



Corporate And Community 2011 Energy and GHG Emissions Update

November 2013

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1. Summary

The corporate and community energy and GHG emissions have been updated for 2011.

The following is a summary of the updated inventories versus the 2016 targets:

Corporate Targets

Energy

Target: 50% per capita reduction by 2016 from 1995 baseline

2011 Progress: 1.6% per capita reduction from 1995 baseline (3% of the target gap)

GHG Emissions

Target: 22% per capita reduction by 2016 from 1995 baseline

2011 Progress: 9.9% per capita reduction from 1995 baseline (45% of the target gap)

Community Targets

Energy

Target: 35% per capita reduction by 2016 from 1995 baseline

2011 Progress: 5% per capita reduction from 1995 baseline (15% of the target gap)

GHG Emissions

Target: 19% per capita reduction by 2016 from 1995 baseline

2011 Progress: 13.9% per capita reduction from 1995 baseline (73% of the target gap)

2. Corporate Operations

2.1 Background

In 2007, the City of Pickering became the fifth municipality in Ontario to successfully complete milestones 1, 2 and 3 of the FCM Partners for Climate Protection (PCP) program for both the corporation and the community. The PCP program provides a five-milestone framework that encourages municipalities to reduce greenhouse gas (GHG) emissions from the community and municipal operations.

The five PCP milestones are:

1. Creating a GHG emissions inventory and forecast;
2. Setting GHG emission reductions targets;
3. Developing a Local Action Plan;
4. Implementing the Local Action Plan;
5. Monitoring progress and reporting results.

One of the key priorities of the Sustainable Pickering program is for the City to lead by example. To this end, the City is focused on corporate GHG action plan implementation, monitoring and reporting in accordance with PCP Milestones 4 and 5.

In 2008, Durham Sustain Ability (DSA) was retained to develop a high level corporate Energy Management Strategy as an overall framework for prioritizing corporate actions to reduce energy and GHG emissions. In 2010, DSA prepared a report that provided GHG emissions reduction results from recent and planned projects and quantified progress towards meeting the corporate 2016 GHG reduction target. The results of this work were summarized in the staff's Report to Executive Committee OS 02-10 dated June 14, 2010, which included a Corporate Emissions Reduction Strategy with priority actions.

Council endorsed the Corporate Emissions Reduction Strategy; however, there are some key challenges to fully implementing this strategy. This report addresses the implementation of this strategy including actions that identify and address these challenges.

2.2 Scope

This corporate operations section addresses the following areas:

- Update the corporate GHG emissions inventory for 2011
- Quantify the corporate GHG emissions and energy savings for recent and planned energy efficiency projects;
- Identify key challenges and barriers to fully implement the Corporate Emissions Reduction Strategy; and
- Recommend actions to address these key challenges and barriers

2.3 Energy and GHG Emissions Inventory and Trends Update

In 2006, as part of the PCP program, the City established a corporate GHG emissions target of 0.050 t eCO₂ per capita by 2016, which represents a 22% reduction from the baseline year of 1995.

Table 1 provides a summary of energy and GHG emissions on an absolute and per capita basis from the 1995 baseline through 2011 actuals.

The 2016 absolute targets have been reduced (more stringent) based on the change to 2016 population forecasts while the 2016 per capita targets remain the same.

Table 1 – Corporate Energy and GHG Inventories and Target

	1995	2007	2008	2010	2011	2016 Target	% Change 2011 vs. 1995
Energy Use (GJ)	104,442	124,471	123,531	114,408	120,829	74,041	15.7%
Per Capita Energy (GJ)	1.33	1.36	1.35	1.24	1.31	0.67	-1.6%
GHG (t eCO₂)	5,032	7,953	6,633	5,853	5,333	5,567	6.0%
Per Capita GHG (t CO ₂)	0.064	0.087	0.072	0.063	0.058	0.050	-9.9%
Energy Cost (\$'000)	\$1,436	\$2,595	\$2,669	\$2,471	\$2,673	\$2,076	86.2%

From 1995 to 2011, corporate energy consumption has increased 15.7% in absolute terms with a small 1.6% reduction in per capita usage. 2011 energy use increased from the previous year by 5.6% on an absolute basis. This is partly as a result of increased facility floor space with the expansion of the Recreation Complex in late 2010, new and expanded HVAC services for the banquet hall at Don Beer arena, and an additional administration facility, Bentley House in Brougham.

The information in table 1 is based on changes in population (per capita data) and annual changes in the GHG electricity coefficient (GHG data), which is impacted by the mix of sources producing electricity in the province. Table 2 provides a summary of this reference data.

Table 2: Historical and Forecasted Reference Data – Population and CO2 Electricity Coefficient

	1995	2007	2008	2010	2011	2016 Target	% Change 2011 vs. 1995
Population	78,527	91,522	91,504	92,560	92,360	111,339	17.6%
CO2 Electricity Coeff. (kg/kWh)	0.120	0.240	0.170	0.150	0.110		-8.3%

