



## REPORT FOR ACTION

## City of Toronto Consolidated Green Fleet Plan 2014-2018 – Progress Report Third Quarter 2017

**Date:** August 11, 2017

**To:** Government Management Committee

**From:** General Manager, Fleet Services Division

**Wards:** All

### SUMMARY

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The purpose of this report is to provide a progress update on the City of Toronto Consolidated Green Fleet Plan objectives, strategies and targets. The City of Toronto Consolidated Green Fleet Plan 2014-2018 can be found at the following link: [http://www1.toronto.ca/city\\_of\\_toronto/fleet\\_services/files/pdf/gfp.pdf](http://www1.toronto.ca/city_of_toronto/fleet_services/files/pdf/gfp.pdf)

This progress report includes Consolidated Green Fleet Plan related updates from City of Toronto Divisions Fleet Services Division (FSD), Toronto Fire Services (TFS), Toronto Paramedic Services and City Agencies Toronto Transit Commission (TTC) and Toronto Police Service. This plan is coordinated by FSD with significant contribution from the aforementioned Divisions and Agencies, and the Environment and Energy Division (EED).

For the actions taken in the reporting period January 1, 2016 to December 31, 2016, by all City of Toronto Divisions and Agencies; the projected net savings expected to be realized from the implementation of the Consolidated Green Fleet Plan, over the life cycle of all City fleet is estimated to be \$1,562,941 in avoided costs and over 5.6 million kilograms (5,600 tonnes) in avoided greenhouse gases (GHG CO<sub>2</sub>e).

### RECOMMENDATIONS

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**The General Manager, Fleet Services Division recommends that:**

1. The Government Management Committee receive this report for information.

### FINANCIAL IMPACT

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There are no budgetary impacts resulting from the approval of this report.

The actions taken in 2016 for the implementation of the Consolidated Green Fleet Plan had a capital expenditure of \$1,291,900, net of a one-time capital cost avoidance \$310,000. The estimated annual operating cost savings of \$314,785 was reflected in

the 2017 Approved Operating Budget and will have ongoing impacts to future operating budgets. The total anticipated operating savings over the expected asset life of the vehicles purchased is \$1,562,941. A breakdown of these costs and savings can be found in the table on pages 17 and 18.

Funding for all Green Fleet initiatives was included in effected 2017 Divisional approved operating and capital budgets. Funding required over the life of vehicles will be included in the future Divisional operating and capital budget submissions.

The Deputy City Manager & Chief Financial Officer has reviewed this report and agrees with the financial impact information.

## **DECISION HISTORY**

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At its meeting on June 10, 11, 12 and 13, 2014, City Council adopted the City of Toronto Consolidated Green Fleet Plan 2014 – 2018 and directed the Director, FSD to track the progress made in achieving the established targets and report back to Government Management Committee in Q2 2016, Q2 2017, Q2 2018 and provide a final report in Q2 2019. City Council also directed the Chief, Toronto Paramedic Services and the Chief, Toronto Fire Services to actively participate in the implementation of the Consolidated Green Fleet Plan. City Council requested that the Toronto Transit Commission Board and the Toronto Police Service Board adopt and implement the Consolidated Green Fleet plan 2014-2018.

<http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2014.GM30.12>

At its meeting on June 15, 2015 Government Management Committee requested the General Manager, FSD report to the next Government Management Committee meeting with performance measures related to the Green Fleet Plan.

<http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2015.GM5.3>

At its meeting on September 17, 2015 Government Management Committee received a report from the Director, FSD outlining the performance measures related to the City of Toronto Consolidated Green Fleet Plan 2014-2018. Government Management Committee also requested that the Director, FSD report in the second quarter of 2016 with data on the current utilization of bicycles in all City divisions and a plan to increase the number of staff using bicycles in each of these divisions.

<http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2015.GM6.3>

At its meeting on September 6, 2016 Government Management Committee received a report from the General Manager, FSD providing a progress update on reporting period 2014-2015 on the City of Toronto Consolidated Green Fleet plan objectives, strategies and targets.

