	2	2	2	2
		Energy Cost Est. ($)	4,909	4,909	4,909	4,909	4,845
		Energy (GJ)	286	286	286	286	283

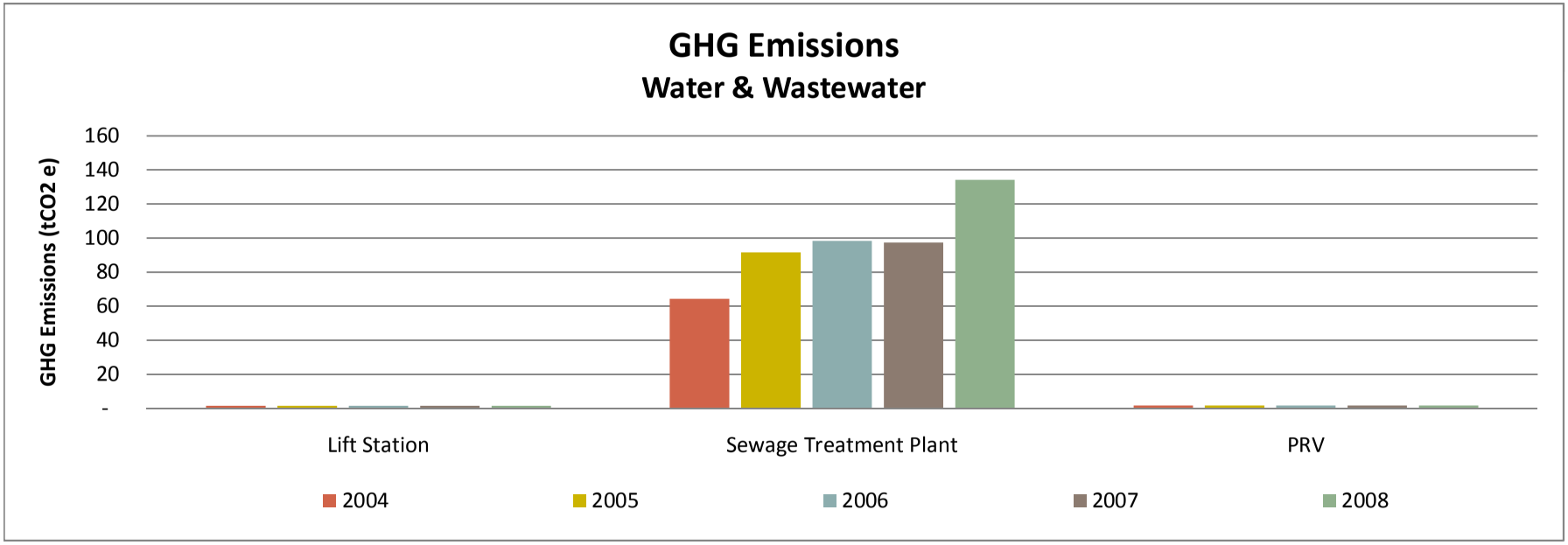
APPENDIX A -Charts
GHG Inventory Summary