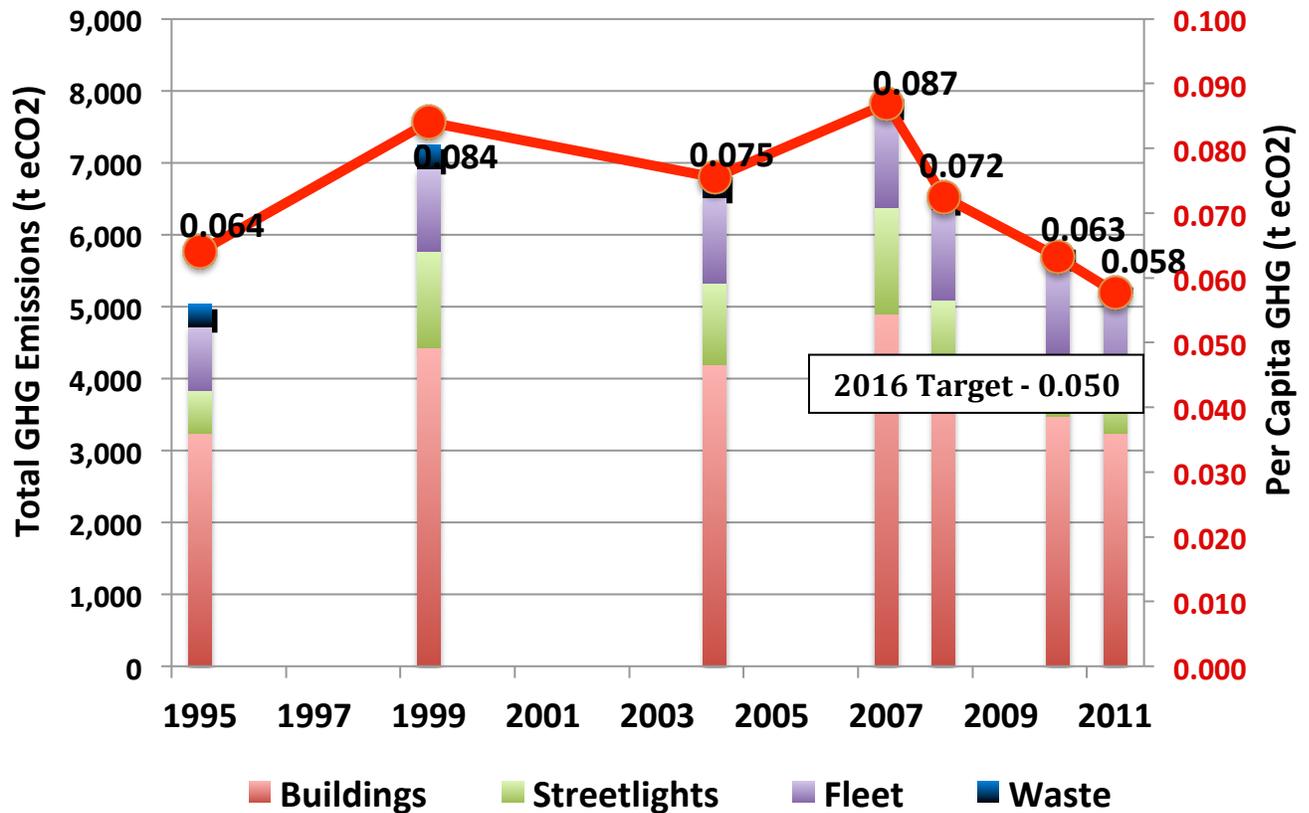
The current population forecast for 2016 is 111,339, which is a significant change to the original forecast of 141,109. This will likely continue to change as forecasts are further refined closer to the target year, however the per capita GHG and energy targets will remain the same. Likewise, the CO2 Electricity Coefficient will change year to year but will not affect the per capita targets, only the actuals.

The population has grown by 17.6% from 1995 to 2011, while the corporate energy use has increased by 15.7% resulting in a slight per capita decline of 1.6%. With the forecasted rise in population to over 111,000 by 2016, facilities and other services will tend to expand to meet the growing needs of the community, resulting in additional energy demand.

The provincial GHG emissions from electricity use in 2007, 2010 and 2011 have been recently updated based on the National Inventory Report 1990 – 2011 – Greenhouse Gas Sources and Sinks in Canada, Annex 13 released April 15, 2013. The provincial electricity coefficient has dramatically dropped from 0.240 kg/kWh in 2007 to 0.110 kg/kWh in 2011. This is as result of a significantly improved mix of electricity generation in Ontario, which includes more GHG emission-free sources (hydro, nuclear, renewables) and less coal-fired generation. The reduction in coal-fired generation is also due to reduced overall electricity demand as a result of the recession and energy conservation initiatives.

Figure A provides the GHG emissions by sector (facilities, streetlights, fleet and waste) and the per capita trend (red line) for each year that the corporate inventory has been quantified. The sector data is provided in Appendix A.

Figure A – GHG Emissions by Sector with Per Capita Trend Line



The 2011 per capita emissions of 0.058 teCO₂ is within reach of the 2016 target of 0.050 teCO₂. Increased energy efficiency efforts at the City and the legislated shutdown of the coal-fired power plants by the end of 2014 could result in the City meeting the 2016 GHG emissions target on both an absolute and per capita basis.

2.4 Corporate Initiatives

Table 3 provides a summary of projects by sector implemented since late 2007. To-date, 50 significant energy-efficiency initiatives have been completed or will be completed by the City as of the end of 2012. These initiatives have been quantified for energy, cost and GHG savings, % energy savings versus 2007, incremental capital cost of energy-efficiency elements of projects, and simple payback to measure financial returns.

These initiatives provide an estimated energy savings of 11.3% from 2007 resulting in estimated annual savings of \$434,000 per year with an average payback of 4.1 years on incremental capital invested.

Table 3 – Impact of 50 Key Initiatives from 2007 through 2012

Sector	Energy Savings (GJ/y)	GHG Savings (t/y)	% Energy Savings from 2007 Baseline	Operating Cost Savings (\$'000/y)	Capital Cost (\$'000)	Simple Payback (years)
Facilities	13,364	562	15.9%	\$414	\$1,688	4.1
Fleet	215	19	1.2%	\$7	\$53	7.8
Streetlights	467	23	2.1%	\$14	\$51	3.7
Total	14,046	604	11.3%	\$434	\$1,792	4.1

The facility energy-efficiency projects have produced the majority of the energy and GHG savings impact to-date accounting for 95% of energy savings.