<http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2016.GM14.12>

## COMMENTS

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The Consolidated Green Fleet Plan 2014-2018 set realistic objectives that measure progress toward established goals and includes specific, measurable strategies to accomplish these objectives.

This Staff Report provides interim progress for the period January 1, 2016 to December 31, 2016 and is broken out into the following four (4) components:

1. **Interim progress report for each objective; and,**
2. **2016 Operations Greenhouse Gases and Air Contaminants Data Reporting**
3. **City of Toronto Bike Share Program**
4. **2016 Savings Realized and Costs Incurred**

### 1. Interim Progress Report by Objective

#### **A. Purchase, lease, or otherwise obtain the most fuel-efficient vehicles where appropriate for City operations, while considering lifecycle cost of the vehicle**

FSD continued to investigate opportunities to reduce vehicle weight, improve payload and reduce fuel consumption and GHG CO<sub>2</sub>e emissions in 2016 by:

- Continuing to optimize its light duty fleet - with consideration to fuel economy, cost and operational requirements. FSD purchased thirty-one (31) Nissan Versa automobiles and achieved an estimated \$310,000 capital cost avoidance, in comparison to the previous passenger vehicle standards. These purchases will realize over 32,000 kg of reduced GHG CO<sub>2</sub>e emissions annually.
- Maintaining an inventory of thirty-two (32) aluminum constructed fifty-three (53) foot waste and recycling trailers. Aluminum trailers are lighter than the comparable steel version, and represent a 21% weight reduction, with an estimated 5% savings in fuel consumption on the towing vehicle. Further, payload capacity increases by 8% which reduces the number of trips required for the same volume of material.

#### **B. Achieve ISO Certification in the area of Environment Management (ISO 14000) and Quality Management (ISO 9000) for the FSD, and work with other City Fleets to explore the feasibility of their ISO Certification**

ISO Certification was reassessed in order to better align the timing and content with the City's Excellence Toronto initiative. As a result, ISO Certification for a benchmark facility will not be undertaken at this time. Rather, in an effort to promote a culture of accountability, openness and collaboration to ensure environmental sustainability, good governance and continual improvement, FSD will utilize the Excellence Toronto framework to achieve these goals.

In May 2017, FSD updated its Quality and Environmental Policy to reflect its commitment to this framework:

[http://www1.toronto.ca/City%20Of%20Toronto/Fleet%20Services/Shared%20Content/Files/Fleet%20Services%20Quality%20and%20Environmental%20Policy%20v03%20\(2017-05-05\).pdf](http://www1.toronto.ca/City%20Of%20Toronto/Fleet%20Services/Shared%20Content/Files/Fleet%20Services%20Quality%20and%20Environmental%20Policy%20v03%20(2017-05-05).pdf)

### **C. Develop selection criteria for alternative fuels**

Selection criteria for vehicles include fuel options available in the market place, total life cycle cost, operating requirements, utilization and impact on GHG. In 2016, where viable, FSD continued to acquire vehicles utilizing alternative fuels while considering the total life cycle costs based on the following selection criteria:

- purchase price
- maintenance and repair cost
- fuel cost and salvage value
- and operational viability.

Environmental benchmarks are also used to measure the City fleet to identify opportunities for improvement, including reduction in GHG CO<sub>2</sub>e emissions. This includes updating our vehicle procurement practices to include all above listed criteria in procurement documents for light-duty vehicles.

Alternative fuel options FSD implemented or continued to manage in 2016 included eleven (11) Electric Vehicles (EV), nineteen (19) Level 2 charging stations and one (1) DC Fast charging station (also known as a Level 3 charging station). More information is available online:

<https://www1.toronto.ca/wps/portal/contentonly?vgnextoid=d3da5c546218f310VgnVCM10000071d60f89RCRD&vgnnextchannel=a47107ceb6f8e310VgnVCM10000071d60f89RCRD>

Driving distance and charging times continued to be the major barriers to the use of electric vehicles (EVs) in 2016. The City's EVs have a limited driving distance range (i.e., typically 100 km on fully charged battery) and Level 2 charging stations require approximately eight (8) hours for a full vehicle battery charge. Therefore, FSD is currently purchasing two (2) 2017 Chevrolet Bolt EV's with a 380 km driving range and level 3 charging capability. Further, in May 2017, FSD installed one (1) DC Fast charging station which will substantially reduce the EV charging time on level 3 capable vehicles, to approximately forty-five (45) minutes.

