PE20.1aa

TORONTO

Transportation Services Division

Parks and Environment Committee
November 19, 2008

Sustainable Transportation Implementation Strategy

Transportation Services Division, with City Planning, is working on developing a Sustainable Transportation Implementation Strategy which will explore the ways in which changes in travel behaviour, urban structure and technology can work towards the achievement of the City's greenhouse gas reduction targets.

Development of Infrastructure Vulnerability Assessment & Environmental Risk Assessment Methods

Undertaking a vulnerability assessments of key infrastructure, such as; bridges, culverts and roads will allow us to build and maintain infrastructure that is more resilient, thereby ensuring public safety, reduced disruption to the public and reduced claims against the City.

Also, an environmental and adaptation risk assessment of our operational activities will be undertaken, assessing the impact of our operational activities on the surrounding environment as well as the impact of severe weather events on operations and delivery of service.

Assess Sustainability of Equipment, Technology and Materials

Transportation Services will evaluate a number initiatives related to sustainable equipment, technology and materials. These initiatives help to mitigate the impacts of poor air quality, but also help to reduce GHG emissions and energy consumption, as well being adaptive measures in reducing the impacts of stormwater runoff and Heat Island Effect.

TABLE #10a **Green Initiatives Reporting Template** *(Transportation Services Division)*	
CATEGORY: Other – Emission Reduction	
Initiative Title: Clean Roads to Clean Air (CRCA) Program	
1. Description (1-2 sentences)	The Clean Roads to Clean Air Program (CRCA) established processes to objectively measure and evaluate the operational and fine particulate matter (PM_{10} & $PM_{2.5}$) removal performances of street sweepers. The Program allowed the following objectives to be achieved: • operate environmentally sustainable sweeping technologies that improve human health, air and stormwater quality; • reduce equipment maintenance costs and downtimes; and • testing of manufacturers' equipment as a requirement under the procurement process.
2. Environmental Benefits	The benefits of the CRCA program are as follows: • reduces airborne fine particulate matter (PM_{10} and $PM_{2.5}$) at street level, by at least 21%;and • improves stormwater quality and reduces the cost of stormwater treatment;
3. Social/Economic Implications	The Canadian Environmental Protection Act (2000) designated inhalable particulates (PM_{10}) as a toxic substance. Toronto Public Health (2004) reported (Appendix 4) estimates of 1,380 premature deaths attributable to chronic and acute exposure to PM_{10} and $PM_{2.5}$. Fine particulates cause respiratory and cardiovascular problems. Removal of PM from the surface of the road reduces the number of cases of acute and chronic exposure of fine particulates which is beneficial to the general health of City's residents, workers and visitors. Economically, the CRCA program reduced maintenance costs and **downtime** for unscheduled repairs; and improved the level of **street sweeping service** across the City.
4. Financial Savings and Other Implications	Reduce maintenance costs by replacing the aging fleet of mechanical street sweepers, 58% reduction in maintenance costs realizes a saving of $750,000/year with full recovery on the differential cost of 25 new sweepers in 3.5 years;
5. Savings in Resources (KWh of hydro or m^3 of gas)	Removal of an additional 14 tonnes of fine particulates (PM_{10} and $PM_{2.5}$) from the surface of the road;
6. Evaluation Model	Street sweepers will be equipped with Global Information Systems and Global Positioning Systems units that will

TABLE #10a **Green Initiatives Reporting Template** *(Transportation Services Division)*	
	monitor the sweeping area and frequency and ensure the street sweeping level of services is being met. Reports can be generated to monitor speed and other sweeping system to ensure that the high PM capture and removal efficiency performance of sweeper is maintained.
7. What worked/what did not work?	Replaced full fleet complement with PM efficiency street sweepers. Reduced downtime and cost of maintaining ageing fleet of sweepers resulting in meeting the level of services.
8. FCM Green Municipal Fund Funding	None
9. Other Funding	Transportation Services' annual Capital and Operating Budget
10. Current Status	Ongoing

NOTE: Please copy and create as many initiative templates as you deem necessary.