The conversion of traffic lights to high efficiency LED's provides a good payback although it accounts for only 3% of total energy savings.

Fleet energy and GHG savings has resulted from the replacement of older vehicles with 8 hybrids and more energy efficient vehicles with more stringent environmental standards. The installation of catalytic converters on lawn mowers and snow removal equipment has a significant air pollution impact, but no material energy savings.

Table 4 provides the impact of the initiatives by year starting with a large impact project: the relamping of the Civic Complex in October 2007. The initiatives ramped up in 2009 with energy savings corresponding to a 3.7% reduction from 2007. The 2010 and 2011 projects have a lower impact than 2009 with a 1.2% and 1.4% annual energy reduction, respectively. The 2012 initiatives are double the impact of those in 2011 at 2.8% savings.

Table 4 – Impact of Corporate Initiatives by Year

Initiatives by Year	Year Completed	Energy Savings (GJ/y)	Cost Savings (\$'000/y)	GHG Savings (t/y)	% Energy Savings from 2007
	2007	2,106	\$63	78	1.7%
	2008	486	\$14	25	0.4%
	2009	4,614	\$124	226	3.7%
	2010	1,533	\$48	70	1.2%
	2011	1,770	\$54	79	1.4%
	2012	3,537	\$131	126	2.8%
Initiatives thru 2012		14,046	\$434	604	11.3%

Table 1 shows a 3% total energy savings from 2007 to 2011. Table 4 shows that the cumulative impact of key projects completed in 2010 (which have their first full year impact in 2011) resulted in an energy savings of 7% versus 2007. The 5% difference may be due to many factors but one significant impact is the expansion of facilities as noted in section 2.1.

Building energy audits have helped the City identify significant energy efficiency projects. Energy audits have been completed on many of the major buildings including Civic Complex (lighting only in 2007 and full energy audits in 2011/2012), Recreation Complex, East Shore CC, and Petticoat CC & library.

In late 2013, the City commissioned energy audits for the Don Beer Arena, Dunbarton Pool, Claremont CC, Fire Stations #2, 5 & 6, West Shore CC, and Greenwood CC and is working on a study of the domestic hot water and waste heat system at the Recreation Complex.

In early 2014, the City will conduct walk-through assessments of all remaining facilities with assistance from Durham Sustain Ability as part of its Durham Partners in Project Green program.

In 2010, an upgrade to the energy management system was installed in the Recreation Complex, Civic Complex and West Shore CC. In 2013, this system upgrade was expanded to the East Shore CC, Petticoat CC & library, Claremont CC, and Dunbarton Pool. This has the potential of saving significant energy use through system optimization.

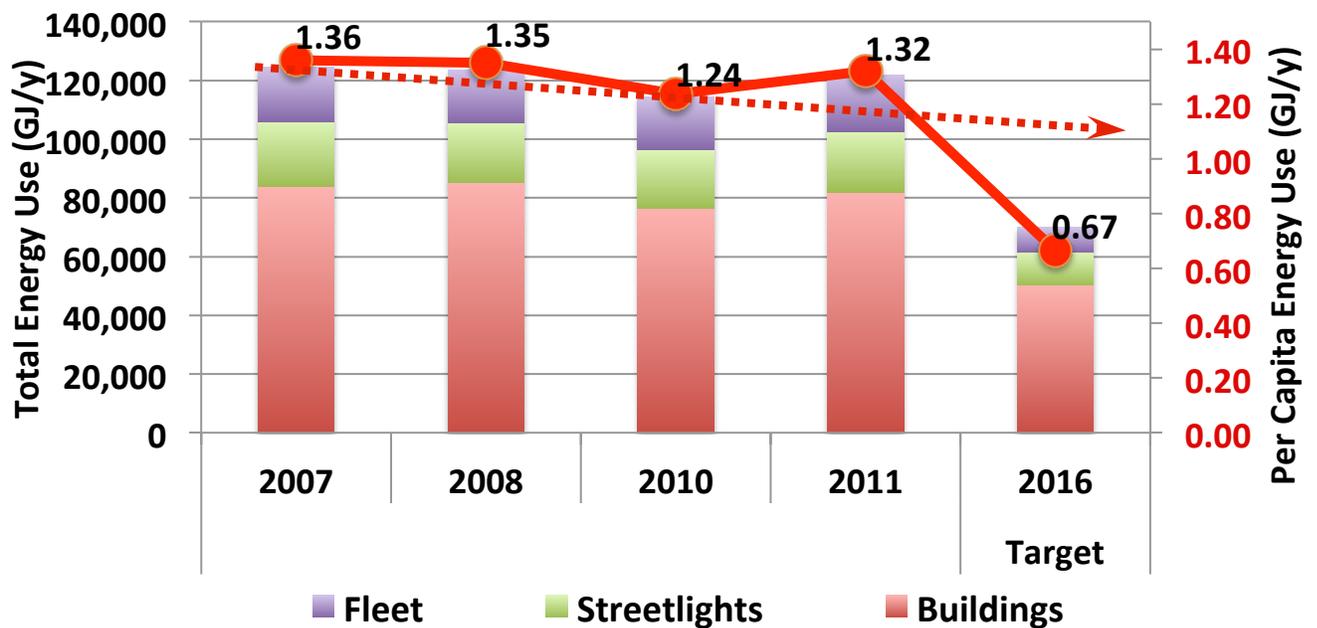
Figure B shows the impact of energy savings on both an absolute basis (bars) and a per capita basis (red trend line). The chart provides actual results from 2007 through 2011, and forecasted results for 2012.

The forecasted results for 2012 also allows for additional energy use in additional facilities: Bentley House and Animal Services (full year impact).

