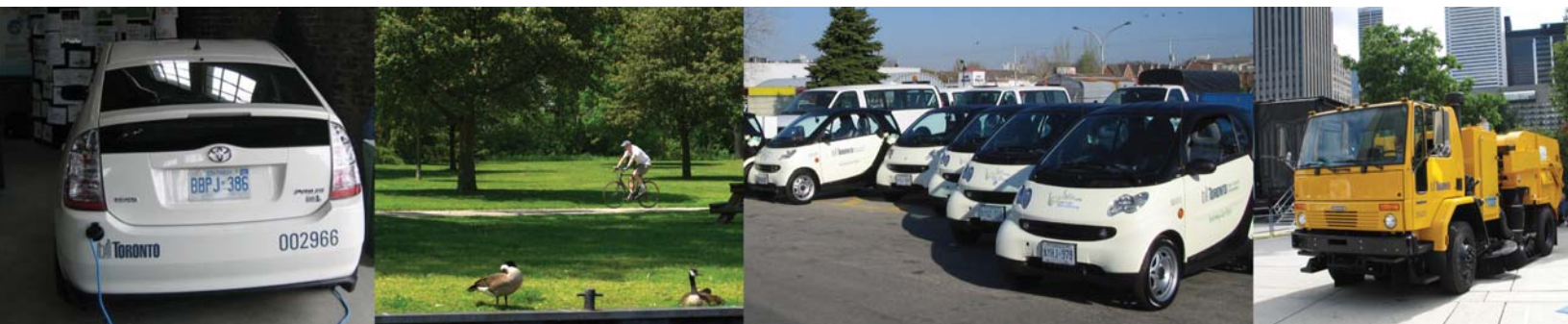




Green Fleet Plan 2008 - 2011

January 2008



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Highlights:

- replacing a minimum of 520 vehicles with green vehicles
- pilot testing hybrid heavy trucks
- pilot testing hydrogen-powered vehicles
- promoting the Idle-Free campaign for City staff



This report outlines actions Toronto will take to accelerate the greening of its vehicles.

Executive Summary

The City of Toronto is introducing Phase II of its green fleet planning process, called the Green Fleet Plan 2008-2011. This is an exciting time to be greening the fleet because a huge variety of products and vehicles are now available and cost premiums are dropping rapidly. Toronto is greening its fleet operations to reduce fuel use, fuel costs, emissions of greenhouse gases and smog pollutants, and reduce the fleet’s environmental impact. This is done by choosing more environmentally sustainable vehicles, fuels and practices. In July 2007, City Council recognized the many benefits of greening Toronto’s fleet by calling for this Green Fleet Plan to guide the City’s activities in the coming years.

This report outlines the actions Toronto will take to accelerate the greening of its fleet over the next four years. The actions cover five topic areas: Emission reduction targets, Vehicles, Fuels, Sustainable choices and Maintenance and management practices. This plan will make the purchase of green vehicles standard practice at the City of Toronto. It also provides the flexibility to adopt promising new technologies and practices over time. The Plan focuses on the City of Toronto’s centrally-managed fleet. These fleet vehicles and fuels are used by all City Divisions and managed by the Fleet Services Division.

This report also evaluates Toronto’s progress in greening the fleet over the past four years by implementing Phase I, the Green Fleet Transition Plan 2004-2007. Most elements of the Transition Plan were implemented. Other elements of the Transition Plan were set aside in favour of preferred emerging technologies. Toronto’s fleet is now benefiting from many new green vehicles, fuels and practices that were implemented in the past four years. Toronto’s green fleet initiatives have lowered emissions of carbon dioxide (CO₂), by an estimated 5,000 tonnes over 2004-2007 compared to the emissions that would have resulted from conventional fuels and vehicles.

By implementing the Green Fleet Plan 2008-2011, the City of Toronto is expected to reduce CO₂ emissions from the City’s central vehicle fleet by approximately 15,000 tonnes, or 11 per cent, compared to the emissions from conventional vehicles, fuels and activities. Emission reductions will be even greater than these estimates because emission reductions from many of the actions in this Plan have yet to be quantified. With the proposed implementation of the Toronto Green Fleet Plan 2008-2011, an estimated \$2.032 million in cost savings are anticipated over the four years.

The City of Toronto, led by Fleet Services Division, will undertake the following actions to green its fleet operations. The City will:

Emission reduction targets

1. Ensure Fleet Services Division operations meet or surpass the emission reduction targets adopted by Council:
 - a) reduction targets for greenhouse gas emissions from the 1990 levels of 6 per cent by 2012 (the “Kyoto target”); 30 per cent by 2020; and 80 per cent by 2050; and

- b) a 20 per cent reduction target for locally generated smog causing pollutants from 2004 levels by 2012;

Vehicles

2. Contain fleet size and purchase fuel-efficient, right-sized vehicles as a standard practice across all Divisions, if they are commercially available and meet operational needs, specifically:
 - a) Contain the size of the City’s fleet by working with Divisions to reduce the number of vehicles required and kilometres travelled, use vehicles more efficiently and delete underused vehicles from the fleet or move them to other City operations;
 - b) Purchase the right size of vehicle for the job, using small vehicles where they meet operational needs; and
 - c) Purchase the most fuel-efficient vehicle, or lowest-emitting vehicle, that is commercially available and meets operational needs;

3. Replace the following numbers of City vehicles with green vehicles, giving priority to the cleanest technologies: At a minimum, replace 80 vehicles in 2008, 100 vehicles in 2009, 140 vehicles in 2010 and 200 vehicles in 2011;

4. Pilot test promising green vehicle technologies and work with industry to accelerate development and large-scale adoption in Canada by:
 - a) Actively seeking, pilot testing and incorporating green vehicles and technologies into the City’s fleet;
 - b) Pilot testing more plug-in electric vehicles and ensuring that they are re-charged at night using off-peak electricity where possible;
 - c) Working with Toronto Atmospheric Fund to expand the Toronto Plug-in Hybrid Electric Vehicle Project to a larger consortium of fleet managers, potentially to include GTA municipalities and utilities;
 - d) Pilot testing full-electric vehicles as well as recharging station technologies and options, in partnership with the Toronto Atmospheric Fund and the Toronto Parking Authority;
 - e) Evaluating electric, low-speed vehicles for City of Toronto operations and pilot testing these vehicles if the evaluation indicates they will be beneficial;
 - f) Pilot testing green trucks, including light-duty, medium-duty and heavy-duty vehicles, targeting those that idle excessively such as delivery trucks and garbage packers, and sharing results with municipal and private fleet managers;
 - g) Developing, in collaboration with the Toronto Atmospheric Fund, a Low-Carbon Truck Pilot Project that pilot tests hybrid, plug-in hybrid, and all-electric truck technologies;
 - h) Pilot testing hydrogen-powered vehicles;
 - i) Adding hybrid-electric aerial tower trucks to the City’s fleet;
 - j) Replacing all of the City’s old street sweepers with “regenerative-air” dustless sweepers that trap fine particulate matter (PM_{2.5}) pollution and have cleaner diesel engines;



Toronto’s Idle-Free Policy saves fuel by requiring staff to shut off vehicles if they are idling for more than 10 seconds.

Highlights
Identify and incorporate equipment and practices that reduce fuel consumption, pollutant emissions and idling by the City’s vehicles.

Promote the City’s Idle-Free Policy and 10-second idling rule for City staff.

Determine the feasibility of establishing a policy prohibiting City vehicles from drive-throughs, and establish the policy if feasible.



Highlight
Investigate the feasibility and benefit of adopting additional green practices at Fleet maintenance facilities, such as using synthetic oils and extending the time between oil changes.