APPENDIX A -Charts
GHG Inventory Summary





APPENDIX B

GHG Inventory - Building Summary

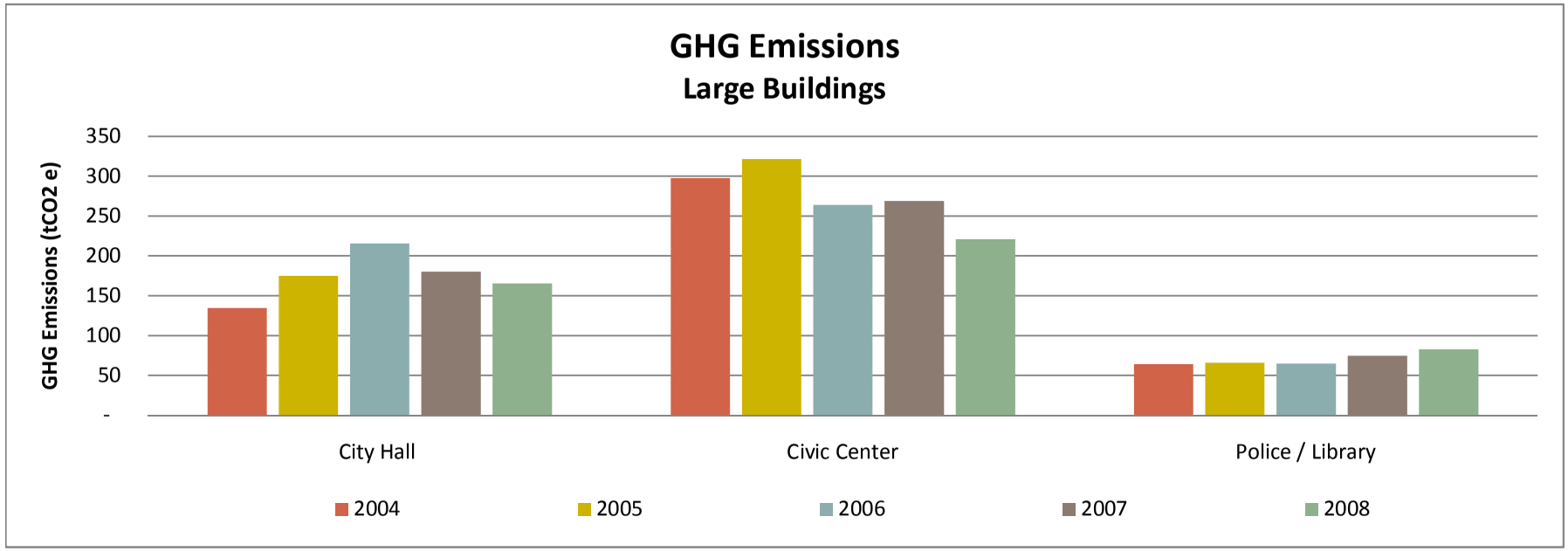
Category	Facility	Energy & Emissions	2004	2005	2006	2007	2008
Bldg - Large	City Hall	GHG (t CO_2e)	135	175	216	180	165
		Energy Cost Est. ($)	75,956	92,513	104,246	96,335	93,417
		Energy (GJ)	4,989	6,133	7,008	6,377	6,135
Bldg - Large	Civic Center	GHG (t CO_2e)	298	322	264	269	221
		Energy Cost Est. ($)	111,033	104,494	82,068	81,847	62,911
		Energy (GJ)	7,818	7,572	6,006	6,020	4,700
Bldg - Large	Police / Library	GHG (t CO_2e)	64	66	65	74	83
		Energy Cost Est. ($)	30,609	32,053	31,583	31,251	36,610
		Energy (GJ)	2,061	2,152	2,119	2,151	2,497
Bldg - Med	Capitol Theatre	GHG (t CO2e)	26	29	36	26	32
		Energy Cost Est. ($)	10,013	10,988	12,879	9,214	11,815
		Energy (GJ)	702	771	912	656	836
Bldg - Med	Curling Club	GHG (t CO_2e)	10	7	5	21	37
		Energy Cost Est. ($)	4,770	3,942	3,634	7,550	11,418
		Energy (GJ)	323	259	231	536	835
Bldg - Med	Fire Hall	GHG (t CO_2e)	19	21	22	22	24
		Energy Cost Est. ($)	10,620	11,625	11,539	12,267	11,514
		Energy (GJ)	698	765	766	809	776
Bldg - Med	Lakeside Rental house	GHG (t CO_2e)	-	-	-	-	-
		Energy Cost Est. ($)	-	-	-	-	-
		Energy (GJ)	-	-	-	-	-
Bldg - Med	Senior's Lounge	GHG (t CO_2e)	13	12	12	13	13
		Energy Cost Est. ($)	3,808	3,563	3,586	3,693	3,738
		Energy (GJ)	283	265	266	275	279
Bldg - Med	Works Complex	GHG (t CO_2e)	30	28	27	28	28
		Energy Cost Est. ($)	9,780	9,326	8,498	11,898	11,218
		Energy (GJ)	709	670	618	816	777
Bldg - Med	Youth Center	GHG (t CO_2e)	10	13	11	13	13
		Energy Cost Est. ($)	4,982	6,022	5,080	5,677	6,014
		Energy (GJ)	332	408	342	386	407
Bldg - Small	Chamber of Commerce	GHG (t CO_2e)	0.6	0.7	0.6	0.6	0.6
		Energy Cost Est. ($)	1,753	1,826	1,673	1,606	1,613
		Energy (GJ)	102	106	98	94	94
Bldg - Small	City Campground	GHG (t CO_2e)	2.4	3.1	2.4	3.1	2.7
		Energy Cost Est. ($)	1,562	1,998	1,382	1,836	1,641
		Energy (GJ)	101	129	90	120	107
Bldg - Small	File Storage	GHG (t CO_2e)	-	-	5.1	-	-
		Energy Cost Est. ($)	-	-	1,300	-	-
		Energy (GJ)	-	-	100	-	-
Bldg - Small	Lions Park Bath House	GHG (t CO_2e)	2.2	2.2	2.2	2.5	2.6
		Energy Cost Est. ($)	731	656	709	882	930
		Energy (GJ)	53	48	51	63	66
Bldg - Small	Old Museum	GHG (t CO_2e)	1.6	1.8	1.7	1.3	1.2
		Energy Cost Est. ($)	4,511	4,926	4,674	3,607	3,315
		Energy (GJ)	263	287	273	210	193
Bldg - Small	Tyler lake pump house	GHG (t CO_2e)	2.0	1.2	1.1	1.9	1.7
		Energy Cost Est. ($)	2,747	2,844	3,165	3,825	3,482
		Energy (GJ)	166	167	185	226	205