The dotted red line reflects the continuation of the current per capita energy savings trend, which shows that **the per capita energy target in 2016 is highly unlikely to be met based on the current trend line.**

In order to meet the 2016 energy reduction target of 0.67 GJ per capita, the City would need to implement energy efficiency projects in 2014 and 2015 that save an average of 26% per year, which is highly improbable.

Figure B – Energy Use By Sector and Per Capita Trend Line



Although 2016 is too short of a timeframe to meet this target, the 50% per capita reduction target can potentially be achieved over a longer period of time. With this in mind, there is currently room for further improvement in identifying, prioritizing and implementing energy efficiency initiatives with acceptable returns. This requires identification of potential barriers and how to address them.

2.5 Identify Potential Barriers

2.5.1 Process

The following process was used to identify barriers and challenges to implementing additional energy efficiency initiatives:

- Key staff that directly deal with energy efficiency, waste reduction and GHG reduction initiatives were interviewed:
 - Coordinator, Sustainability
 - Mechanical Foreman, Facility Operations
 - Supervisor, Facility Operations
 - Manager, Municipal Operations and Fleet Services
- The interviews were combined with data gathering on current initiatives in order to quantify their impact

2.5.2 Potential Barriers

Based on the staff interviews in 2011, some key barriers and challenges were identified below. There have been some improvements by 2013, especially with regards to communication between the Community Services Department and the Office of Sustainability.

- Resources – staff do not always have sufficient time to dedicate to energy efficiency measures, and to capital spending reductions through funding programs; there is also a lack of software/resources to develop detailed business cases to inform decision-making and a lack of a coordinated program;
- Systems / Culture – energy efficiency efforts in Community Services Department are not always coordinated with Office of Sustainability; the decision-making process is sometimes slow, and there is a resistance to change the system. Additional facilities or expansions are planned without realizing the full impact on energy and GHG targets;
- Financial – the annual budget for capital projects is somewhat constrained and the City is therefore behind on optimal replacement of old and inefficient equipment; there is also a perceived ceiling of 25% - 30% of gas tax funds allocated to facility and fleet energy efficiency projects;
- Monitoring and Reporting – other than this report, there is a lack of a continual feedback mechanism and no formal monitoring system to quantify and report successes (e.g. monthly reporting to maintain focused awareness throughout organization);

2.6 Address Potential Barriers

2.6.1 Recommended Actions to Drive Energy Efficiency and GHG Reduction Initiatives

The following recommended actions in Table 5 address the potential key barriers identified in the interviews and support an approach that should help the City meet its targets in the longer term. Bracketed comments in bold provide the current status of actions, as applicable.

Table 5: Recommended Actions in 2012 and 2013 to Address Barriers

Barrier Category	Barrier Key Elements	Recommended Actions
Resources	<ul style="list-style-type: none"> • Lack of time to dedicate to energy efficiency and to securing outside funding • Lack of support software to develop business cases • Lack of coordination 	<ul style="list-style-type: none"> • Create position of “Supervisor, Energy Management & Projects” to coordinate and monitor energy efficiency initiatives (created in June 2012) • Set-up project prioritization system (completed in August 2012) • Identify funding sources (completed in August 2012) • Obtain grants, as applicable (in process) • Evaluate software to support project prioritization and decision making
Financial	<ul style="list-style-type: none"> • Perceived constraints in annual budget and gas tax funding • Playing catch-up on replacement of obsolete equipment 	<ul style="list-style-type: none"> • Complete inventory of all key equipment (updated in 2012) • Estimate cost of deferring replacement (maintenance savings quantified in project prioritization, more work required) • Develop business cases to include life cycle of equipment • Centralized approach for energy efficiency and GHG projects including separate line item in corporate budget
Monitoring and Reporting	<ul style="list-style-type: none"> • Lack of ongoing monthly monitoring and reporting of projects • Lack of feedback 	<ul style="list-style-type: none"> • Manually report on projects for 2012/2013 and evaluate internal vs. external software for ongoing reporting • Implement energy management monitoring and quarterly reporting system (Continuing with integration of in-house monitoring system) • Implement corporate waste diversion monitoring and reporting system

Barrier Category	Barrier Key Elements	Recommended Actions
		(waste audit for key facilities to be complete by end of 2012)
Systems / Culture	<ul style="list-style-type: none"> • Operations is somewhat separate, not a coordinated program • Slow decision-making • Slow to change system 	<ul style="list-style-type: none"> • Address through larger corporate engagement process • Develop an objective and transparent energy efficiency recognition and incentive program

3 Community Inventory Update

3.1 Background and Scope

In 2007, the City successfully completed milestones 1, 2 & 3 of the Partners for Climate Protection (PCP) program for both the corporation and the community, which includes establishing a greenhouse gas (GHG) baseline inventory, setting reduction targets and developing a local action plan.

The remaining milestones 4 & 5 in the PCP framework are the implementation of the local action plan initiatives and development of a monitoring and reporting system to verify GHG reductions, respectively.

This section provides an update of community energy and GHG emissions inventory for 2011 as part ongoing PCP requirements for recognition of completing Milestones 4 & 5 for the community.

3.2 Methodology

Establishing a community GHG emissions inventory involves gathering data on fuel, energy and waste from all sectors comprising the community at large. Energy consumption data in the residential, industrial, commercial and institutional (IC&I), and transportation sectors are gathered along with waste generation and disposal information.

The following Pickering community data was used for the inventory:

Residential, IC&I sector electricity usage and prices: Veridian

Residential, IC&I sector natural gas usage and prices: Enbridge

Transportation sector data: 2006 Transportation Tomorrow Survey (TTS) for Pickering residents based on annual average daily trips and kilometers driven. TTS is conducted every five years, however the 2011 data is not available until the end of 2013, so the 2006 data was updated using trend information from 2006 and 2009 Cordon Count (peak traffic counts) data.