- k) Adding electric, zero-emission ice resurfacers to the City's fleet; and
 - l) Continuing to review the merits and applicability of natural gas vehicles;
5. Identify and incorporate equipment and practices that reduce fuel consumption, pollutant emissions and idling by the City's vehicles, such as:
 - a) Procure LED lights, batteries, inverters, space heaters or other equipment that reduces the need to idle a vehicle for long periods in order to operate lights, arrow boards and other necessary tools; and
 - b) Install electric plugs for truck block heaters at all major Solid Waste yards where feasible, and develop a policy to ensure they are used by staff to reduce unnecessary vehicle idling;
 6. Replace the oldest vehicles with cleaner, modern technology by continuing to accelerate the replacement of overdue City vehicles;
 7. Include in all vehicle procurement specifications green vehicle attributes, such as fuel efficiency and low emissions, and provide an appropriate weighting for these attributes when selecting a product;

Fuels

8. Evaluate biofuels to determine which products and feedstocks provide the greatest environmental benefits on a life-cycle basis;
9. Evaluate the use of biofuels with the federally mandated new diesel engines (2007 US EPA compliant models) and emission control devices to optimize emission reductions achieved by the City;
10. Expand the biofuels program to deliver biofuels to all City Divisions;
11. Explore the feasibility of using biodiesel in off-road diesel fuel, and implement a pilot project if feasible;
12. Use clean sources of energy for vehicles, including biofuels from sustainable feedstocks as they become available, for example ethanol produced from cellulose;
13. Advocate for sustainable electricity in Ontario, including conservation, renewables and the timely phase out of coal-fired electricity, to ensure the environmental benefits of plug-in and all-electric vehicles are realized;

Sustainable choices

14. Host annual Green Fleet Expo with the City of Hamilton, Fleet Challenge and other partners to provide public and private fleet managers and members of the public with an opportunity to learn about green fleet technologies and practices;
15. Encourage other municipalities and private companies to green their fleets, and share Toronto's experience by:
 - a) Participating in Fleet Challenge in 2008 by presenting Toronto's green fleet experience to other Ontario municipalities;
 - b) Sharing information with Greater Toronto Area municipal fleet managers through the GTA Clean Air Council;
 - c) Sharing information with public and private fleet managers through the Canadian Association of Municipal Fleet Managers (CAMFM), National Association of Fleet Administrators (NAFA Canada) and Municipal Equipment and Operations Association (MEOA); and
 - d) Working with the Director of the Toronto Environment Office to create a Greening Commercial Fleets Enviro-Action Working Group consisting of representatives of the National Association of Fleet Administrators and operators of large fleets in the areas of phone, cable, utilities, retail and courier providers to work together to identify and implement actions that green these fleets and achieve a reduction in emissions city-wide;
16. Provide technical support to the Toronto Transit Commission, Emergency Medical Services, Toronto Fire Services, Toronto Police Service and other Agencies, Boards and Commissions in developing and implementing their consolidated green fleet plans;
17. Provide technical support to Municipal Licensing and Standards, Toronto Atmospheric Fund and other partners in their efforts to green the fleets of vehicles that are licensed by the City (e.g. taxis);
18. Support the City's Bike Share program for staff by providing bike procurement assistance, safety training and maintenance for a pool of City bicycles;
19. Provide information and assistance to support establishment of bicycle infrastructure at City facilities by Facilities and Real Estate, including bike parking, bike lockers and other ancillary facilities as appropriate;
20. Promote the City's Idle-Free Policy and 10-second idling rule for City staff;
21. Continue to provide Idle-Free training in staff driver training courses, to monitor staff compliance with the 10-second idling rule, and to follow up with staff found to be idling;

Vehicles are important sources of greenhouse gases and air pollutants including:
 VOCs – volatile organic compounds
 NO_x – nitrogen oxides
 PM – particulate matter
 CO – carbon monoxide
 SO_x – sulphur oxides
 (Department of Justice 2003)



22. Determine the feasibility of establishing a policy prohibiting City vehicles from drive-throughs, and establish the policy if feasible;
23. Encourage other orders of government to support policies and incentives that encourage the use of sustainable vehicles, fuels and practices;
24. Work with Divisions to explore the feasibility of making green pool vehicles available to staff who require their vehicle for work;
25. Investigate and implement ways to reduce the number of work-related vehicle trips taken by Fleet Services staff, such as increasing the use of conference calls and scanners to share information between work sites;
26. Work with other Divisions to encourage City of Toronto employees to make sustainable transportation choices on their commute and at home, including by providing information on green vehicles and commuting alternatives to City staff;
27. Support the Smart Commute program by providing data and information and promoting the program as it is rolled out to all City employees;
28. Provide information to the public on green vehicles and funding incentives on Fleet Services' website;
29. Promote green vehicles at public events such as the Green Living Show, Canadian National Exhibition and Green Toronto Festival;

Maintenance and management practices

30. Investigate the feasibility and benefit of adopting additional green practices at Fleet maintenance facilities, such as using synthetic oils and extending the time between oil changes;
31. Continue to reduce the number of fuel sites operated by the City of Toronto by consolidating, upgrading or closing fuel sites, in consultation with client Divisions;
32. Have the City's fleet reviewed and rated under the E3 Fleet Rating System to identify opportunities to reduce fuel use and pollutant emissions and measure Toronto's fleet against available environmental benchmarks;
33. Examine the practices used by international municipal green fleet leaders such as New York City and Los Angeles, and incorporate successful practices into Toronto's fleet operations where feasible;
34. Undertake a study to confirm that the actions Fleet Services is taking will meet the emission reduction targets for greenhouse gases and smog pollutants;

35. Request funding in 2009 and later years to provide an operating budget for emission reduction assessment studies and green fuel premiums;
 36. Seek funding opportunities to enable the City to accelerate greening of its fleet;
 37. Include green fleet practices in tenders for work done by private contractors, such as a requirement to use fuel-efficient vehicles for City business and to prevent idling, and consider this information in the selection process; and
 38. Provide annual updates on progress achieved in meeting the commitments and targets of the Green Fleet Plan 2008-2011 on Fleet Services' website.
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Introduction

In 2004, the City of Toronto committed to greening the City’s fleet of vehicles. This commitment was adopted by Council in the Green Fleet Transition Plan 2004-2007. Since then, Toronto has implemented many green fleet initiatives, including some that were not foreseen in 2004 when the Transition Plan was developed. Over the past four years, Toronto has established itself as a Canadian leader in greening municipal fleets, and in 2006 won a Public Sector Quality Fair award.

To build on this success, the City of Toronto has prepared the Green Fleet Plan 2008-2011 (the Plan). The goal of the Plan is to reduce fuel use, fuel costs and emissions of greenhouse gases and smog-causing air pollutants, and reduce the fleet’s environmental impact. The Plan will guide the City’s approach over the next four years. The Plan:

- a) Summarizes Toronto’s current green fleet activities;
- b) Evaluates the implementation of the Green Fleet Transition Plan 2004-2007 including greenhouse gas emission reductions achieved so far;
- c) Outlines the actions the City will take over the next four years to reduce fuel use and emissions from Toronto’s vehicle fleet;
- d) Projects the emission reductions to be achieved by these actions.

The Plan is divided into discussions of emission-reduction targets, vehicles, fuels, sustainable choices and maintenance and management practices.

The Green Fleet Plan 2008-2011 was developed by Toronto Fleet Services Division with input from Divisions and Agencies, Boards and Commissions (ABCs) including the City’s drivers, mechanics and other staff who know the City’s vehicles best. The Plan also benefited from input from technical experts in the field of environmentally sustainable transportation and green vehicles and from interested City Councillors.

The City of Toronto defines a “green vehicle” as: a vehicle that reduces fuel consumption and/or reduces emissions of greenhouse gases and air pollutants, relative to a conventional vehicle. Examples of green vehicles include those with an ultra-fuel-efficient design, hybrid-electric or plug-in electric drive system, or an engine that uses cleaner alternative fuel or electricity as its energy source.

Scope of Green Fleet Plan 2008-2011

The City of Toronto's fleet of 4,700 vehicles and equipment is the focus of the Plan. The fleet is shared by all City Divisions and some Agencies, Boards and Commissions.

This plan will green the vehicles and the fuel used by all Divisions and Agencies, Boards and Commissions that are supplied at fuel sites operated by Fleet Services.

Fleet Services is also providing technical support to other areas — TTC, Toronto Fire, Toronto Police and Emergency Medical Services — in their efforts to prepare green plans for their fleets, as directed by Council.

Background

Motivation for greening the City's vehicle fleet

Greening the fleet helps the City of Toronto achieve many different objectives. Greening the fleet involves choosing vehicles, equipment, fuels and practices that consume less fuel and emit less pollution. Reducing fuel consumption lowers the City's fuel costs and helps conserve fossil fuel resources. It also reduces emissions of the greenhouse gases that cause climate change and the air pollutants that cause smog and health impacts.

Toronto's Medical Officer of Health reports that air pollution from traffic gives rise to approximately 440 premature deaths and 1,700 hospitalizations in Toronto each year (Toronto Public Health 2007). Air pollutants that are emitted from vehicles and cause health problems include nitrogen oxides (NO_x), fine particles (PM_{2.5}, particulate matter less than 2.5 µm in diameter), volatile organic compounds (VOCs) and sulphur oxides (SO_x). On sunny days, VOCs and NO_x combine to create ozone, the key ingredient in smog.

Climate change, also called global warming, is caused by human activities that release greenhouse gases such as carbon dioxide (CO₂). The consequences of climate change are now well understood and include sea-level rise, changing rain patterns and the spread of disease-bearing parasites to new parts of the globe. Vehicles are part of the problem and can be part of the solution. One third of the greenhouse gas emitted in Toronto comes from the transportation sector (ICF 2007). In response, municipalities across the Greater Toronto Area are already greening their fleets to reduce climate impacts from their operations (Canzi 2007). International experts estimate that by 2050 emissions of carbon dioxide per kilometre travelled could be reduced by 50 per cent (King 2007).