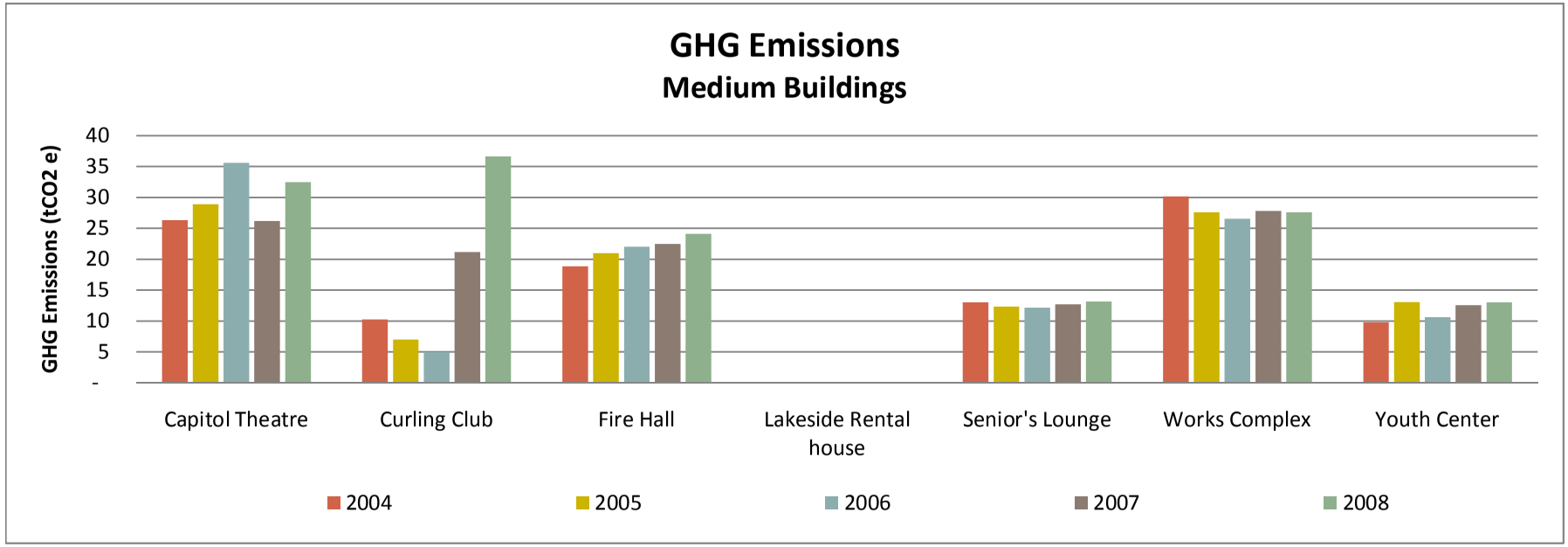
APPENDIX B

GHG Inventory - Building Summary

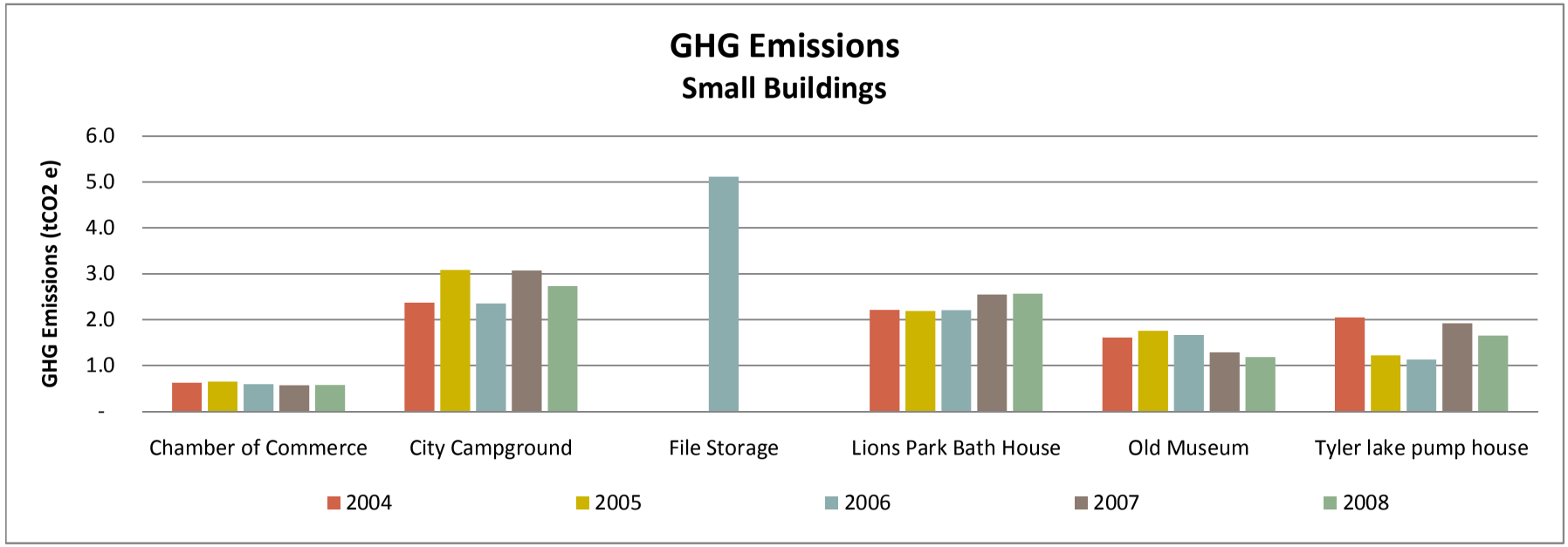
Category	Facility	Energy & Emissions	2004	2005	2006	2007	2008
Bldg - V Small	Airport	GHG (t CO_2e)	0.62	0.73	0.77	0.74	0.73
		Energy Cost Est. ($)	1,745	2,059	2,161	2,071	2,038
		Energy (GJ)	102	120	126	121	119
Bldg - V Small	BC gas building	GHG (t CO_2e)	0.43	0.56	0.56	0.64	0.56
		Energy Cost Est. ($)	1,204	1,574	1,574	1,792	1,581
		Energy (GJ)	70	92	92	105	92
Bldg - V Small	Chamber of Mines	GHG (t CO_2e)	0.38	0.48	0.31	0.41	0.37
		Energy Cost Est. ($)	1,055	1,335	862	1,160	1,041
		Energy (GJ)	62	78	50	68	61
Bldg - V Small	Farmers Market	GHG (t CO_2e)	0.03	0.04	0.02	0.02	0.03
		Energy Cost Est. ($)	72	109	56	66	88
		Energy (GJ)	4	6	3	4	5
Bldg - V Small	Gyro Park bathhouse	GHG (t CO_2e)	0.02	0.32	0.29	0.73	0.78
		Energy Cost Est. ($)	70	145	99	212	215