Residential waste generation, diversion and disposal data: Durham Region

Once energy consumption and waste generation data were collected, appropriate emission coefficients were applied for each source of energy and waste to landfill to calculate the resulting GHG emissions. Annual GHG emissions are expressed in absolute terms and are not corrected for weather or population growth, however emissions are also expressed on a per capita basis for trend analysis.

The equivalent carbon dioxide coefficient (eCO₂) for electricity is based on the annual average amount of fossil fuel (coal, natural gas, oil) used at Ontario's electricity power plants. Other sources such as hydropower, nuclear and renewable energy do not directly produce eCO₂ emissions. As Ontario's electrical generation mix changes from year to year so does the eCO₂ electricity coefficient.

Tables 6 and 7 provide the emission coefficients used in the GHG inventory calculations.

Table 6: GHG Emission Coefficients

Energy Source	Base Unit	eCO₂ Coefficient (t eCO₂ / base unit)
Diesel	(litres)	0.002732
Fuel Oil	(litres)	0.002735
Gasoline	(litres)	0.002440
Natural Gas	(cubic metres)	0.001891
Propane	(litres)	0.001544

Table 7: Electricity Emission Coefficients

Inventory Year	Electricity eCO₂ Coefficient (kg eCO₂ / kWh)
1995	0.120
2004	0.200
2007	0.240
2011	0.110

The 2007 and 2011 coefficients were updated as per the latest National Inventory Report 1990-2011 – Greenhouse Gas Sources and Sinks in Canada, Annex 13 released April 15, 2013.

Table 7 lists the electricity emission coefficient used in the GHG emission calculations for each year, which is trending lower as coal-burning plants are phased out and replaced by cleaner natural gas generation and renewable energy sources.

3.3 Population Forecast Update

In 2006, the Pickering community GHG inventory was developed for the years 1995 (baseline) and 2004 (latest year update) and a 2016 emissions target was established based in part on population growth projections.

Table 8 provides the original and updated population forecast for the target year 2016 along with absolute and per capita GHG emission targets.

Table 8: Original and Updated 2016 Population Forecasts and Targets

	2016 Population Forecast	2016 GHG Target (t eCO₂)	2016 Per Capita Target (t / capita)
2006 Original	141,099	744,634	5.28
2013 Update	111,339	587,870	5.28

The original 2016 population forecast included significant urban development in Seaton in north Pickering. As a result of delays in the Seaton expansion, the current 2016 forecast does not include significant population growth in Seaton as the expansion is projected to commence in 2016.

The original 2016 GHG emissions target of 744,634 t was based on the original population forecast of 141,099. With the reduced growth, it is recommended that the absolute emissions target be revisited as it is no longer a stretch target. Using the same per capita target of 5.28 t/capita, **the recommended revised 2016 absolute target is 587,870 t.**

3.4 Summary of GHG Emissions and Energy Inventory

Table 9 summarizes the annual GHG emissions, energy consumption, and energy cost on an absolute and per capita basis from the 1995 baseline to 2011 as well as the 2016 targets.

Table 9: Community GHG Emissions, Energy Use and Energy Cost

	1995	2007	2011	2016 Target
GHG Emissions (t)	511,839	672,121	518,105	587,870
Per Capita GHG (t)	6.52	7.34	5.61	5.28
Energy Use (GJ)	9,264,042	10,822,417	10,741,920	8,537,726
Per Capita Energy (GJ)	118.0	118.2	116.3	76.7
Energy Cost (\$'000)	N/A	\$231,436	\$252,744	\$200,882
Per Capita Cost (\$)	N/A	\$2,529	\$2,737	\$1,804

From 1995 to 2007, absolute and per capita GHG emissions increased by 31.3% and 12.7%, respectively. The per capita increase is mainly attributable to the change in the provincial electricity emissions coefficient.

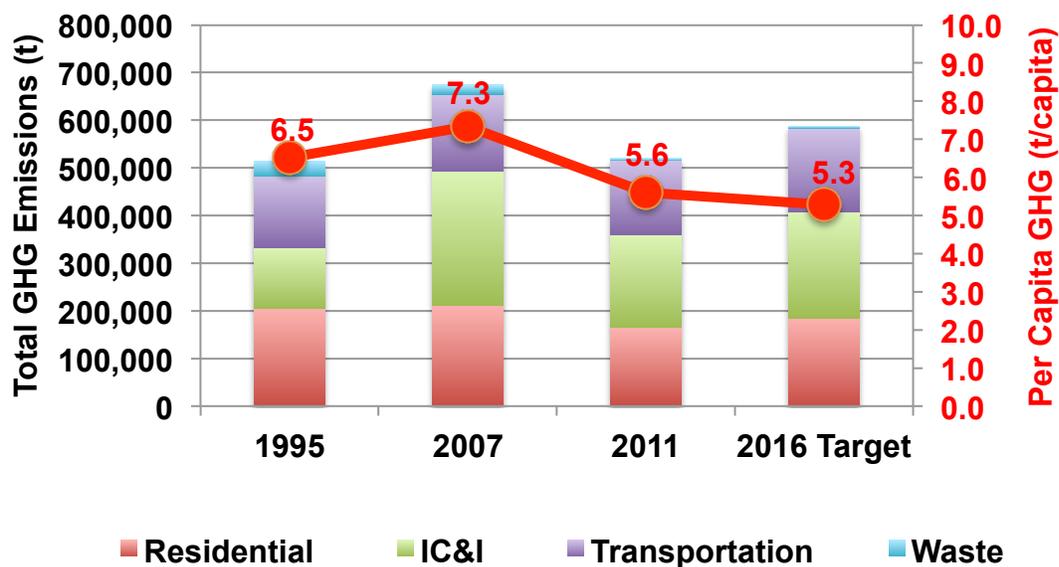
During this period, the absolute community energy consumption increased by 16.8% while the per capita energy use remained essentially unchanged, so the absolute change in energy use aligns exactly with population growth.