When the City undertakes a green fleet initiative and demonstrates its success, it benefits Toronto in four ways. First, the initiative helps the City meet emission-reduction targets for its own operations. Second, it helps the City reduce fuel consumption and save money. Third, it encourages other municipal and private fleet managers to adopt green fleet technologies, which helps improve air quality and reduce climate change. Fourth, demonstrating new or experimental technology promotes accelerated development, commercialization and wide-spread adoption of green fleet technologies, reduces prices and speeds infrastructure development.

Recognizing the many benefits of greening Toronto's fleet, in July 2007 City Council called for a new Green Fleet Plan to guide the City's activities in the coming years (City of Toronto 2007).

Scope of Green Fleet Plan 2008-2011

The Green Fleet Plan 2008-2011 focuses on the City of Toronto's centrally-managed fleet. These fleet vehicles and fuels are used by all City Divisions and managed by the Fleet Services Division.

Fleet Services Division purchases, manages and maintains the City of Toronto’s fleet of approximately 4,700 vehicles and pieces of equipment. Fleet Services also provides the City’s fuel at multiple sites across the City. The majority of the vehicles managed by Fleet Services are used by Parks, Forestry and Recreation; Transportation Services; Toronto Water; and Solid Waste Management Services. Other Divisions receive only fuel (e.g. Emergency Medical Services) or a small number of vehicles (e.g. Municipal Licensing and Standards) from Fleet Services. The centrally managed City of Toronto fleet shared by these Divisions and some ABCs (“Toronto’s fleet”) is the focus of the Green Fleet Plan 2008-2011.

In addition Fleet Services is providing technical support to other ABCs (Toronto Transit Commission, Toronto Fire Services, Toronto Police Service and Emergency Medical Services) in their efforts to prepare green plans for their fleets, as directed by Council. The fleets belonging to these organizations are not within the scope of the Green Fleet Plan 2008-2011.

Toronto’s green fleet today

Toronto currently has a variety of green fleet initiatives for vehicles and fuels, and is promoting sustainable fleet-related choices and green maintenance and management practices.

Vehicles

Today the City’s fleet includes 283 green vehicles. These include a variety of gasoline-electric hybrid vehicles, ultra fuel-efficient vehicles and alternative fuel vehicles as shown in Table 1.

Hybrid-electric vehicles have a gasoline or diesel engine plus an electric motor to increase fuel efficiency. Hydrogen-powered utility vehicles used by Exhibition Place can be used as portable clean energy generators when required. Transportation Services’ regenerative-air street sweepers clean the streets and the air by capturing the fine dust that is disturbed during sweeping operations. Toronto Water’s cube vans have special heaters that allow staff to turn the engine off and still keep the inside of the truck warm in winter. This allows staff repairing broken pipes in the winter to warm up and continue working without idling the vehicle.

Green vehicles make up one third of the cars in the Fleet Services-managed fleet of City vehicles. Approximately seven per cent of the vehicles in Toronto’s entire fleet are green vehicles.

For the City of Toronto, a “green vehicle” is defined as a vehicle that reduces fuel consumption and/or reduces emissions of greenhouse gases and air pollutants, relative to

Table 1
Green vehicles in Toronto’s fleet as of December 31, 2007

Type of green vehicle	Number in Toronto’s fleet
Smart Car	25
Honda Insight hybrid	1
Honda Civic hybrid	24
Toyota Prius plug-in hybrid	1
Toyota Prius hybrid	3
Ford Escape hybrid	2
Saturn Vue hybrid	9
Chevy Silverado hybrid pickup	27
Natural gas vehicle	141
Cube van with idle-free space heater	29
Hydrogen gator at Exhibition Place	4
Regenerative-air dustless street sweeper	16
100 per cent Biodiesel garbage truck	1
Total	283

Biofuels, particularly those from sustainable feedstocks, can reduce the lifecycle greenhouse gas emissions from vehicle fuels. Scientists are still investigating which biofuels provide the greatest environmental benefit. Using ethanol and biodiesel helps the City reduce its fossil fuel consumption. The City will continue to evaluate the benefits of biofuels and adopt new sustainable feedstocks when available.

a conventional vehicle. Examples of green vehicles include those with an ultra-fuel-efficient design, hybrid-electric or plug-in electric drive system, or an engine that uses cleaner alternative fuel or electricity as its energy source.

Fuels

Making the City’s fleet operations more environmentally friendly requires more than purchasing efficient vehicles. The City of Toronto also purchases cleaner fuels. Toronto has three cleaner fuels programs:

1. Since 2000, the City has purchased on-road diesel fuel for its off-road operations. On-road diesel contains less sulphur than off-road diesel, and emits less of the air pollution that contributes to acid rain and poor air quality. This policy has been adopted by other municipalities in the Greater Toronto Area;
2. The City purchases gasoline that contains ethanol. Since January 2007, the Provincial government has required gasoline sold in Ontario to contain an average of five per cent ethanol. Since January 2006, Toronto has purchased gasoline containing 10 per cent ethanol (from corn) in an effort to reduce the lifecycle greenhouse gas emissions from the gasoline we use; and
3. Toronto also purchases on-road diesel fuel containing biodiesel. This biodiesel is made from soybeans and replaces diesel from fossil sources.

Biofuels, particularly those from sustainable feedstocks, can reduce the lifecycle greenhouse gas emissions from vehicle fuels. Biofuels are made from plants and other biological materials. Examples are ethanol made from corn and biodiesel made from soy, animal fat or fish oil. Ethanol and biodiesel can be mixed with gasoline and diesel fuel, respectively, and burned in ordinary vehicles to reduce the amount of fossil fuel required. Since plants absorb carbon dioxide as they grow, biofuels from sustainable sources can reduce overall net carbon dioxide emissions, compared to the use of fossil fuels alone. However, the amount of CO₂ reduced by biofuels depends on the farming practices and the amount of energy, fuel, fertilizer, pesticide and other inputs that go into growing, harvesting, processing and transporting the crop from which the biofuel is made. Ethanol from cellulosic materials (the tough fibres in plants) is an example of a biofuel from a sustainable feedstock, but this fuel is not yet commercially available. Scientists are actively trying to determine which biofuels provide the greatest environmental benefits. Toronto is using biofuels as part of a temporary solution to reducing fossil fuel use and will continue to assess the benefits of the biofuels that are available.

Sustainable choices

Other City of Toronto programs help staff burn less fuel by making sustainable choices. To reduce fuel use and harmful emissions, in June 2007 the City of Toronto introduced a 10-second idling rule for City staff. The Idle-Free policy requires staff to turn off their vehicles if they are idling for more than 10 seconds and do not require the vehicle to be operating. The policy also sets out the time required for light-duty and heavy duty vehicles to warm up in different seasons. Idling wastes fuel. Reducing idling reduces fuel use, fuel costs and emissions of greenhouse gases and smog-causing pollutants. The 10-second idling rule

asks City staff to show leadership by going beyond the requirements of Toronto’s three-minute anti-idling by-law for the public.

All of the City’s staff driver training courses now include Idle-Free and fuel-efficient driver training to ensure that all City drivers know how to conserve fuel. In addition, Fleet Safety and Driver Education staff perform spot checks of City vehicles on the road to monitor adherence to the 10-second idling rule and follow up with staff who are found to be idling their vehicle.

The goal of the Idle-Free campaign is to reduce fuel consumption in the City’s central fleet by 10 per cent. Progress in meeting this goal will be assessed by monitoring the results of Fleet Safety spot checks, the number of public complaints about idling City vehicles and fuel usage data. Fleet Services also monitors idling in a small sample of City vehicles through pilot projects using idle-monitoring devices and global positioning systems.

Other City programs promote green vehicles to the public and fleet managers from other municipal and private fleets to encourage them to make sustainable choices. Each year, the cities of Toronto and Hamilton host the Green Fleet Expo, a one-day event where fleet managers and the public can learn about green vehicles, fuels and practices and fleet managers can road-test a variety of green vehicles. Toronto promotes green transportation at public events and festivals including the Green Toronto Festival, the Green Living Show and the Canadian National Exhibition by demonstrating its green vehicles and promoting its Idle-Free program for staff.

City Divisions also reduce fuel use in their own operations. For example, Solid Waste Management Division and Transportation Services Division have route-optimization programs to minimize the distance travelled during their operations.

Maintenance & management practices

Toronto’s fleet maintenance garages help reduce the environmental impacts of the City’s fleet in many ways. Used engine oil is recycled and resold instead of burned to reduce the carbon dioxide emissions resulting from vehicle maintenance. The garages also recycle engine coolant, and filter and reuse hydraulic oil. The City uses self-sealing tires to maintain tire pressure. This is beneficial since having the correct tire pressure is one of the best ways to maintain a vehicle’s fuel efficiency. To reduce the resources required, the City’s garages use rebuilt alternators, starters, hydraulic cylinders, brake cores and other components. The central maintenance facility also has a south-facing solar wall that preheats air in the winter to reduce the energy required for heating and reduce heating costs and associated emissions.