In addition to the EVs, thirty seven (37) Compressed Natural Gas (CNG) collection vehicles were purchased for Solid Waste Management Services (SWMS) bringing the total to forty-two (42) CNG rear loading Class 8 packers in the fleet by the end of 2016. The resulting fuel savings from these vehicles compared to conventional diesel trucks was \$236,000 with a reduction of 195,200 kg in GHG CO<sub>2</sub>e emission. FSD continues to purchase CNG units on behalf of SWMS with an additional twenty-eight (28) CNG units ordered in early 2017.

## **D. Enhance operational efficiency and driver education**

### **Eco-driving campaign**

The City's Eco-driving campaign was developed in 2015 for both the G and D Class Permit/License upgrade courses. In 2016, over 2,200 City staff received training. All City staff permitted to operate a City vehicle are provided with ecofriendly driving tips including trip planning and anti-idling behaviours including turning off the vehicle engine if stopped for more than ten (10) seconds, idling, aggressive acceleration and braking, overloading vehicles, and proper tire inflation.

It is estimated that the idle prevention practices taught by FSD as part of the Class G and D vehicle training may contribute to an approximate 2% fuel reduction in fuel. Further, anti-idling behaviour practices extend engine life and reduce required maintenance. When a vehicle is left idling lower oil pressure is attained, however, when the engine is shut off, wear time ceases, thus extending the life of the vehicle and reducing greenhouse gas emissions.

### **Idling Reduction Technologies**

In 2016, Toronto Paramedic Services added forty-seven (47) new ambulances with anti-idling systems, after testing the anti-idling technology on one vehicle for a full year. With almost 2,200 litres of annual fuel savings for each ambulance, the savings for all forty-eight (48) ambulances with this technology in 2016 was approximately 53,900 litres. This resulted in a fuel savings of approximately \$56,000 in 2016 and a corresponding 67,000 kg of reduced GHG CO<sub>2</sub>e emissions.

Toronto Fire Services continued the use of auxiliary power units as an idle reduction technology in nine (9) front line aerial trucks. With an estimated 3,300 L of fuel savings annually per truck, the resulting fuel savings in 2016 was 29,700 litres of diesel fuel, representing a savings of approximately \$30,000 and over 80,000 kg of reduced GHG CO<sub>2</sub>e emissions.

Toronto Police Service added auxiliary batteries to 428 patrol vehicles that have mobile work stations and in-car camera systems. In order to reduce the necessity of idling of the vehicle to perform stationary patrolling, auxiliary batteries were added to isolate the workstation. With an estimated 1,460 litres of fuel savings annually per vehicle, it is estimated that approximately 625,000 litres of fuel was saved on all vehicles equipped with auxiliary batteries; representing a savings of over \$649,000 and approximately 1.5 million kg of reduced GHG CO<sub>2</sub>e emissions.

For the 2016 reporting period, FSD's fleet included 335 Hybrid vehicles with OEM anti-idling systems, resulting in an annual savings of approximately 73,000 litres; representing a savings of approximately \$76,000 and over 170,000 kg of reduced GHG CO<sub>2</sub>e emissions annually.

Finally, in 2016, start-stop system technology became more readily available on light-duty vehicles. As such, FSD will consider this technology on future procurements and will factor the fuel savings from this technology into the total cost of ownership.