		Energy (GJ)	4	10	7	16	16
Bldg - V Small	Lakeside Concession	GHG (t CO_2e)	0.62	0.21	0.24	0.29	0.20
		Energy Cost Est. ($)	1,742	594	686	812	572
		Energy (GJ)	102	35	40	47	33
Bldg - V Small	Lakeside Park	GHG (t CO_2e)	0.50	0.50	0.51	0.50	0.58
		Energy Cost Est. ($)	1,391	1,395	1,436	1,410	1,634
		Energy (GJ)	81	81	84	82	95
Bldg - V Small	Rental House	GHG (t CO_2e)	0.07	0.05	0.07	0.06	0.10
		Energy Cost Est. ($)	186	130	192	169	285
		Energy (GJ)	11	8	11	10	17
Bldg - V Small	Rod & Gun Club	GHG (t CO_2e)	0.41	0.25	0.32	0.30	0.36
		Energy Cost Est. ($)	1,141	708	910	836	1,005
		Energy (GJ)	67	41	53	49	59
Bldg - V Small	Rowing Club & Tramway	GHG (t CO_2e)	0.21	0.20	0.22	0.26	0.19
		Energy Cost Est. ($)	601	556	626	743	530
		Energy (GJ)	35	32	37	43	31

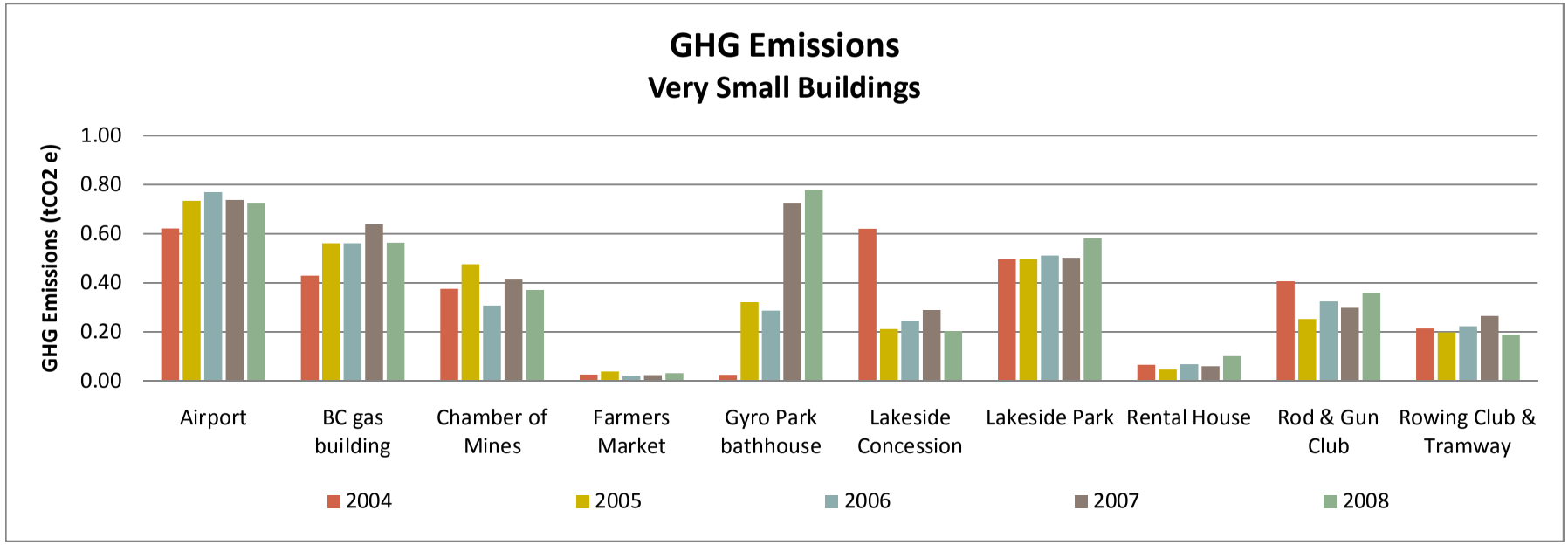
APPENDIX B - Charts
GHG Inventory - Building Summary