TABLE # 10b **Green Initiatives Reporting Template** *Transportation Services Division*	
CATEGORY: Renewable Energy Generation	
Initiative Title: Solar Powered Transit Shelters	
1. Description (1-2 sentences)	Installation of a minimum of 1742 "off-the-grid" solar illuminated new transit shelters using Photovoltaic Panel Systems and L.E.D. lighting over the twenty year term of the Coordinated Street Furniture Agreement with Astral Media Outdoor L.P.
2. Environmental Benefits	Reduction in GHGs (CO_2 , NO_X and SO_X) over the 20 year term of the contract will be in the amount of 4,286 tonnes over the first 10 years and by year 20 the total reduction will have been 12,020 tonnes.
3. Social/Economic Implications	Contributes to the environment by reducing energy consumption off the electrical power grid.
4. Financial Savings and Other Implications	Saves approximately $420,000 in hydro costs during the first 10 year of the contract: with a total savings of $1,200,000 by the end of year 20.
5. Savings in Resources (KWh of hydro or m^3 of gas)	Reduction in hydro consumption by about 4.5 million kilowatt hours after the first 10 years; with a total reduction of 12.7 million kilowatt hours by the end of the 20 year contract term.
6. Evaluation Model (How is project being monitored ?)	There are currently 300 existing type shelters throughout the City of Toronto that are being monitored by the Street Furniture Group. New transit shelters will be monitored in accordance with the Terms of the Agreement
7. What worked/what did not work?	New shelters will be adequately illuminated using a clean renewable energy source at no cost to tax payers.
8. FCM Green Municipal Fund Funding	
9. Other Funding	The Cost for manufacturing and maintaining all transit shelters will be absorbed by Astral Media Outdoor L.P.
10. Current Status	Installation of the transit shelters commenced in July 2008. 10% of the total number of shelters being installed in years 1 to 7 are solar powered with the balance being installed in the remaining years of the contract.

NOTE: Please copy and create as many initiative templates as you deem necessary.

TABLE # 10c **Green Initiatives Reporting Template** *Transportation Services Division*	
CATEGORY: Waste Management – Energy Use Avoided	
Initiative Title: Cold-in-Place Recycling Asphalt	
1. Description	Recycling of existing hot-mix asphalt (may include granular sub-base) using pulverization or milling methods in-place
2. Environmental Benefits	Reduction in use of energy/ materials (asphalt cement, gravel and sand).
3. Social/Economic Implications	Contributes towards reducing smog related to production & transportation of asphalt to and from site.
4. Financial Savings and Other Implications	Cost savings can range from 20 to 40 percent over conventional techniques. Materials savings are realized from the reduction in new asphalt and aggregate.
5. Savings in Resources	In 2006 and 2007, cold-in-place projects contributed in reducing energy consumption by over 4 million MJ. Energy savings result primarily from reduced aggregate haul and drying, and asphalt transportation.
6. Evaluation Model	The performance of completed projects was monitored through condition survey, on-site testing and by maintaining quality control requirements.
7. What worked/what did not work?	Effective for many roads in the City as an alternative to partial reconstruction.
8. FCM Green Municipal Fund Funding	None
9. Other Funding	None
10. Current Status	Use annually for past 15 years with success, process continues to evolve and improve.

* Website links:
http://www.pavementpreservation.org/
http://www.asphaltinstitute.com/
http://www.cdrecycling.org/ (concrete recylcing)
http://www.arra.org/ (asphalt recycling, HIP, CIP)
http://insideto.toronto.ca/wes/techserv/spqa/pdf/pavement-structural-design-summary.pdf (pavement structural design)