Since 2007, the absolute and per capita GHG emissions have declined by 22.9% and 23.6%, respectively, as the electricity emissions intensity has also significantly been reduced. However, between 2007 and 2011, the per capita energy use declined by 1.6%, from 118.2 GJ/person to 116.3 GJ/person.

Despite growth in population over the last four years, the absolute energy use was reduced by 0.7%, which may indicate a possible reversal of the upward trend, on an absolute basis, from 1995 to 2007.

Figure C provides total GHG emissions by sector with the total per capita GHG emissions trend line in red. Section 3.5 will provide further discussion on each community sector.

Figure C: Absolute GHG Emissions by Sector and Per Capita Trend Line



Although the 2011 absolute GHG emissions are below the 2016 absolute target, the forecasted population growth between 2011 and 2016 will require further GHG reductions. The per capita trend line shows a further decline from 5.6 t/capita in 2011 to 5.3 t/capita in 2016 is required to meet the absolute target.

3.5 Trends By Community Sector

3.5.1 Summary

Table 10 provides a summary of absolute and per capita GHG emissions by sector. Each sector will be discussed in the next sections.

Table 10 – GHG Emissions by Sector

GHG Emissions (t)	1995	2007	2011	2016 Target
Residential	203,900	210,193	163,353	185,349
Residential Per Capita	2.60	2.30	1.77	1.66
IC&I	127,020	281,505	195,180	221,462
IC&I Per Capita	1.62	3.08	2.11	1.99
Transportation	150,048	161,203	155,892	176,883
Transportation Per Capita	1.91	1.76	1.69	1.59
Waste	30,872	19,219	3,680	4,176
Waste Per Capita	0.39	0.21	0.04	0.04
Total	511,839	672,121	518,105	587,870
Total Per Capita	6.52	7.34	5.61	5.28

Figure A above provides a summary of the GHG emissions by sector.

The increase in absolute and per capita GHG emissions from 1995 to 2007 is mainly due to the significant rise in emissions in the IC&I sector. All sectors reduced emissions on an absolute and per capita basis from 2007 to 2011.

3.5.2 Residential

The residential sector for purposes of this analysis is comprised of single-family detached and semi-detached homes. Condominiums and apartments are generally on single meters and as such are regarded by the electricity local distribution company (LDC) as commercial accounts and cannot be readily segregated from other IC&I customers.

The residential sector accounted for 31% of total community GHG emissions in 2011. Table 11 provides the residential GHG emissions, energy consumption, and energy cost on an absolute and per capita basis.

Table 11: Residential GHG Emissions, Energy Use and Energy Cost

Residential	1995	2007	2011	2016 Target
GHG Emissions (t)	203,900	210,193	163,353	185,349
Per Capita GHG (t)	2.60	2.30	1.77	1.66
Energy Use (GJ)	4,258,460	3,835,654	3,634,386	2,888,626
Per Capita Energy (GJ)	54.2	41.9	39.4	25.9
Energy Costs (\$'000)	N/A	\$66,417	\$62,175	\$49,417
Per Capita Cost (\$)	N/A	\$726	\$673	\$444

From 1995 to 2011, the population grew by 17.6% while the number of households increased by 22.5%. Despite the increase in population and households, the absolute energy consumption has dropped by 14.7% and the GHG emissions have been reduced by 19.9%. This is a major accomplishment for the residential sector, which provides real per capita energy savings despite an increasing energy unit price trend.

The difference between the GHG and energy measures is attributable to the small change in the annual provincial electricity eCO₂ coefficient between 1995 and 2011 as shown in Table 7 in section 3.2.

Based on the current trend, the GHG emissions target likely will be met.

3.5.3 Institutional, Commercial and Industrial (IC&I)

The IC&I sector comprises of institutions (government, schools, hospitals, churches, museums, and other public buildings), office buildings, retail and food service establishments, and industrial facilities. It also includes apartments and condominiums in this analysis for reasons discussed in residential Section 3.5.2.

This sector accounts for the largest portion of total community GHG emissions. In 2011, it generated 38% of emissions. Table 12 shows the IC&I GHG emissions, energy consumption, and energy cost on an absolute and per capita basis.

Table 12: IC&I GHG Emissions, Energy Use and Energy Cost

IC&I	1995	2007	2011	2016 Target
GHG Emissions (t)	127,020	281,505	195,180	221,462
Per Capita GHG (t)	1.62	3.08	2.11	1.99
Energy Use (GJ)	2,824,208	4,645,899	4,884,416	3,882,155
Per Capita Energy (GJ)	36.0	50.8	52.9	34.9
Energy Cost (\$'000)	N/A	\$101,446	\$113,664	\$90,341
Per Capita Cost (\$)	N/A	\$1,108	\$1,231	\$811

From 1995 to 2007, total energy consumption and GHG emissions grew significantly by 64.5% and 121.6%, respectively. The difference between the GHG and energy

measures is attributable to the significant change in the annual provincial electricity eCO₂ coefficients in 1995 and 2007 as shown in table 7 in section 3.2.

From 2007 to 2011, per capita energy use continued to increase although at a reduced rate of 1.0% per year between 2007 and 2011 versus an average of 3.4% per year between 1995 and 2007.