The City’s fleet management practices also reduce the environmental impacts of fleet operations. For instance, the City is currently reducing the number of City-operated fuel sites by approximately 10 per year. In consultation with client Divisions, Fleet Services consolidates, upgrades or closes fuel sites to optimize their locations. Having fewer fuel sites reduces the environmental risk posed by aging fuel tanks and fuel operations.



Fleet Services staff repair and maintain vehicles for all City Divisions. The garages use environmentally friendly methods including recycling engine oil, engine coolant and hydraulic oil.

Other green fleet management approaches include continually seeking best practices by networking with North American fleet managers. Fleet Services exchanges information on best practices with other fleet managers during regular discussions with the Canadian Association of Municipal Fleet Managers (CAMFM) and other associations.

Also, each year Toronto is approached by numerous vendors of fuel additives, devices and other products that are designed to reduce fuel consumption or pollutant emissions from vehicles. To manage the many new product ideas efficiently and ensure that Toronto’s green fleet resources are reserved for the most promising technologies, Fleet Services invites vendors to first have their products reviewed by Environmental Technology Verification Canada. Affiliated with Environment Canada, ETV Canada assesses and verifies the environmental performance claims associated with a product. Products with proven environmental performance may then be tested in the City’s fleet. Information gathering, verification, real-world tests and sharing successes and lessons with other fleet managers are all important components of managing the City’s green fleet.

Toronto’s green fleet tomorrow

This is an exciting time to be greening the fleet because a huge variety of products and vehicles are now available and cost premiums are dropping rapidly. Over the next four years and beyond the City of Toronto will increasingly purchase commercially available green vehicles and work with industry to test promising prototype technologies. The Green Fleet Plan 2008-2011 sets out an accelerated green fleet program which will make the purchase of green vehicles standard practice at the City of Toronto. The Plan also provides the flexibility to adopt promising new technologies as they become available.

Today, Toronto’s fleet of 4,700 vehicles includes many varieties of cars, but they are relatively few (Table 2). Toronto has incorporated many green cars into its fleet and anticipates having an entirely green fleet of cars in the near future.

Table 2
Toronto’s vehicle fleet by type as of December 31, 2007
The total number of vehicles includes green vehicles.

Type of vehicle	Total number of vehicles	Number of green vehicles
Cars	160	54
Light trucks ¹	1,533	179
Heavy trucks ²	448	29
Garbage packers	356	1
Aerial tower bucket trucks	43	-
Trailers ³	343	N/A
Miscellaneous & off-road vehicles	1,778	20
Total	4,661	283

¹ Light trucks include pickup trucks, vans and SUVs

² Heavy trucks include those the size of a Ford F450 and larger

³ Trailers are towed and do not have an engine

One third of Toronto’s fleet is made up of light-duty trucks including pickup trucks, vans and SUVs (Table 2). Green solutions are needed for this sector of the fleet. Fleets across Canada look forward to full-hybrid pickup trucks becoming commercially available in Canada to help reduce operational fuel consumption in 2009.

Toronto’s fleet also includes a large number of heavy-duty vehicles including large trucks, garbage packers and aerial tower bucket trucks (Table 2), and their emissions are substantial. The City’s heaviest vehicles (Class 8 garbage trucks, dump trucks, etc.) alone emit approximately 57 per cent of the smog-causing nitrogen oxides (NO_x) from the City’s vehicle fleet, based on 2004 data from Toronto’s emission inventory (ICF 2007). These heavy diesel trucks are responsible for 12 per cent of all NO_x emitted from the City’s operational energy use (ICF 2007). The formation of ozone, the key ingredient in smog, is often limited by the amount of NO_x in the air. In the summertime, vehicle exhaust is the predominant local source of NO_x in Toronto (ICF 2007), highlighting the need to reduce vehicle NO_x emissions.

Stricter diesel engine emission standards being phased in over 2007 to 2010 mean that new diesel engines will be cleaner than old equipment. Replacing old heavy-duty vehicles with modern conventional diesel equipment will reduce emissions from those trucks. This is a positive step but alone will not ensure we reach our air quality goals.

Green solutions are needed for Toronto’s heavy equipment. In municipal and private fleets, large delivery vans and garbage packers start and stop frequently, and aerial tower bucket trucks idle for long periods, making these vehicles ideal for hybrid technology. While some technology is available in Canada, other green heavy equipment is just emerging. Toronto is ideally suited to testing green heavy equipment. Promoting the development and large-scale adoption of green heavy equipment by Canadian fleets is a major focus of the Green Fleet Plan 2008-2011. Testing and incorporating fuel-efficient, low-emission heavy equipment into Toronto’s fleet will strategically reduce Toronto’s greenhouse gas and smog pollutants and stimulate similar improvements in other public and private Canadian fleets.

Other green fleets

Toronto is a municipal green fleet leader in Canada. However, Toronto can benefit from the experience of international cities that are far ahead along the path to a greener municipal fleet. Los Angeles, New York City and Seattle are a few examples of cities that are adopting green technologies and practices on a large scale (City of Los Angeles 2007, City of New York 2005, City of Seattle 2003 & 2007). These cities provide a welcome model and valuable lessons for Toronto as we continue to green our fleet.



Toronto is ideally suited to testing green heavy equipment. Promoting the development and large-scale adoption of green heavy equipment by Canadian fleets is a major focus of the Green Fleet Plan 2008-2011.

The City's green vehicles, largely hybrid-electric vehicles, reduced emissions by an estimated 25 per cent, compared to the conventional vehicles they replaced. The most efficient hybrid cars and ultra-fuel-efficient cars cut gasoline consumption in half.

Evaluation of Toronto's green fleet activities 2004 - 2007

This report evaluates Toronto's progress in reducing CO₂ emissions from the City's centrally managed vehicle fleet. It also evaluates the City's implementation of the Green Fleet Transition Plan 2004-2007.

Business as usual 2004-2007

If the City of Toronto did not have a green fleet program, there wouldn't be any hybrid vehicles, ultra-fuel-efficient vehicles or right-sizing in the City's fleet. The City wouldn't use biofuels or clean fuels, and the Idle-Free rule and other programs to encourage fuel conservation and sustainable fleet choices would not exist. This lack-lustre fleet represents a "Business as usual" scenario and is the baseline against which the City's green fleet progress is being compared.

Target green fleet activities 2004-2007

The Green Fleet Transition Plan set specific annual targets for purchasing alternative vehicles and fuels over 2004 to 2007. It also projected the greenhouse gas emission reductions that would be achieved by fully implementing those plans. The Transition Plan targets are represented here as the "Target 2004-2007" scenario. This report evaluates Toronto's actual progress in greening the fleet compared to this target scenario.

Actual green fleet activities implemented 2004-2007

The City has implemented green fleet activities over the past four years. The City's actual progress in greening the fleet is represented here as "Actual 2004-2007".

Method for evaluating green fleet progress 2004-2007

The City's "Actual 2004-2007" progress is compared here to the "Business as usual" scenario. For each year, Actual CO₂ emissions are compared to the emissions that would have resulted under "Business as usual".

In this evaluation, greenhouse gas (carbon dioxide, CO₂) emissions are estimated for vehicles and fuels managed by Fleet Services Division. Other pollutants are extremely important for air quality and health, but their evaluation is complex and beyond the scope of this review.

"Actual 2004-2007" total emissions from the fleet are estimated from the total quantity of fuel consumed using emission factors provided by Natural Resources Canada. Virtually all carbon dioxide that comes from a vehicle tailpipe comes from fuel (Oliver 2007). To avoid double-counting, the tailpipe emissions from the vehicles burning this fuel are not added to this total.

Overall, 2004-2007 CO₂ emissions were reduced by an estimated 5,088 tonnes, or four per cent by using green vehicles and fuels, compared to the regular vehicles and fuels they replaced.

“Actual 2004-2007” emission reductions from the “Business as usual” scenario represent the City’s real progress in greening its fleet. For each year, emission reductions from the City’s alternative fuel use are estimated by subtracting the total “Actual” fuel emissions from the total “Business as usual” emissions from conventional gasoline and diesel. The difference is the reduction achieved by the City’s cleaner fuels.

“Actual 2004-2007” emission reductions from the City’s green vehicles are estimated for each green vehicle individually, based on the litres of fuel it consumed each year. For each year, each “Actual” green vehicle is compared with the “Business as usual” conventional vehicle type that it would replace in the City’s fleet. Emission reductions from vehicles that lower fuel consumption, such as hybrids and ultra-fuel-efficient vehicles, were added to fuel emission reductions. To avoid double-counting the emission reductions, care was taken to ensure that reductions from alternative fuel vehicles were only counted once. For instance, reductions from natural gas vehicles were recorded as emission reductions from fuel, not from vehicles as well.

When looking at emission reductions as a percentage of total emissions it is important to note that estimated reductions from fuel cover all fuel used by the centrally-managed fleet. As Table 4 outlines, the percentage emission reductions from green vehicles are for 122 green vehicles for which reductions could be quantified compared to the 122 conventional vehicles they replaced, not for all vehicles in the fleet. This method was used for percentages in the Green Fleet Transition Plan 2004-2007 and allows a meaningful comparison between the targets set out in that plan and the City’s actual implementation.