## **Car Share**

The City's Car Share Pilot Project was completed in 2015. At its meeting on May 3, 2016 City Council authorized the General Manager, FSD to enter into an Acknowledgement Agreement with the Province of Ontario to allow use of their Vendors of Record for Car Share services. Information can be found in the following link: (<http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2016.GM11.10%20>)

Agreements with two companies are now in place and the Car Share Program was made available to all City Divisions in the fall of 2016. FSD is monitoring the program with Divisions and Agencies to capture savings that are realized and will provide an update in the Q2 2018 Green Fleet Progress Report, following the first full year of implementation.

## **Light duty vehicle under-utilization**

FSD reviewed light duty vehicle under-utilization (i.e., those vehicles that were driven less than 7,000 km per year) in 2016 and the target, as set by the Consolidated Green Fleet Plan, of no more than 20% of the light-duty passenger vehicles fleet under-utilized was met. In 2016, 186 vehicles were identified as travelling less than 7,000 km per year. Of these, 139 vehicles were identified as necessary for job specific tasks such as transportation of tools and crew with long parking times.

Feedback from FSD clients indicates that 2% or forty-seven (47) vehicles of the City's 2,000 light duty vehicles are used as pool cars to attend meetings and other operational requirements.

In an effort to reduce the number of underutilized vehicles used as pool cars, FSD has implemented the following programs available to all Divisions:

- A new chargeback rate model that charges clients a premium for older vehicles that are beyond optimum life. This provides financial incentives for clients to return units which are underutilized
- Both Car Share and Bike Share options have been implemented. The use of these sharing programs allow Divisional staff to use these alternatives rather than keeping underutilized units for use as pool cars
- Car rentals to accommodate short-term needs. Providing this service allows clients to return any additional units as they have a rental alternative
- In 2016, twenty-nine (29) vehicles were returned to FSD as surplus. These vehicles will not be replaced as they were part of the continuous fleet rightsizing program.

## **Fuel Site Management and Closures**

In 2016, FSD closed two (2) fuel sites and upgraded one (1) fuel site. Upgraded sites have above ground fuel storage tanks that reduce the risk of soil contamination and these sites have technology that allows secure, real-time, centralized fuel and data management.

Since 2013, FSD has closed twenty-three (23) fuel sites and currently manages twenty three (23) active and fully upgraded sites that have been designed to improve efficiencies and reduce environmental impacts.

FSD continues to install Vehicle Identification Boxes (VIBs) in all City vehicles that utilize our fuel sites. This technology allows for automated fuel authorization and to date VIBs have been installed on 1,329 vehicles.

It has been proven that the VIB project is an industry leading cost effective means to capture asset data, while ensuring secure, accurate fuel management and appropriate data for scheduling preventative maintenance according to engine hours. When compared with other solutions, such as those that require ongoing monthly charges and/or human effort to input odometer readings and review and correct entry and reporting errors the savings are easily quantified. FSD fuel sites data rejection rate has been reduced from 22.6% in 2014 to 1.45% in 2016, providing evidence of data collection process improvement and technology effectiveness.

To continue innovative efforts and ensure seamless integration of the VIB program, FSD developed an online training video for Client Divisions. Link to "Introduction to Vehicle Identification Boxes" video on YouTube:

<https://www.youtube.com/watch?v=iOgbx6Pf37E&feature=youtu.be>

### **E. Create one new temporary dedicated Green Fleet Coordinator position in FSD for the 2015-2018 period, to be included in the FSD operating budget, and establish a Green Fleet Team comprised of current staff from each of the participating members of the Fleet Management Steering Committee**

The City's dedicated Green Fleet Project Manager has been in place since September 2015 to coordinate, implement, analyse and report progress and the Green Fleet Team is in place to execute the Consolidated Green Fleet Plan. The Green Fleet Team is comprised of Divisional and Agency staff from each of the participating members of the Fleet Management Steering Committee.

## **2. 2016 City of Toronto Fleet Operations Greenhouse Gases and Air Contaminants Data Reporting**

Greenhouse Gases (GHGs) are the fundamental cause of the greenhouse effect contributing to climate change. Carbon Dioxide (CO<sub>2</sub>) is the primary greenhouse gas emitted through human activities, including transportation, and the most effective way to reduce CO<sub>2</sub> emissions is to reduce fossil fuel consumption.