From 2007 to 2011, the absolute and per capita GHG emissions were reduced by 30.7% and 31.3%, respectively. With energy use continuing to increase during this period, the emissions decline is entirely due to the significant reduction in the provincial electricity coefficient from 2007 to 2011. The 2016 target requires a further 6% reduction in per capita emissions from 2011, which seems to be quite achievable if the provincial electricity coefficient continues to decline as forecasted by the Ministry of Energy.

3.5.4 Transportation

The transportation sector includes travel by all Pickering residents in personal vehicles and public transportation vehicles, but not rail, marine or air transportation as per PCP protocol. It also includes commercial vehicles used by Pickering businesses and institutions based on provincial proxy data. The total vehicle kilometers traveled is then used to calculate fuel and emission data based on average fuel efficiencies for different classes of vehicles.

In 2011, transportation accounted for the third largest portion of total community GHG emissions generating 30% of emissions. Table 13 shows the GHG emissions, energy consumption, and energy cost on an absolute and per capita basis.

Table 13: Transportation GHG Emissions, Energy Use, and Energy Cost

Transportation	1995	2007	2011	2016 Target
GHG Emissions (t)	150,048	161,203	155,892	176,883
Per Capita GHG (t)	1.91	1.76	1.69	1.59
Energy Use (GJ)	2,181,374	2,340,864	2,223,118	1,766,944
Per Capita Energy (GJ)	27.8	25.6	24.1	15.9
Energy Cost (\$'000)	N/A	\$63,573	\$76,905	\$61,124
Per Capita Cost (\$)	N/A	\$695	\$833	\$549

From 1995 to 2007, total transportation fuel consumption and GHG emissions increased by 7.3% and 7.4%, respectively. Since 2007, fuel consumption and GHG emissions have declined through to 2011 by 5.0% and 3.3%, respectively. The small differences between energy and GHG emissions are likely due to changes in fuel use mix between gasoline and diesel.

On a per capita basis, energy and GHG emissions declined by 13.4% and 11.7%, respectively, from 1995 to 2011. Despite the decline in fuel use, the per capita energy cost has escalated by 20% from 2007 to 2011.

3.5.5 Waste

The community waste sector includes all waste collected by Durham Region from residents and institutions within Pickering. It also includes waste collected by private companies from institutions and businesses except industrial waste and construction and demolition waste as very little of the organic portion of this waste ends up in municipal landfills, and industrial landfill conditions do not foster decay. As little data is available on private collection, provincial proxy data was used to estimate commercial waste disposal, which is added to Durham Region records.

In 2011, waste accounted for only 0.7% of total community GHG emissions. Table 14 shows the GHG emissions and waste tonnage to landfill on an absolute and per capita basis.

Table 14 – Waste GHG Emissions and Waste to Landfill

Waste	1995	2007	2011	2016 Target
GHG Emissions (t)	30,872	19,219	3,680	4,176
Per Capita GHG (t)	0.39	0.21	0.04	0.04
Waste to Landfill (t)	64,089	39,899	39,509	48,060
Per Capita Waste (t)	0.82	0.44	0.43	0.43

From 1995 to 2011, total waste to landfill was reduced by 38.4% through successful diversion programs. However, GHG emissions was reduced by 88.1% as a result of the change in composition of waste to landfill due to the organics recycling program, and due to the change in landfill disposition from no methane recovery to methane recovery landfills in New York State.

In 2011, the per capita waste to landfill is 0.43 t/person, which equals the 2016 per capita target. The absolute and per capita GHG targets are achievable.

Appendix A – Corporate Energy and GHG by Sector

Sector	Energy and GHG Parameters	1995	2007	2008	2010	2011	Target 2016
Buildings	Energy Use (GJ)	74,981	83,810	85,087	76,444	80,683	53,199
	Per Capita Energy	0.95	0.92	0.93	0.83	0.87	0.48
	GHG (t eCO ₂)	3,242	4,896	4,125	3,476	3,244	3,690
	Per Capita GHG	0.041	0.053	0.045	0.038	0.035	0.033
Streetlights	Energy Use (GJ)	16,599	22,146	20,395	19,882	19,971	11,766
	Per Capita Energy	0.21	0.24	0.22	0.21	0.22	0.11
	GHG (t eCO ₂)	585	1,476	963	826	610	1,025
	Per Capita GHG	0.007	0.016	0.011	0.009	0.007	0.009
Fleet	Energy Use (GJ)	12,862	18,514	18,050	18,082	20,175	9,076
	Per Capita Energy	0.16	0.20	0.20	0.20	0.22	0.08
	GHG (t eCO ₂)	897	1,293	1,259	1,264	1,398	634
	Per Capita GHG	0.011	0.014	0.014	0.014	0.015	0.006
Corporate Waste	Waste to Landfill (t)	641	598	592	592	592	453
	GHG (t eCO ₂)	309	288	285	285	81	218
	Per Capita GHG	0.004	0.003	0.003	0.003	0.001	0.002
Total	Energy Use (GJ)	104,442	124,471	123,531	114,408	120,829	74,041
	% Change from 1995	0%	19%	18%	10%	16%	-29%
	Per Capita Energy	1.33	1.36	1.35	1.24	1.31	0.67
Total	GHG (t eCO₂)	5,032	7,953	6,633	5,853	5,333	5,567
	% Change from 1995	0%	58%	32%	16%	6%	11%
	Per Capita GHG	0.064	0.087	0.072	0.063	0.058	0.050
Total	Energy Costs (\$'000)	\$1,436	\$2,595	\$2,669	\$2,471	\$2,673	\$2,076