APPENDIX B - Charts
GHG Inventory - Building Summary





APPENDIX C

Greenhouse Gas Reduction Plan - Project List

Item No.	Facility Type	Sub Type	Facility	Description	Project Year	Status	Expense Type	Total Capital Cost Estimate ($)	2009 Capital Plan Budget ($)	2010 Capital Plan Budget ($)	Climate Plan Budget ($)	Annual Cost ($)	Gas Reduction (GJ)	Elect. Reduction (kWh)	Energy Reduction (GJ)	Energy Savings ($ /Yr)	GHG Reduction (tCO2e)	Offsets Reduced ($/Yr)	Annual Savings ($/Yr)	Simple Payback (Yrs)	Capital Cost/tCO2e ($)
1	Admin		Corporate	Purchase Carbon Offsets - Estimated at $25/ tonne	2012	Planned	Operating	$31,500			$31,500				0.0	$0	0.00	$0	$0	0.00	$0
2	Admin		Corporate	Purchase Carbon Offsets - Estimated at $25/ tonne	2013	Planned	Operating	$29,750			$29,750				0.0	$0	0.00	$0	$0	0.00	$0
3	Admin		Corporate	Purchase Carbon Offsets - Estimated at $25/ tonne	2014	Planned	Operating	$28,000			$28,000				0.0	$0	0.00	$0	$0	0.00	$0
4	Admin		Corporate	Purchase Carbon Offsets - Estimated at $25/ tonne	2015	Planned	Operating	$26,250			$26,250				0.0	$0	0.00	$0	$0	0.00	$0
6	Admin		Corporate	Corporate Climate Action Coordinator - 2010	2010	Planned	Operating	$35,000			$35,000				0.0	$0	0.00	$0	$0	0.00	$0
7	Admin		Corporate	Corporate Climate Action Coordinator - 2011	2011	Planned	Operating	$35,000			$35,000				0.0	$0	0.00	$0	$0	0.00	$0
8	Admin		Corporate	Corporate Climate Action Coordinator - 2012	2012	Planned	Operating	$35,000			$35,000				0.0	$0	0.00	$0	$0	0.00	$0
9	Admin		Corporate	Corporate Climate Action Coordinator - 2013	2013	Planned	Operating	$35,000			$35,000				0.0	$0	0.00	$0	$0	0.00	$0
10	Admin		Corporate	Corporate Climate Action Coordinator - 2014	2014	Planned	Operating	$35,000			$35,000				0.0	$0	0.00	$0	$0	0.00	$0
11	Admin		Corporate	Corporate Climate Action Coordinator - 2015	2015	Planned	Operating	$35,000			$35,000				0.0	$0	0.00	$0	$0	0.00	$0
15	Admin		Corporate	Public workshop to be held as part of capital plan release - March 4th, 2010	2010	Planned	Operating	$0			$0				0.0	$0	0.00	$0	$0	0.00	$0
16	Buildings	Bldg - Large	City Hall	Solar hot water system design	2010	Planned	Capital	$3,500			$3,500		0.0		0.0	$0	0.00	$0	$0	0.00	$0
17	Buildings	Bldg - Large	City Hall	Install computer shutdown software	2010	Planned		$100	$30,000		-$29,900			2,830	10.2	$192	0.06	$2	$194	0.52	$1,606
18	Buildings	Bldg - Large	City Hall	Facility review and energy audit	2010	Planned		$10,000	$10,000		$0				0.0	$0	0.00	$0	$0	0.00	$0
19	Buildings	Bldg - Large	City Hall	Variable air volume conversion	2010	Planned		$45,000			$45,000		113.0	12,069	156.4	$2,385	6.05	$151	$2,536	17.75	$7,444
20	Buildings	Bldg - Large	City Hall	Optimize large motors on pumps and fan systems using high efficiency motors of the correct size	2010	Planned		$1,000			$1,000			13,071	47.1	$889	0.29	$7	$896	1.12	$3,477
21	Buildings	Bldg - Large	City Hall	Replace T12 high intensity discharge lights with 10.5 watts per square metre lighting power density	2010	Planned		$3,554			$3,554			10,971	39.5	$746	0.24	$6	$752	4.73	$14,722
22	Buildings	Bldg - Large	City Hall	Convert compact fluorescent exit lights to LED lights	2010	Planned		$2,519			$2,519			5,674	20.4	$386	0.12	$3	$389	6.48	$20,177