Emission reductions achieved 2004-2007

The City has reduced greenhouse gas emissions from the fleet by over five million kilograms (5,000 tonnes) of carbon dioxide over the past four years (Table 3). Overall, Toronto reduced emissions from its fleet operations by a minimum of four per cent using green vehicles and alternative fuels.

The emission reductions achieved over 2004-2007 are actually deeper than those presented here. Many of the green fleet initiatives in place today are reducing fuel use and reducing pollutant emissions, however it is difficult to quantify the reductions from these projects.

The emission-reduction estimates include reductions from alternative fuels such as biodiesel, ethanol and natural gas. They also include some of the City’s green vehicles, namely the hybrid-electric, plug-in hybrid-electric and ultra-fuel-efficient vehicles. However, additional emission reductions are being achieved by the City’s other green vehicles including regenerative-air street sweepers, cube vans with idle-free space heaters and practices such as the Idle-Free 10-second idling rule for staff.

In terms of tonnes of CO₂ prevented, the majority of emission reductions came from the use of alternative fuels: biodiesel, ethanol in gasoline and natural gas. From fuels, 2004-2007 CO₂ emissions were reduced by an estimated 4,862 tonnes (Table 4). These alternative fuels lowered emissions from the City’s transportation fuel by an estimated four

Table 3
Estimated total greenhouse gas emission reductions 2004-2007, from the City’s “Actual” green fleet activities, compared to “Business as usual”

	Total actual emission reductions	
	(kg CO ₂)	%
2004	118,000	0.4
2005	855,000	3
2006	2,148,000	6
2007	1,967,000	6
Total	5,088,000	4

per cent, relative to conventional gasoline and diesel fuel. These reductions are estimates based on the best information available to date, including average emission factors for biodiesel, ethanol and natural gas.

Table 4
Estimated greenhouse gas emission reductions 2004-2007, from the City's "Actual" green vehicles and fuels, compared to "Business as usual"

	Actual emission reductions from green vehicles		Actual emission reductions from fuels		Total actual emission reductions	
	(kg CO ₂)	%*	(kg CO ₂)	%	(kg CO ₂)	%
2004	6,700	13	111,000	0.4	118,000	0.4
2005	9,600	12	846,000	3	855,000	3
2006	66,000	29	2,082,000	6	2,148,000	6
2007	144,000	26	1,823,000	5	1,967,000	6
Total	226,000	25	4,862,000	4	5,088,000	4

(Numbers may not add evenly due to rounding)

*Actual emission reductions from green vehicles are for 122 green vehicles for which reductions could be quantified compared to the 122 conventional vehicles they replaced, not for all vehicles in the fleet.

Quantifying emission reductions from biofuels is not an exact science and is a controversial process due to the number of assumptions that must be made. The lifecycle emission reductions from biofuels vary depending on the feedstock from which it is manufactured, the sustainability of the farm practices used to grow the feedstock, the processing methods and the distance that the fuel travels. Biofuels are an important component in greening fleet operations, but cannot compare to the environmental benefits of actually reducing fuel consumption.

In terms of percentages, green vehicles are extremely effective in reducing CO₂ emissions from Toronto's fleet operations. The City's green vehicles reduced emissions by an estimated 25 per cent, compared to the conventional vehicles they replaced. The 25 per cent emission reduction refers to 122 green vehicles, compared to the 122 conventional vehicles they replaced. It does not refer to the entire City fleet. The 122 green vehicles include the hybrids, ultra-fuel-efficient cars (Smart cars), cube vans and 100 per cent biodiesel garbage packer. Reductions from the hydrogen Gators and regenerative-air street sweepers could not be quantified at this time. Emission reductions from the City's natural gas vehicles are included in the reductions from fuels.

The green vehicles reduced the City's CO₂ emissions by an estimated 226 tonnes over four years (Table 4). Most of these reductions were a result of lower fuel consumption, rather than switching to an alternative fuel. Ultra-fuel-efficient and hybrid vehicles are particularly beneficial when a vehicle is absolutely required for City operations and working without a vehicle is not an option. Hybrid vehicles have the additional benefit in big cities of shutting off automatically when the vehicle comes to a stop, reducing wasted fuel and air pollutant emissions when streets are congested. When the driver touches the gas pedal, a hybrid vehicle automatically turns on again, providing seamless operation while conserving fuel. The most efficient hybrid cars and ultra-fuel-efficient cars cut gasoline consumption in half.

Table 5 describes the overall emissions from the City’s fleet operations, relative to the business as usual emissions that would result if the City had no green fleet activities. All vehicles and fuels are included.

Table 5
Estimated greenhouse gas emissions 2004-2007, from the City’s “Actual” green fleet activities, compared to “Business as usual”

	Total business as usual emissions	Total actual emission reductions	Total actual emissions
	(kg CO ₂)	(kg CO ₂)	(kg CO ₂)
2004	28,166,000	118,000	28,048,000
2005	34,219,000	855,000	33,364,000
2006	33,867,000	2,148,000	31,719,000
2007	35,248,000	1,967,000	33,281,000
Total	131,500,000	5,088,000	126,412,000

Comparison of achievements with targets for 2004-2007

The Green Fleet Transition Plan outlined the green vehicles and cleaner fuels that the City would buy over 2004-2007, based on the best information available in 2004. Specifically the Transition Plan proposed using biodiesel, natural-gas vehicles and hybrid-electric vehicles. In addition to the technologies described in the Transition Plan, Toronto has implemented many green fleet technologies and initiatives not foreseen in 2004.

Table 6 summarizes the Transition Plan targets and their implementation. Toronto purchased hybrid-electric vehicles and biodiesel as described in the Transition Plan. Some other elements of the Transition Plan were evaluated and set aside due to feasibility or in light of preferred emerging green options. The City’s fleet includes over one hundred natural gas vehicles that were put into service before 2004. However, additional natural gas vehicles were not added to the fleet, in part because the last original equipment manufacturer producing OEM natural gas vehicles ceased production in 2004. Other green vehicles were added to the fleet in lieu of the natural gas vehicles.

Green Fleet technology develops rapidly. Several additional initiatives were implemented by Fleet Services that were not included in the Transition Plan when it was approved by Council in 2004. Toronto’s fleet includes 25 ultra-fuel-efficient vehicles (Smart cars) that were not specified in the Transition

Plan. The Green Fleet Expo and Idle-Free campaign were implemented, to share information and reduce idling by City staff. The City’s use of 10 per cent ethanol in gasoline also goes beyond the Transition Plan commitments. Toronto purchased regenerative-air street sweepers that

Table 6
Summary of Green Fleet Transition Plan target initiatives and implementation

	2004	2005	2006	2007
Hybrid-electric vehicles	√	√	√	√
Biodiesel	N/A	Partial year	√	Partial year
Natural gas vehicles	No*	No	No	No

Adapted from a table by Drew Shintani, City of Toronto

* Five natural gas vehicles went into operation in 2004, but these were ordered in 2003.

clean the air by reducing particulate matter emissions from sweeping operations and from the tailpipe compared to older conventional sweepers. The City purchased cube vans with idle-free space heaters and hydrogen-powered utility vehicles that were not anticipated in the Transition Plan. Toronto also successfully converted a garbage packer to run on 100 per cent biodiesel.

Table 7 outlines the number of alternative vehicles purchased by Toronto each year over 2004-2007, compared to the targets set in the Transition Plan. After a slow start in 2004 and 2005, the City purchased more alternative vehicles than anticipated in 2006 and 2007.

Table 7
Number of green vehicles added to the fleet each year 2004-2007, relative to Transition Plan targets

	Pre-2004 Total green vehicles	2004 Additions		2005 Additions		2006 Additions		2007 Additions		Total additions 2004-2007		Total green vehicles December 31/07	
	Actual	Target	Actual	Target	Actual	Target	Actual	Target	Actual	Target	Actual	Target	Actual
Hybrid cars & SUVs	4	1	1	16	7	11	18	11	10	39	36	43	40
Hybrid pickup trucks	0	10	11	28	0	23	16	23	0*	84	27	84	27
Natural gas vehicles	136	17	5**	10	0	10	0	10	0	47	5**	183	141
Ultra-fuel-efficient cars	0	0	0	0	0	0	7	0	18	0	25	0	25
Cube vans with idle-free space heater	0	0	0	0	0	0	8	0	21	0	29	0	29
Regenerative-air dustless street sweepers	0	0	0	0	0	0	14	0	2	0	16	0	16
Hydrogen Gators	0	0	0	0	2	0	2	0	0	0	4	0	4
100 per cent Biodiesel garbage packer	0	0	0	0	0	0	1	0	0	0	1	0	1
Total	140	28	17	54	9	44	66	44	51	170	143	310	283

* No original equipment manufacturer hybrid pickups were available in 2007.
 ** The five natural gas vehicles put into service in 2004 were ordered in 2003.
 Total number of green vehicles in the fleet December 31, 2007 results from vehicle additions and retirements over 2004-2007.