TABLE # 10d **Green Initiatives Reporting Template** *Transportation Services Division*	
CATEGORY: Other – Emission Reduction	
Initiative Title: Environmental Preferred Pavement Markings	
1. Description (1-2 sentences)	In 2005, in support of the City's Environmentally Responsible Procurement Policy, the City's Smog Alert Response Plan and the Federal Smog Management Plan, Transportation Services Division (Signs and Markings) converted the product used in the City's pavement marking repaint contracts from solvent-based traffic paint to waterborne traffic paint. In-house operations were converted shortly thereafter. In addition, the Transportation Services Division has used durable markings (preformed tape) for over 20 years. Recently, the City has also expanded its use of other durable markings such as cold plastic and preformed thermoplastic.
2. Environmental Benefits	Waterborne paint and durable markings have much lower volatile organic compound (VOC) content than solvent-based paint. Solvents and other compounds in conventional traffic paint can volatize during mixing or application which causes a temporary increase in the air concentration. In addition, solvents are also required for maintenance of the application equipment. These volatiles pose harmful health risks with individuals who come into contact with it. The paint crews are exposed to these volatiles on a routine basis.
3. Social/Economic Implications	Both waterborne and durable pavement markings have much lower VOC emissions and pose less of a health risk during application and maintenance of equipment. These changes to environmentally preferred products will reduce our impacts on climate change, smog and be less detrimental to our health and well-being.
4. Financial Savings and Other Implications	Life cycle costs (cradle-to-grave) of waterborne traffic paint application and durable markings versus solvent-based paint can be researched and further evaluated. The material cost of waterborne traffic paint is slightly higher than solvent-based paint. The maintenance costs are slightly less since fewer solvents are used. Also, impacts on the environment are less and therefore costs to clean up pollution and remedy human health are less. Durable markings material and application

TABLE # 10d **Green Initiatives Reporting Template** *Transportation Services Division*	
	costs are higher than solvent-based paint, however, they last much longer than solvent-based paint. Impacts to traffic are also minimized since the markings are only applied once every few years instead of once or twice a year.
5. Savings in Resources (KWh of hydro or m^3 of gas)	Each year, approximately 250,000 L of waterborne paint and 25,000 L of durable paint are used instead of solvent-based paint which results in a reduction of 90,720 kilograms of VOCs and 11,525 kilograms. VOC emissions are reduced by as much as 78% by using waterborne paint and as much as 99% by using durable markings.
6. Evaluation Model	Pavement marking applications are being monitored through maintenance and custom contracts as well as by in-house programs.
7. What worked/what did not work?	The application and performance of waterborne and durable markings is continually being monitored and reviewed by the City and its in-house and contracted services staff.
8. FCM Green Municipal Fund Funding	None
9. Other Funding	None
10. Current Status	Contracts specifying waterborne paint and durables (cold plastic and preformed thermoplastic) are currently in progress. In-house programs are also in progress.

NOTE: Please copy and create as many initiative templates as you deem necessary.

TABLE # 10e **Green Initiatives Reporting Template** *Transportation Services Division*	
CATEGORY: Energy Efficiency in Other Operations	
Initiative Title: Warm Asphalt	
1. Description	The use of additives in the production of hot-mix asphalt to improve workability at lower temperatures (~25-50°c)
2. Environmental Benefits	Reduces energy required in the production of hot-mix asphalt.
3. Social/Economic Implications	Contributes towards reducing smog related to production & transportation of asphalt to and from site. Labourers working conditions improves working with by lower temp asphalt.
4. Financial Savings and Other Implications	Improved workability and the reduced compaction efforts (labor & equipment) needed contribute towards cost savings.
5. Savings in Resources	Fuel savings in the production of hot-mix asphalt can be up to 50 percent, thereby reducing GHG emissions also by 50%. Pilot project saved a total of 6,820 litres of diesel fuel, resulting in 22 tonnes of eCO_2.
6. Evaluation Model	The performance of completed projects was monitored through condition survey, on-site testing and by maintaining QC/QA requirements.
7. What worked/what did not work?	Comparable to regular hot-mix asphalt production & placement.
8. FCM Green Municipal Fund Funding	None
9. Other Funding	None
10. Current Status	In pilot project phase. One project completed in 2007/08

* Website links:
http://www.pavementpreservation.org/
http://www.asphaltinstitute.com/
http://www.cdrecycling.org/ (concrete recylcing)
http://www.arra.org/ (asphalt recycling, HIP, CIP)
http://insideto.toronto.ca/wes/techserv/spqa/pdf/pavement-structural-design-summary.pdf (pavement structural design)