23	Buildings	Bldg - Large	City Hall	Replace one boiler with condensing modulating unit	2010	Planned		$56,000	$100,000		-$44,000		955.0		955.0	$13,217	48.85	$1,221	$14,438	3.88	$1,146
24	Buildings	Bldg - Large	City Hall	Install exterior insulation finishing system (EIFS)	2011	Planned		$64,900			$64,900		309.0	14,629	361.7	$5,271	16.13	$403	$5,675	11.44	$4,024
25	Buildings	Bldg - Large	City Hall	Install window awnings to reduce electricity required for AC in summer months	2011	Planned		$2,500			$2,500			7,550	27.2	$513	0.17	$4	$518	4.83	$15,049
26	Buildings	Bldg - Large	City Hall	Upgrade air handling unit AC efficiency and use green refrigerant	2013	Planned		$30,000			$30,000		376.0	563	378.0	$5,242	19.24	$481	$5,723	5.24	$1,559
27	Buildings	Bldg - Large	City Hall	Install heat recovery ventilator	2013	Planned		$61,650			$61,650		471.0		471.0	$6,519	24.09	$602	$7,121	8.66	$2,559
31	Buildings	Bldg - Large	Civic Center	Replace boiler with high efficiency near condensing modulating boiler	2010	Planned		$85,000			$85,000		1,062.0	4,088	1,076.7	$14,976	54.41	$1,360	$16,336	5.20	$1,562
32	Buildings	Bldg - Large	Civic Center	Convert compact fluorescent exit lights to LED lights	2010	Planned		$175			$175			1,865	6.7	$127	0.04	$1	$128	1.37	$4,264
33	Buildings	Bldg - Large	Civic Center	Optimize large motors on pumps and fan systems using high efficiency motors of the correct size	2010	Planned		$1,000			$1,000			4,298	15.5	$292	0.09	$2	$295	3.39	$10,574
34	Buildings	Bldg - Large	Civic Center	Replace high intensity discharge lights with T8 lights	2010	Planned		$18,900			$18,900			24,049	86.6	$1,635	0.53	$13	$1,649	11.46	$35,717
35	Buildings	Bldg - Large	Civic Center	Replace T12 high intensity discharge lights with 10.5 watts per square metre lighting power density	2010	Planned		$13,600			$13,600			16,834	60.6	$1,145	0.37	$9	$1,154	11.79	$36,716
36	Buildings	Bldg - Large	Civic Center	Replace window AC with split unit	2011	Planned		$10,000			$10,000		52.0	7,215	78.0	$1,210	2.82	$70	$1,281	7.81	$3,548
37	Buildings	Bldg - Large	Civic Center	Install heat recovery ventilator in gymnasium	2012	Planned		$7,500			$7,500		26.0	1,082	29.9	$433	1.35	$34	$467	16.05	$5,540
38	Buildings	Bldg - Large	Civic Center	Retrofit to low-e ceiling	2012	Planned		$12,000			$12,000			22,846	82.2	$1,554	0.50	$13	$1,566	7.66	$23,871
41	Buildings	Bldg - Large	Civic Center	Upgrade dehumidifier and use green refrigerant, replacement date to be determined by facilities maintenance plan	2015	Planned		$5,000			$5,000			4,569	16.4	$311	0.10	$3	$313	15.96	$49,734
43	Buildings	Bldg - Large	Police / Library	Facility review and energy audit	2010	Planned		$10,000			$10,000				0.0	$0	0.00	$0	$0	0.00	$0
44	Buildings	Bldg - Large	Police / Library	Convert compact fluorescent exit lights to LED lights	2010	Planned		$263			$263			1,023	3.7	$70	0.02	$1	$70	3.75	$11,684
45	Buildings	Bldg - Large	Police / Library	HVAC upgrades - arising out of review report	2011	Planned		$100,000	$30,000		$70,000		750.0		750.0	$10,380	38.36	$959	$11,339	8.82	$2,607
46	Buildings	Bldg - Large	Police / Library	Upgrade roof insulation on replacement schedule	2014	Planned		$15,000			$15,000		44.0	2,374	52.5	$770	2.30	$58	$828	18.12	$6,514