The equivalent carbon dioxide (CO<sub>2</sub>e) is the standard unit adopted for measuring multiple GHGs including CO<sub>2</sub>, Methane (CH<sub>4</sub>) and Nitrous Oxide (N<sub>2</sub>O). Criteria Air Contaminants (CAC), are also produced from vehicles emissions, including Carbon Monoxide (CO), Nitrogen Oxides (NO<sub>x</sub>), Particulate Matter (PM 10 and PM 2.5), Sulphur Dioxides (SO<sub>2</sub>) and Volatile Organic Compounds (VOC) which are of concern to public health.

The size, composition and fuel consumption of the City Fleet changes over time in response to operational and policy requirements, and GHGs and CAC from tailpipe emissions are monitored and estimated based on Fleet fuel use and vehicle and equipment specifications.

For this report, the Environmental & Energy Division (EED) provided emissions calculations using Transport Canada's Urban Transportation 2011 Emission Calculator (UTE<sub>C</sub>) in order to calculate both GHGs and CACs. However, it should be noted that for the purposes of the City of Toronto's GHG Inventory, EED uses National Inventory Report (NIR) 2014 emissions factors to calculate GHG CO<sub>2</sub>e emissions.

The following tables summarize the City fleets' GHG measured by CO<sub>2</sub>e and relevant CAC emissions for 2016 and comparison with 2015 fuel use and emissions. The tables are broken out by FSD, who report on all City vehicles with the exception of Toronto Paramedic Services, TFS, Toronto Police Service and the TTC who each manage their fleet separately from FSD. Each has reported out separately as noted in this section.



## Fleet Services Division (FSD) Greenhouse Gases (CO2e) and Air Contaminants (CAC) Data Reporting 2016

**Table 1 Fleet Services Division (FSD) CO2e and CACs by Fuel Type, 2016**

Fuel Type	CO2e kg	CO Kg	NOx kg	PM10 kg	PM2.5 kg	SO2 kg	VOC kg
DIESEL	22,584,588	20,478	99,731	2,647	2,076	367	4,926
UNLEADED	5,497,683	103,697	13,142	304	187	77	6,686
DYED	2,379,229	3,060	10,261	273	213	38	580
CNG	685,849	93	1,422	17	39	15	103
<b>Total</b>	<b>31,147,350</b>	<b>127,329</b>	<b>124,557</b>	<b>3,240</b>	<b>2,515</b>	<b>498</b>	<b>12,295</b>

Source: 2016 EED results based on FSD data and 2011-UTEC emission factors

**Table 2 Fleet Services Division (FSD) Fuel Quantity and CO2e by Fuel Type, Variance 2016-2015**

Fuel Type	Fuel 2016 Litres or m3	Fuel 2015 Litres or m3	CO2e 2015-2016 Variance kg	Fuel or CO2e 2015-2016 Variance %
DIESEL	8,392,623	8,626,173	-628,502	-3%
UNLEADED	2,333,831	2,342,491	-19,397	0%
DYED	889,058	1,004,855	-311,459	-12%
<b>Sub-total</b>	<b>11,615,512</b>	<b>11,973,519</b>	<b>-959,358</b>	<b>-3%</b>
CNG (m3)	400,847 m3	56,064 m3	589,924	615%

Source: 2016 FSD fuel data and 2015/2016 EED CO2e results based on 2011-UTEC emission factors

As identified in Table 2, the City's diesel fuel usage reduction (-233,550 litres) led to 3% reduction in CO2e emissions in 2016 compared to 2015. In 2016, forty-two (42) CNG rear loading packers replaced old generation diesel trucks with an estimated reduction of approximately 600,000 kg CO2e.