TABLE # 10f **Green Initiatives Reporting Template** *Transportation Services Division*	
CATEGORY: Energy Efficiency in Other Operations	
Initiative Title: Light Emitting Diode (LED) Traffic Signal Lamp Conversion at all Existing Traffic Control Signals	
1. Description (1-2 sentences)	A retrofit conversion program replacing existing incandescent lamps with LED lamp modules.
2. Environmental Benefits	Once complete the program is expected to reduce energy use at Traffic Signals by more than 85% resulting in a total reduction of 18,700,000 watt hours by 2010.
3. Social/Economic Implications	LED's not only save energy, they are more visible and last up to 8 times longer than incandescent lamps. The longer life results in reduced maintenance costs and fewer trucks hours required for service.
4. Financial Savings and Other Implications	Based on current energy costs (10.3 cents / KWh), the program once complete (2010) will result in energy savings of approximately $1,900,000.
5. Savings in Resources (KWh of hydro or m^3 of gas)	Estimated 18.7 megawatt hour reduction at project completion (2010). Approximately 11.6 megawatt hour reduction project to date (June 2008).
6. Evaluation Model	Interval metres are used for before and after data collection of actual load at sample locations. The collected data is used to validate theoretical load calculations. After validation, the theoretical load is used to determine load at all locations.
7. What worked/what did not work?	The program has been a great success and is well underway (60% complete). As the energy used in Traffic Signals is part of an un-metered account and as such is based on a calculated (or theoretical) load and not a measured load (no hydro meter), continuous co-ordination with Toronto Hydro to ensure that load reductions are properly reflected in our energy billing is required.
8. FCM Green Municipal Fund Funding	
9. Other Funding	Original Pilot Study (2003) funded by Toronto Atmospheric Fund grant of $100,000.
10. Current Status	The project is approximately 60% complete with 635 intersections fully converted (vehicle and pedestrian displays) and 1050 intersections partially converted (pedestrian displays only).

NOTE: Please copy and create as many initiative templates as you deem necessary.

TABLE # 10g **Green Initiatives Reporting Template** *Transportation Services Division*	
CATEGORY: Trees	
Initiative Title: Tree Planting Program/Other Tree Planting	
1. Description (1-2 sentences)	• Planting of 2000 trees per year since 2005 on streets that have undergone construction or where asphalt has been removed and sod has been installed; • Initiated and funded the planting of 328 trees within the public realm in 2007, with a further 477 trees projected for planting in 2008.
2. Environmental Benefits	• Carbon sequestration, reduced air pollution, increase in wildlife habitat, reduction in stormwater flows, increase in shade, reduction in local temperatures; • Each tree increases the coverage of the city tree canopy and supports City Forestry's objective of increasing the canopy from the current 17% to 30-40%.
3. Social/Economic Implications	Increase in property values, improved air quality, improved aesthetics. Creates an environment suitable for exercise and for residents and tourists to walk commercial areas while improving the aesthetics of the public realm.
4. Financial Savings and Other Implications	Reduction in cooling costs (reduces Carbon Dioxide levels) due to an increase in shade, reduction in local temperatures and increases oxygen levels in the atmosphere.
5. Savings in Resources (KWh of hydro or m^3 of gas)	Not known at this time TEO & urban forestry evaluating/developing a standard
6. Evaluation Model	Starting in early 2008, Urban Forestry will be using a tool called the Urban Forest Effects (UFORE) model. The purpose is to develop plots, which will help to: • Quantify the structure and form of the existing urban forest; • Assess forest vulnerability factors such as mortality, poor soil and catastrophic events; • Model the growth of trees and canopy over time; and • Develop a suite of measurable indicators to assess forest sustainability on an ongoing basis.
7. What worked/what did not work?	Newly planted trees improve the streetscape, newly planted trees require maintenance and continuous care and as a result improving growing conditions through the addition of soil amendments will be initiated in the future
8. FCM Green Municipal Fund	None

TABLE # 10g **Green Initiatives Reporting Template** *Transportation Services Division*	
Funding	
9. Other Funding	None
10. Current Status	• Ongoing; • Clean and Beautiful City continues to work with partner divisions and agencies to identify locations for additional tree planting

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