APPENDIX C

Greenhouse Gas Reduction Plan - Project List

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47	Buildings	Bldg - Large	Police / Library	Upgrade rooftop units to heat pump system	2011	Planned		$37,500			$37,500		218.0		218.0	$3,017	11.15	$279	$3,296	11.38	$3,363
48	Buildings	Bldg - Large	Police / Library	Replace electric heat and fuel fired rooftops with air to air heat pumps - for Library	2011	Planned		$5,000			$5,000		204.0		204.0	$2,823	10.43	$261	$3,084	1.62	$479
49	Buildings	Bldg - Large	Police / Library	Replace electric heat and fuel fired rooftops with air to air heat pumps - for Police	2011	Planned		$37,500			$37,500		326.0		326.0	$4,512	16.67	$417	$4,929	7.61	$2,249
50	Buildings	Bldg - Large	Police / Library	Replace economizers in rooftop units	2011	Planned		$10,000			$10,000		45.0		45.0	$623	2.30	$58	$680	14.70	$4,345
51	Buildings	Bldg - Large	Police / Library	Install heat recovery ventilators	2011	Planned		$25,000			$25,000		110.0		110.0	$1,522	5.63	$141	$1,663	15.03	$4,443
52	Buildings	Bldg - Large	Police / Library	CO2 sensors on HVAC systems to ensure adequate ventilation and reduce excess air when unoccupied	2011	Planned		$1,000			$1,000			4,867	17.5	$331	0.11	$3	$334	3.00	$9,338
53	Buildings	Bldg - Large	Police / Library	Replace boilers with 3 high efficiency units	2011	Planned		$30,000			$30,000		362.0		362.0	$5,010	18.52	$463	$5,473	5.48	$1,620
54	Buildings	Bldg - Med	Capitol Theatre	Replace current lighting systems with compact fluorescent lights	2010	Planned		$7,500			$7,500			13,696	49.3	$931	0.30	$8	$939	7.99	$24,887
55	Buildings	Bldg - Med	Capitol Theatre	Replacement of faucet aerators and shower heads with low flow aerators and nozzles	2010	Planned		$2,000			$2,000			1,826	6.6	$124	0.04	$1	$125	15.98	$49,778
56	Buildings	Bldg - Med	Capitol Theatre	Replace electric heating and fuel fired rooftop units with air to air heat pumps	2011	Planned		$9,000			$9,000		162.0		162.0	$2,242	8.29	$207	$2,449	3.67	$1,086
57	Buildings	Bldg - Med	Capitol Theatre	Upgrade warm air furnace to a high efficiency condensing furnace	2011	Planned		$5,000			$5,000		28.0		28.0	$388	1.43	$36	$423	11.81	$3,491
58	Buildings	Bldg - Med	Curling Club	Upgrade warm air furnace to a high efficiency condensing furnace	2010	Planned		$10,000			$10,000		82.0		82.0	$1,135	4.19	$105	$1,240	8.07	$2,384
59	Buildings	Bldg - Med	Curling Club	Upgrade roof insulation	2011	Planned					$0				0.0	$0	0.00	$0	$0	0.00	$0
60	Buildings	Bldg - Med	Curling Club	Install ASD and pony pumps on refrigeration circuits for low demand periods	2013	Planned		$3,000			$3,000			6,269	22.6	$426	0.14	$3	$430	6.98	$21,749
61	Buildings	Bldg - Med	Fire Hall	Convert metal halide lights to LED lights	2010	Planned		$450			$450			906	3.3	$62	0.02	$0	$62	7.25	$22,573
62	Buildings	Bldg - Med	Fire Hall	Replace T12 high intensity discharge lights with 10.5 watts per square metre lighting power density	2010	Planned		$2,500			$2,500			3,048	11.0	$207	0.07	$2	$209	11.97	$37,276
63	Buildings	Bldg - Med	Fire Hall	Install heat recovery ventilator on MUA	2011	Planned		$3,000			$3,000		89.0		89.0	$1,232	4.55	$114	$1,346	2.23	$659
64	Buildings	Bldg - Med	Fire Hall	Insulate ambulance bay doors	2011	Planned		$3,000			$3,000		27.0		27.0	$374	1.38	$35	$408	7.35	$2,172
65	Buildings	Bldg - Med	Fire Hall	Seal off attic	2011	Planned		$4,000			$4,000		35.0		35.0	$484	1.79	$45	$529	7.56	$2,234
66	Buildings	Bldg - Med	Fire Hall	Insulate basement	2011	Planned		$5,000			$5,000		27.0		27.0	$374	1.38	$35	$408	12.25	$3,620
69	Buildings	Bldg - Med	Works Complex	Convert compact fluorescent exit lights to LED lights	2010	Planned		$350			$350			667	2.4	$45	0.01	$0	$46	7.65	$23,848
70	Buildings	Bldg - Med	Works Complex	Replace T12 high intensity discharge lights with 10.5 watts per square metre lighting power density	2010	Planned		$4,000			$4,000			7,221	26.0	$491	0.16	$4	$495	8.08	$25,175
71	Buildings	Bldg - Med	Works Complex	Replace fuel fired rooftops with heat pumps - main building	2011	Planned		$7,500			$7,500		253.0		253.0	$3,502	12.94	$324	$3,825	1.96	$580
72	Buildings	Bldg - Med	Works Complex	Replace electric roof top units with heat pumps in vehicle bays	2011	Planned		$15,000			$15,000			10,746	38.7	$731	0.24	$6	$737	20.36	$63,438
73	Buildings	Bldg - Med	Works Complex	Weather-strip bay doors	2010	Planned		$5,000			$5,000		70.0		70.0	$969	3.58	$90	$1,058	4.72	$1,396
74	Buildings	Bldg - Med	Works Complex	Insulate bay doors	2010	Planned		$10,000		$10,000	$0		75.0		75.0	$1,038	3.84	$96	$1,134	8.82	$2,607
75	Buildings	Bldg - Med	Youth Center	Replace office track lights with compact fluorescents or LED lights	2010	Planned		$450			$450			1,457	5.2	$99	0.03	$1	$100	4.51	$14,037
76	Buildings	Bldg - Med	Youth Center	Complete retrofit of current lighting system with compact fluorescents	2010	Planned		$4,500			$4,500			2,208	7.9	$150	0.05	$1	$151	29.73	$92,624
77	Buildings	Bldg - Med	Youth Center	Convert high intensity discharge lights to T5 lights	2010	Planned		$4,500			$4,500			2,208	7.9	$150	0.05	$1	$151	29.73	$92,624
78	Buildings	Bldg - Med	Youth Center	Replace roof top unit with heat pump	2012	Planned		$15,000			$15,000		170.0	-13,246	122.3	$1,452	8.40	$210	$1,662	9.02	$1,785
79	Buildings	Bldg - Med	Youth Center	Upgrade warm air furnace to a high efficiency condensing furnace	2012	Planned		$10,000			$10,000		36.0		36.0	$498	1.84	$46	$544	18.37	$5,431
80	Buildings	Bldg - Med	Youth Center	Double roof insulation, replacement date to be determined by facilities maintenance plan	2015	Planned		$20,000			$20,000		11.0	1,104	15.0	$227	0.59	$15	$242	82.65	$34,075
82	Buildings	Bldg - Small	Old Museum	Complete retrofit of current lighting system with compact fluorescents	2010	Planned		$450			$450			5,785	20.8	$393	0.13	$3	$397	1.13	$3,535
83	Buildings	Bldg - Small	Old Museum	Convert compact fluorescent exit lights to LED lights	2010	Planned		$155			$155			453	1.6	$31	0.01	$0	$31	4.99	$15,550
84	Buildings	Bldg - Small	Old Museum	Replace AC with high efficiency heat pump	2012	Planned		$3,500			$3,500			7,304	26.3	$497	0.16	$4	$501	6.99	$21,778
85	Buildings	Bldg - V Small	Airport Terminal	Replace current lighting systems with compact fluorescent lights	2010	Planned		$750			$750			2,348	8.5	$160	0.05	$1	$161	4.66	$14,517