The Transition Plan targeted emission reductions of 15 to 23 per cent over 2004-2007 depending on the biodiesel feedstock. The City's actual emission reductions for 2004-2007 are estimated at 25 per cent for green vehicles (based on 122 of the green vehicles) and four per cent for green fuels. This results in overall City fleet emission reductions of approximately four per cent (Table 4).

Reduced implementation of some elements decreased the City's ability to meet the emission reduction targets described in the Transition Plan. The City's emissions reductions are lower than those anticipated due to a number of factors:

- a) The City used biodiesel made from soy, not animal fats. The Green Fleet Transition Plan anticipated CO₂ reductions of 15 per cent overall if soy biodiesel was used and 23 per cent if animal-fat biodiesel was used. The City used soy biodiesel since this is the industry's primary source. Therefore the appropriate CO₂ reduction target is 15 per cent;
- b) The City purchased less biodiesel than anticipated due to price and complications arising from a fragile market with few suppliers. In addition, initially there was no fuel standard for biodiesel so some parties lacked confidence in the fuel. The Transition Plan proposed biodiesel concentrations of B10 (10 per cent biodiesel) and B30 for 2005 and B20 and B50 in 2006-2007 based on successful trials in other cities. The biodiesel concentrations actually purchased ranged from B5 to B10 starting in 2005, and in some months no biodiesel was used. Some years there was a price premium for biodiesel, capping the quantity that could be purchased. Gasoline prices reached one dollar per litre retail for the first time in 2005 limiting the funds available for biofuels. The small number of large-scale biodiesel suppliers was also a factor. One year the City's biodiesel supplier failed to deliver the product and a new biodiesel supplier had to be found, causing a gap in biodiesel delivery. In 2007, fuel supplier and equipment manufacturer concerns over using high concentrations of biodiesel were a factor limiting the concentration of biodiesel used;
- c) The City did not pursue natural gas vehicles. In 2004, the only original equipment manufacturer to sell natural gas vans and pickup trucks (Ford) discontinued production. Toronto chose not to convert gasoline vehicles to burn natural gas. There was a general industry trend away from natural gas vehicles during 2004-2007 due to limited range and power and availability of fuel sites; and
- d) The City did not purchase hybrid pickup trucks in 2007 since none were available from original equipment manufacturers.

In 2004 the Green Fleet Transition Plan set out a strategic direction to follow with targets and timelines. Much of the Transition Plan was implemented while other elements were set aside in light of other promising green fleet technologies.

Periodically evaluating implementation of green fleet plans provides valuable lessons in how far the City's fleet has come and areas for future focus. Fleet Services will provide annual updates on Fleet Services' website on the progress achieved in meeting the commitments in the Green Fleet Plan 2008-2011.

Green fleet opportunities and actions 2008 - 2011

The Actions planned for 2008-2011 are presented below under the headings of: Emission reduction targets, Vehicles, Fuels, Sustainable choices and Maintenance and management practices.

Emission reduction targets

In July 2007, City Council adopted Toronto’s Climate Change, Clean Air and Sustainable Energy Action Plan. This plan included greenhouse gas and smog-pollutant emission-reduction targets for the Toronto urban area.

Vehicles and fuels are important sources of greenhouse gases and smog pollutants in Toronto. Thirty-five per cent of the greenhouse gas produced in Toronto as a whole comes from transportation (ICF 2007). For the City’s own operations, fleet vehicles are responsible for approximately four per cent of City greenhouse gas emissions (Michigan waste transport not included in fleet emissions) (ICF 2007). The fleet’s contribution to the City’s operational greenhouse gas emissions is relatively small. However, the large amount of transportation pollution in Toronto as a whole demonstrates the need to reduce our emissions and encourage private fleets and the public to green their vehicles and make sustainable transportation choices. By greening our own fleet operations the City of Toronto can lead by example and stimulate private fleets and the public to reduce their vehicle emissions as well.

The City’s fleet emits a substantial portion of the smog pollutants that come from City operations. The City’s fleet of gasoline and diesel on-road vehicles is responsible for approximately 21 per cent of the nitrogen oxides (NO_x), 67 per cent of the volatile organic compounds (VOCs) and 72 per cent of the carbon monoxide (CO) from City operations (ICF 2007). NO_x and VOCs combine to form ground-level ozone, a key ingredient in smog.

The large amount of pollution from vehicles and fuels highlights the need for emission reductions from this sector. Consistent with Council’s targets, the City will adopt the following pollution-reduction targets for its own fleet operations.

Actions

1. Ensure Fleet Services Division operations meet or surpass the emission reduction targets adopted by Council:
 - a) reduction targets for greenhouse gas emissions from the 1990 levels of 6 per cent by 2012 (the “Kyoto target”); 30 per cent by 2020; and 80 per cent by 2050; and
 - b) a 20 per cent reduction target for locally generated smog causing pollutants from 2004 levels by 2012;



Vehicles

A wide variety of green vehicles is available today. Some are commercially available and some are still in experimental and pilot stages. Today Toronto's fleet has many different commercially available green vehicles, as described above. In 2008, Toronto will put into service 89 garbage packers that meet U.S. EPA requirements for cleaner diesel engines. While the packers are conventional vehicles, they have new emission-control technology that will help reduce emissions from the City's fleet. Toronto Fleet Services also works with industry to pilot test promising green fleet technology and has incorporated some of these vehicles into the fleet, for instance a plug-in hybrid-electric vehicle and a 100 per cent biodiesel garbage packer.

Over the next four years many new types of green vehicles will become available, and many of those currently available will become more affordable. Some of the green vehicles available will be discontinued. Toronto will have to consider a number of factors when selecting green vehicles over the coming years. These factors include Canada's 2010 diesel engine emission control requirements which will substantially reduce pollutant emissions from diesel engines, traditionally a heavy source of particulate pollution. Another factor is the availability, cost and convenience of alternative power sources for vehicles such as electricity and hydrogen.

As described above, trucks are an area of special focus for the Green Fleet Plan 2008-2011. Given the health impacts of smog and the importance of heavy trucks as a source of key smog pollutants, emission reductions from heavy trucks are needed in municipal and private fleets. Through the Green Fleet Plan, the City of Toronto can fill this niche by working with manufacturers and other organizations to test green medium- and heavy-duty trucks. This effort will benefit Toronto and help accelerate their commercialization and wide-scale adoption by other public and private fleets.

The City of Toronto will undertake the following actions to green City vehicles. These actions are designed to be flexible enough to allow the City to take advantage of new green vehicle opportunities and lessons learned over time.

Actions

2. Contain fleet size and purchase fuel-efficient, right-sized vehicles as a standard practice across all Divisions, if they are commercially available and meet operational needs, specifically:
 - a) Contain the size of the City's fleet by working with Divisions to reduce the number of vehicles required and kilometres travelled, use vehicles more efficiently and delete underused vehicles from the fleet or move them to other City operations;
 - b) Purchase the right size of vehicle for the job, using small vehicles where they meet operational needs; and
 - c) Purchase the most fuel-efficient vehicle, or lowest-emitting vehicle, that is commercially available and meets operational needs;



3. Replace the following numbers of City vehicles with green vehicles, giving priority to the cleanest technologies: At a minimum, replace 80 vehicles in 2008, 100 vehicles in 2009, 140 vehicles in 2010 and 200 vehicles in 2011;
4. Pilot test promising green vehicle technologies and work with industry to accelerate development and large-scale adoption in Canada by:
 - a) Actively seeking, pilot testing and incorporating green vehicles and technologies into the City's fleet;
 - b) Pilot testing more plug-in electric vehicles and ensuring that they are re-charged at night using off-peak electricity where possible;
 - c) Working with Toronto Atmospheric Fund to expand the Toronto Plug-in Hybrid Electric Vehicle Project to a larger consortium of fleet managers, potentially to include GTA municipalities and utilities;
 - d) Pilot testing full-electric vehicles as well as recharging station technologies and options, in partnership with the Toronto Atmospheric Fund and the Toronto Parking Authority;
 - e) Evaluating electric, low-speed vehicles for City of Toronto operations and pilot testing these vehicles if the evaluation indicates they will be beneficial;
 - f) Pilot testing green trucks, including light-duty, medium-duty and heavy-duty vehicles, targeting those that idle excessively such as delivery trucks and garbage packers, and sharing results with municipal and private fleet managers;
 - g) Developing, in collaboration with the Toronto Atmospheric Fund, a Low-Carbon Truck Pilot Project that pilot tests hybrid, plug-in hybrid, and all-electric truck technologies;
 - h) Pilot testing hydrogen-powered vehicles;
 - i) Adding hybrid-electric aerial tower trucks to the City's fleet;
 - j) Replacing all of the City's old street sweepers with "regenerative-air" dustless sweepers that trap fine particulate matter (PM_{2.5}) pollution and have cleaner diesel engines;
 - k) Adding electric, zero-emission ice resurfacers to the City's fleet; and
 - l) Continuing to review the merits and applicability of natural gas vehicles;
5. Identify and incorporate equipment and practices that reduce fuel consumption, pollutant emissions and idling by the City's vehicles, such as:
 - a) Procure LED lights, batteries, inverters, space heaters or other equipment that reduces the need to idle a vehicle for long periods in order to operate lights, arrow boards and other necessary tools; and
 - b) Install electric plugs for truck block heaters at all major Solid Waste yards where feasible, and develop a policy to ensure they are used by staff to reduce unnecessary vehicle idling;
6. Replace the oldest vehicles with cleaner, modern technology by continuing to accelerate the replacement of overdue City vehicles;



7. Include in all vehicle procurement specifications green vehicle attributes, such as fuel efficiency and low emissions, and provide an appropriate weighting for these attributes when selecting a product;

Fuels

The City of Toronto operates several cleaner fuel programs, as described above. Over the next four years the City will continually evaluate its fuel choices to make sure we are incorporating new information and opportunities.