Appendix B – Corporate Initiatives by Facility / Function

Location/ Function	Initiative	Year Completed	Energy Savings (GJ/y)	Cost Savings (\$/y)	GHG Savings (t/y)	Total Energy in 2007 (GJ/y)	% Energy Savings from 2007 Baseline	
Facilities								
Civic Complex	Relamping	2007	1,830	\$58,413	62.3	16,295	23.0%	
	HVAC upgrades (3)	2009	1,119	\$42,779	44.0			
	HVAC upgrades (1)	2010	153	\$4,420	5.5			
	HVAC upgrades (2)	2011	603	\$11,985	28.4			
	Library roof upgrade, white roof	2011	48	\$1,395	1.7			
	HVAC upgrades (3)	2012	376	\$12,853	13.6			
	Windows - pilot tinting	2012	68	\$1,377	2.8			
Total			3,753	\$118,992	142.0			
Recreation Complex	Systems Automation (2)	2008	232	\$5,029	9.5	33,283	8.6%	
	Catalytic converters	2009	-	\$0	4.8			
	HVAC upgrades (1)	2009	1,509	\$27,328	74.4			
	HVAC upgrade (1)	2010	124	\$9,590	4.5			
	Green roof	2010	106	\$2,083	4.5			
	Upgrade energy mgmt system	2011	587	\$16,969	21.2			
	HVAC upgrade (1)	2011	139	\$15,470	5.0			
	Relamping, motion detectors	2011	179	\$2,336	6.5			
	HVAC upgrades (3)	2012	684	\$39,252	24.7			
	Relamping, sensors	2012	1,319	\$38,095	47.6			
	Total			2,876	\$78,805			130.4
Don Beer Arena	Catalytic converters	2009	-	\$0	4.8	10,207	7.5%	
	HVAC Upgrade	2010	708	\$23,771	35.1			
	Green roof	2011	54	\$1,100	2.7			
	Roof replacement & white roof	2012	1	\$43	0.1			
	Relamping	2012	140	\$4,034	5.0			
Total			762	\$24,871	42.6			
East Shore	Relamping	2010	17	\$499	0.6	3,158	10.1%	
	Roof rehab - phase 1	2010	303	\$3,867	14.2			
	Relamping	2011	35	\$999	1.2			
	Roof replacement & white roof	2012	25	\$714	0.9			
	HVAC upgrade	2012	39	\$2,117	1.4			
	Relamping	2012	28	\$699	1.0			
	Total			320	\$4,366			14.9
West Shore	HVAC upgrade	2007	174	\$1,648	8.6	546	40.3%	
	Window replacement, new blinds	2010	46	\$2,100	1.8			
	New energy mgmt system	2011	68	\$1,136	3.0			
	Relamping	2011	19	\$545	0.7			
	Total			220	\$3,748			10.4
Greenwood CC	Roof replacement & white roof	2012	4	\$103	0.1	492	-72.2%	
	HVAC upgrade	2012	(359)	-\$2,963	(18.0)			
Total			(356)	-\$2,861	(17.9)			
Greenwood Library	Fuel switch with new furnace	2008	34	\$2,208	4.2	109	31.1%	
Dunbarton Pool	Building and HVAC upgrade	2009	1,739	\$46,428	85.8	4,763	36.5%	
Firehall #2	Upgrade roof	2010	44	\$627	2.0	708	6.3%	
Operations Centre	Fuel switch with new furnace	2011	38	\$2,436	4.7	5,089	0.8%	
Petticoat CC	Relamping	2012	263	\$ 7,591	9	2,871	9.2%	
Total Facilities	Initiatives By Year	2007	2,004	\$ 60,061	71		2.4%	
		2008	265	\$ 7,237	14		0.3%	
		2009	4,367	\$ 116,535	214		5.2%	
		2010	1,501	\$ 46,957	68		1.8%	
		2011	1,770	\$ 54,372	75		2.1%	
		2012	2,585	\$ 103,914	89		3.1%	
		Initiatives through 2012		12,493	\$ 389,075	531	83,810	14.9%
		Potential Projects in 2013	2013	2,400	\$143,718	90		2.9%
Total through 2013			14,893	\$532,793	620	83,810	17.8%	

Location/ Function	Initiative	Year Completed	Energy Savings (GJ/y)	Cost Savings (\$/y)	GHG Savings (t/y)	Total Energy in 2007 (GJ/y)	% Energy Savings from 2007 Baseline
Fleet							
Efficient Vehicles Emissions	Hybrid Ford Escape - 5 vehicles	2007	102	\$3,233	6.9	18,514	0.6%
	Hybrid Ford Escape - 1 vehicle	2010	32	\$1,009	2.2		0.2%
	Emissions - catalytic converters	2010 - 2012			4.2		0.0%
	Hybrid GM Sierra - 2 vehicles	2012	47	\$1,505	3.2		0.3%
	Right size vehicles	2012	34	\$1,082	2.3		0.2%
	Initiatives through 2012			215	\$6,830		19
Streetlights							
Traffic Lights	Relamp with LED's	2008	220	\$6,412	11	934	24%
	Relamp with LED's	2009	247	\$7,186	12		26%
Total Traffic Lights			467	\$13,599	23		50%
Total	Total Streetlights		467	\$13,599	23	22,146	2%
Grand Total							
	Initiatives by Year	Year Completed	Energy Savings (GJ/y)	Cost Savings (\$'000/y)	GHG Savings (t/y)	Total Energy in 2007 (GJ/y)	% Energy Savings from 2007 Baseline
Grand Total	Initiatives through 2012	2007	2,106	\$63	78	124,471	1.7%
		2008	486	\$14	25		0.4%
		2009	4,614	\$124	226		3.7%
		2010	1,533	\$48	70		1.2%
		2011	1,770	\$54	79		1.4%
		2012	2,667	\$107	94		2.1%
	2013	Potential Projects in 2013	2,400	\$144	90		1.9%
Total Initiatives through 2013		15,576	\$553	663	124,471	12.5%	