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86	Buildings	Bldg - V Small	Airport Terminal	Replace T12 high intensity discharge lights with 10.5 watts per square metre lighting power density	2010	Planned		$2,500			$2,500			4,629	16.7	$315	0.10	$3	$317	7.88	$24,545
87	Buildings	Bldg - V Small	Airport Terminal	Install ground source heat pump to offset electric baseboards	2011	Planned		$15,000			$15,000			11,070	39.9	$753	0.24	$6	$759	19.77	$61,582
88	Buildings	Bldg - V Small	Park Field House	User operated timers on tennis court lighting	2010	Planned		$10,000			$20,000			7,200	25.9	$490	0.16	$4	$494	40.52	$126,242
89	Buildings	Bldg - V Small	Rowing Club & Tramway	Replace T12 high intensity discharge lights with 10.5 watts per square metre lighting power density	2010	Planned		$980			$980			1,119	4.0	$76	0.02	$1	$77	12.78	$39,802
101	Fleet		Fleet	Driver training for all staff to develop awareness	2010	Planned					$0				0.0	$0	0.00	$0	$0	0.00	$0
102	Fleet		Fleet	Track and record vehicle maintenance data by costs and labour	2010	Planned					$0				0.0	$0	0.00	$0	$0	0.00	$0
103	Fleet		Fleet	Track and record vehicle usage data by kms and hours	2010	Planned					$0				0.0	$0	0.00	$0	$0	0.00	$0
104	Fleet		Fleet	Track and record fuel consumption data	2010	Planned					$0				0.0	$0	0.00	$0	$0	0.00	$0
105	Fleet		Fleet	Track and record vehicle availability and downtime	2010	Planned					$0				0.0	$0	0.00	$0	$0	0.00	$0
107	Fleet		Fleet	Bio diesel use - 5% blend	2010	Planned					$0	$5,000			0.0	$0	17.00	$425	$425	0.00	$0
112	Fleet		Fleet	Investigate the 15 units identified by E3 Fleet review as having higher than avg fuel consumption	2010	Planned					$0				0.0	$0	0.00	$0	$0	0.00	$0
113	Fleet		Fleet	Review effectiveness and frequency of scheduled maintenance programs	2011	Planned					$0				0.0	$0	0.00	$0	$0	0.00	$0
115	Fleet		Fleet	Implementation of fleet initiatives	2011	Planned		$20,000			$20,000				0.0	$0	0.00	$0	$0	0.00	$0