In the near future, new opportunities for green fuels may include commercialization of biofuels from more environmentally friendly feedstocks such as switchgrass. Hydrogen fuel presents another opportunity for the City. While Exhibition Place currently has a hydrogen fuel program, a hydrogen program is not yet in place for the City’s Divisions. Electricity is another energy source that will become increasingly important for vehicles, highlighting the need for a clean, sustainable electricity system.

The City of Toronto will green its fuel use by undertaking the following actions.

Actions

8. Evaluate biofuels to determine which products and feedstocks provide the greatest environmental benefits on a life-cycle basis;
9. Evaluate the use of biofuels with the federally mandated new diesel engines (2007 US EPA compliant models) and emission control devices to optimize emission reductions achieved by the City;
10. Expand the biofuels program to deliver biofuels to all City Divisions;
11. Explore the feasibility of using biodiesel in off-road diesel fuel, and implement a pilot project if feasible;
12. Use clean sources of energy for vehicles, including biofuels from sustainable feedstocks as they become available, for example ethanol produced from cellulose;
13. Advocate for sustainable electricity in Ontario, including conservation, renewables and the timely phase out of coal-fired electricity, to ensure the environmental benefits of plug-in and all-electric vehicles are realized;

Sustainable choices

Greening the City’s fleet reduces emissions of greenhouse gases and smog pollutants from the City’s operations. It also makes a greater impact in the community by providing leadership and demonstrating what commercial fleet managers and members of the public can do to reduce their own vehicle emissions. Green vehicle fleets, in concert with sustainable transportation strategies such as transit, bike infrastructure and carpooling, can substantially reduce greenhouse gas and smog pollutant emissions in Toronto.

Greener vehicles and cleaner fuels alone will not achieve Toronto’s air quality and greenhouse gas goals. Driving less and driving smarter are important ways to reduce fuel use and emissions. The City has several programs to train and encourage City staff to conserve fuel and make other sustainable transportation choices, as described above. These include promoting the Idle-Free 10-second rule for staff and fuel-efficient driver training. Fleet Services has set an ambitious target for the Idle-Free campaign of reducing fuel consumption by 10 per cent. Other initiatives, such as the annual Green Fleet Expo, are an opportunity for public and private fleet managers to learn about green fleet technologies and practices.

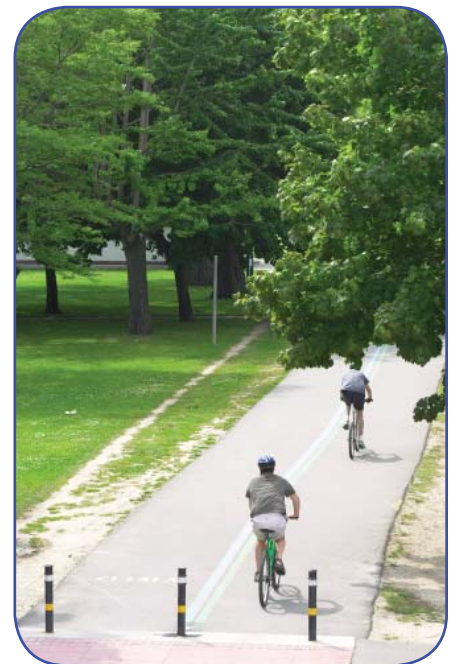
Over the next four years, Toronto will undertake the following actions to encourage City staff and others to make sustainable fleet-related choices.

Actions

14. Host annual Green Fleet Expo with the City of Hamilton, Fleet Challenge and other partners to provide public and private fleet managers and members of the public with an opportunity to learn about green fleet technologies and practices;
15. Encourage other municipalities and private companies to green their fleets, and share Toronto’s experience by:
 - a) Participating in Fleet Challenge in 2008 by presenting Toronto’s green fleet experience to other Ontario municipalities;
 - b) Sharing information with Greater Toronto Area municipal fleet managers through the GTA Clean Air Council;
 - c) Sharing information with public and private fleet managers through the Canadian Association of Municipal Fleet Managers (CAMFM), National Association of Fleet Administrators (NAFA Canada) and Municipal Equipment and Operations Association (MEOA); and
 - d) Working with the Director of the Toronto Environment Office to create a Greening Commercial Fleets Enviro-Action Working Group consisting of representatives of the National Association of Fleet Administrators and operators of large fleets in the areas of phone, cable, utilities, retail and courier providers to work together to identify and implement actions that green these fleets and achieve a reduction in emissions city-wide;



16. Provide technical support to the Toronto Transit Commission, Emergency Medical Services, Toronto Fire Services, Toronto Police Service and other Agencies, Boards and Commissions in developing and implementing their consolidated green fleet plans;
17. Provide technical support to Municipal Licensing and Standards, Toronto Atmospheric Fund and other partners in their efforts to green the fleets of vehicles that are licensed by the City (e.g. taxis);
18. Support the City's Bike Share program for staff by providing bike procurement assistance, safety training and maintenance for a pool of City bicycles;
19. Provide information and assistance to support establishment of bicycle infrastructure at City facilities by Facilities and Real Estate, including bike parking, bike lockers and other ancillary facilities as appropriate;
20. Promote the City's Idle-Free Policy and 10-second idling rule for City staff;
21. Continue to provide Idle-Free training in staff driver training courses, to monitor staff compliance with the 10-second idling rule, and to follow up with staff found to be idling;
22. Determine the feasibility of establishing a policy prohibiting City vehicles from drive-throughs, and establish the policy if feasible;
23. Encourage other orders of government to support policies and incentives that encourage the use of sustainable vehicles, fuels and practices;
24. Work with Divisions to explore the feasibility of making green pool vehicles available to staff who require their vehicle for work;
25. Investigate and implement ways to reduce the number of work-related vehicle trips taken by Fleet Services staff, such as increasing the use of conference calls and scanners to share information between work sites;
26. Work with other Divisions to encourage City of Toronto employees to make sustainable transportation choices on their commute and at home, including by providing information on green vehicles and commuting alternatives to City staff;
27. Support the Smart Commute program by providing data and information and promoting the program as it is rolled out to all City employees;
28. Provide information to the public on green vehicles and funding incentives on Fleet Services' website;
29. Promote green vehicles at public events such as the Green Living Show, Canadian National Exhibition and Green Toronto Festival;





Maintenance and management practices

In addition to using greener vehicles and fuels, there are many opportunities to green the City's fleet maintenance and fleet management operations. The City's maintenance garages currently use many green maintenance practices such as recycling used oil, retreading used tires and using rebuilt components. Fleet management practices currently in use include reducing the number of City-run fuel sites to reduce costs and environmental liability. In consultation with City Divisions, Fleet Services continues to augment some fuel sites and close others where they are located close together or are underused. Fleet Services also regularly networks with other fleet managers to learn about and incorporate green fleet best practices. To further green the City's fleet maintenance and fleet management operations, the City will undertake the following actions.

Actions

30. Investigate the feasibility and benefit of adopting additional green practices at Fleet maintenance facilities, such as using synthetic oils and extending the time between oil changes;
31. Continue to reduce the number of fuel sites operated by the City of Toronto by consolidating, upgrading or closing fuel sites, in consultation with client Divisions;
32. Have the City's fleet reviewed and rated under the E3 Fleet Rating System to identify opportunities to reduce fuel use and pollutant emissions and measure Toronto's fleet against available environmental benchmarks;
33. Examine the practices used by international municipal green fleet leaders such as New York City and Los Angeles, and incorporate successful practices into Toronto's fleet operations where feasible;
34. Undertake a study to confirm that the actions Fleet Services is taking will meet the emission reduction targets for greenhouse gases and smog pollutants;
35. Request funding in 2009 and later years to provide an operating budget for emission reduction assessment studies and green fuel premiums;
36. Seek funding opportunities to enable the City to accelerate greening of its fleet;
37. Include green fleet practices in tenders for work done by private contractors, such as a requirement to use fuel-efficient vehicles for City business and to prevent idling, and consider this information in the selection process; and
38. Provide annual updates on progress achieved in meeting the commitments and targets of the Green Fleet Plan 2008-2011 on Fleet Services' website.

Projected greenhouse gas emission reductions 2008-2011

This Plan includes many new and expanded green fleet initiatives. They will reduce fuel use and reduce emissions of greenhouse gases and other pollutants. However, it is difficult to quantify the emission reductions that will result from many of these initiatives.

The emission reductions predicted below for 2008 to 2011 include only a few of the green fleet initiatives planned for the next four years. The forecast reductions include only some alternative fuels (biodiesel, ethanol and natural gas). The emission reductions from hydrogen and electric vehicles will be in addition to those described below. The forecast reductions also include only some of the City’s green vehicles (hybrid-electric and ultra-fuel-efficient cars and light trucks). Emission reductions from all other green vehicles in the fleet today or purchased in the future will be additional.

Additional emission reductions will result from vehicles with idle-reduction technology such as idle-free space heaters, or idle-free power for tools and utility lighting. Additional reductions will also result from the regenerative-air street sweepers, hybrid aerial tower bucket trucks and electric ice resurfacers that the City plans to purchase in the near future. Emission reductions from green purchasing policies, the Idle-Free campaign, information sharing, bicycles, hybrid garbage packers, hybrid delivery trucks and diesel engines meeting new emission standards will all lower emissions below those predicted here. New, sustainable biofuels and green vehicle technologies developed over the next few years will also provide additional emission reductions beyond those forecast here.

Over 2008-2011, the use of biofuels, green cars and green light trucks is forecast to reduce emissions of CO₂ from Toronto’s fleet operations by a minimum of 15 million kilograms (15,000 tonnes), relative to the use of conventional vehicles and fuels (Table 8). This equals a CO₂ reduction of 11 per cent or more below the emissions that would result if Toronto didn’t have a green fleet program.

Table 8
Estimated total forecast greenhouse gas emission reductions 2008-2011, from the City’s green fleet activities, compared to “Business as usual”

	Total forecast emission reductions	
	(kg CO ₂)	%
2008	3,280,000	9
2009	4,010,000	11
2010	4,006,000	11
2011	4,008,000	11
Total	15,304,000	11

Because of the large volumes of fuel purchased by Toronto each year, the majority of emission reductions over the next four years are anticipated to result from fuel choices. Over the next four years, biodiesel, ethanol and natural gas are projected to lower the City's CO₂ emissions from fuel by approximately 14,600 tonnes or 10 per cent compared to gasoline and diesel (Table 9). Emission reductions from current and future use of hydrogen, electricity and new, sustainable biofuels will provide additional reductions.

This Plan commits Toronto to pilot testing and implementing a range of exciting hybrid and fuel-efficient heavy diesel equipment in 2008-2011. Toronto Fleet Services Division is already seeking and pilot testing green heavy equipment as part of its regular green fleet research and operations. These green heavy vehicles will reduce emissions from Toronto's fleet operations. At this stage it is difficult to predict which technologies will be adopted on a large scale by Toronto so it is difficult to quantify the emission reductions that will result. The reductions forecast here from vehicles include only:

- a) 122 of the green vehicles already in Toronto's fleet, for which emission reductions could be estimated (hybrid vehicles, ultra-fuel efficient cars, Idle-free cube vans and 100 per cent biodiesel packer), and
- b) 520 hybrid-electric or ultra-fuel efficient vehicles to be added at a minimum over 2008-2011.

With that in mind, over 2008-2011 green cars and light trucks are anticipated to reduce CO₂ emissions by a minimum of 680 tonnes or 31 per cent compared to the vehicles they replace (Table 9).

Table 9
Estimated forecast greenhouse gas emission reductions 2008-2011, from the City's green vehicles and fuels, compared to "Business as usual"

	Forecast emission reductions from green vehicles		Forecast emission reductions from fuels		Total forecast emission reductions	
	(kg CO ₂)	%*	(kg CO ₂)	%	(kg CO ₂)	%
2008	160,000	29	3,120,000	9	3,280,000	9
2009	164,000	30	3,846,000	11	4,010,000	11
2010	172,000	32	3,834,000	11	4,006,000	11
2011	184,000	34	3,824,000	11	4,008,000	11
Total	681,000	31	14,624,000	10	15,304,000	11

(Numbers may not add evenly due to rounding.)

*Actual emission reductions from green vehicles are for 642 green vehicles (122 existing and 520 planned) compared to the 642 conventional vehicles they replace, not for all vehicles in the fleet. Additional reductions will result from initiatives that could not be quantified at this time.

Total forecast emissions over 2008-2011 are described below (Table 10). The wide variety of green vehicles, fuels and practices planned for the next four years is expected to lower emissions below those shown here since reductions from many initiatives could not be quantified at this time.

Table 10
 Estimated forecast greenhouse gas emissions 2008-2011, from the City's green fleet activities, compared to "Business as usual"

	Total forecast business as usual emissions	Total forecast emission reductions	Total forecast emissions
	(kg CO ₂)	(kg CO ₂)	(kg CO ₂)
2008	35,248,000	3,280,000	31,968,000
2009	35,248,000	4,010,000	31,238,000
2010	35,248,000	4,006,000	31,242,000
2011	35,248,000	4,008,000	31,240,000
Total	140,992,000	15,304,000	125,688,000



Funding for green fleet activities

Funding for green vehicles is provided by the City of Toronto’s Green Fleet capital project. Fleet Services uses this project funding to pay for green vehicle upgrades when Divisions purchase vehicles. For instance, if a Division plans to replace a conventional sedan in 2008, the Green Fleet capital fund allows them to purchase a much more fuel-efficient hybrid vehicle instead. In this example, the Division would pay the usual cost to purchase a conventional sedan. The price premium to purchase a hybrid vehicle instead would be paid from the Green Fleet fund. The Green Fleet capital fund allows Divisions to access greener vehicle technology with oversight and coordination by Fleet Services.

It is projected that the implementation of the Green Fleet Plan 2008-2011 will result in a net savings of \$2.032 million, summarized as follows:

Table 11
Financial implications of the Green Fleet Plan 2008-2011

	Capital Cost ('000s)	Operating Cost* ('000s)	Total Cost ('000s)
2008	\$500	-\$917	-\$417
2009	\$500	-\$947	-\$447
2010	\$500	-\$1,027	-\$527
2011	\$500	-\$1,141	-\$641
Total	\$2,000	-\$4,032	-\$2,032

* Operating costs are net costs after fuel savings have been deducted.

The total capital cost over four years will be \$2 million. The Fleet Services 2008 Approved Capital Budget and 2009-2012 Capital Plan include an annual provision of \$0.5 million for green fleet initiatives. The Green Fleet Fund is to fund the incremental costs associated with new technologies such as hybrids, electric vehicles and other alternative vehicles.

There will be a net savings in operating costs of approximately \$4.032 million. Savings are expected from the reduction in fuel costs, offset by the additional cost of some alternative fuels such as ethanol.

Conclusions

The City of Toronto is a Canadian leader in greening its fleet. The Green Fleet Transition Plan 2004-2007 introduced sustainable vehicle and fuel initiatives into the City's fleet. Since then, hybrid-electric and ultra-fuel-efficient compact vehicles have become popular, the biofuels market has evolved and electric vehicles have emerged on the horizon.

The City is using the momentum of its achievements to accelerate the greening of the fleet. The actions outlined in the Green Fleet Plan 2008-2011 will guide Toronto's activities in the coming years. By implementing the Plan, in 2008-2011 the City of Toronto is expected to reduce carbon dioxide emissions from the City's central vehicle fleet by approximately 15,000 tonnes, or 11 per cent, compared to the emissions from conventional vehicles, fuels and activities. The implementation of the Green Fleet Plan 2008-2011 is anticipated to result in an estimated net savings of \$2.032 million over the four years.

Toronto will continue to seek and use greener vehicles, fuels, technologies and practices to meet the City's air quality and climate protection goals. Many new green fleet opportunities and technologies are becoming available today and in the near future. By implementing the Green Fleet Plan 2008-2011 the City of Toronto will embrace these opportunities to green the City's fleet and encourage others to make sustainable choices as well.

Each year Natural Resources Canada publishes fuel economy and greenhouse gas ratings for conventional and green vehicles sold in Canada (NRCan 2007). These ratings show that fuel-efficient vehicles on the market today can dramatically reduce fuel consumption, fuel costs and emissions. The numbers also highlight the need to use large hybrid vehicles judiciously. For example, hybrid sport utility vehicles (SUVs) can reduce fuel consumption substantially if they are replacing a gas-guzzler like an older, large pickup truck. However, they will not have a dramatic effect on fuel consumption if they are used to replace a fuel-efficient conventional sedan. The Fuel Consumption Guides can be used by individuals or fleet managers to select a vehicle with lower greenhouse gas emissions and fuel costs.



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