In 2016, FSD developed and introduced a North American first; an innovative method to normalize the GHG emission measurement in order to determine the year over year trend in a fleet where the fleet size, fleet mix, distance driven, and hours of use can vary. FSD has adopted the use of Vehicle Equivalency Unit (VEU) methodology that is generally used in advanced fleet management for determining work effort and mechanic staffing. Each Class of vehicle is assigned a VEU depending on its complexity. In the City fleet the VEU ranges from one (1) for a general-purpose small passenger vehicle to a VEU of eight and one-half (8.5) for large vehicles and equipment that are more complex and specialized. The following table provides a year over year comparison of

GHG emissions per VEU. The data illustrates the difference in 2016 when compared to 2015. Overall, from 2015 to 2016, the GHG emissions per VEU for on-road vehicles has decreased by 100 kg per VEU, primarily due to the increased use of CNG fuel. Alternately, as assets age fuel economy typically degrades by two-percent per year. These factors have been included in Table 3 below.

**Table 3 Fleet Services Division (FSD) GHG Emissions per VEU Variance, 2016-2015**

Vehicle Class	2016 Average GHG (kg per VEU)	2015 Average GHG (kg per VEU)	Change in Average GHG (kg per VEU)
CLASS 1	1,900	1,900	0
CLASS 2	3,500	3,600	-100
CLASS 3	1,800	1,700	100
CLASS 4/5	1,900	2,000	-100
CLASS 6/7	2,000	2,000	0
CLASS 8	3,200	3,500	-300
Sweepers	1,700	1,800	-100
On Road Total	2,700	2,800	-100

Source: FSD data analysis

FSD will continue to explore alternatives to reduce fuel consumption by including estimated fuel consumption as part of total cost (where available) and by reducing vehicles weight and size, promoting eco-driving, and considering alternative methods of transportation, such as carpooling, bicycles, Car Share and reducing travel.

FSD is committed to improving fuel efficiency through the procurement process, and application of advanced engineering, design, materials and technologies to integrate the use of more fuel efficient vehicles and equipment.

## Toronto Paramedic Services Greenhouse Gases (CO<sub>2</sub>e) and Air Contaminants (CAC) Data Reporting 2016

**Table 4 Toronto Paramedic Services CO<sub>2</sub>e and CACs by Fuel Type, 2016**

Fuel Type	CO <sub>2</sub> e Kg	CO kg	NO <sub>x</sub> kg	PM10 Kg	PM2.5 kg	SO <sub>2</sub> kg	VOC kg
DIESEL	150,331	137	670	18	14	2	33
UNLEADED	4,551,759	59,433	12,231	264	175	64	4,564
<b>Total</b>	<b>4,702,090</b>	<b>59,570</b>	<b>12,900</b>	<b>282</b>	<b>189</b>	<b>67</b>	<b>4,597</b>

Source: 2016 EED results based on FSD data and 2011-UTEC emission factors

**Table 5 Toronto Paramedic Services Fuel Quantity and CO<sub>2</sub>e by Fuel Type, Variance 2016-2015**

Fuel Type	Fuel 2016 Litres	Fuel 2015 Litres	CO <sub>2</sub> e 2015-2016 Variance kg	Fuel or CO <sub>2</sub> e 2015-2016 Variance %
DIESEL	55,864	55,551	844	0.6%
UNLEADED	1,941,712	2,001,984	- 143,124	-3.0%
<b>Total</b>	<b>1,997,576</b>	<b>2,057,535</b>	<b>- 142,280</b>	<b>-2.9%</b>

Source: 2016 Toronto Paramedic Services fuel data and 2015/2016 EED CO<sub>2</sub>e results based on 2011-UTEC emission factors

Toronto Paramedic Services fuel usage decreased in 2016 and can be directly attributed to an improved distribution of ambulances and therefore shorter distances being driven to emergency calls, as well as the new anti-idling technology deployed in the new 2016 ambulances. Additionally, in early 2016 Toronto Paramedic Services decommissioned approximately thirty (30) emergency response vehicles held for the Pan Am games. The combined impact of these variables resulted in a 2.9% decrease in fuel usage for Toronto Paramedic Services.

Toronto Paramedic Services is committed to evaluating new initiatives and technology towards implementing a green fleet. The evaluation must take into consideration operational requirements, as well as meeting the current legislatively required Ontario Provincial Land Ambulance & Emergency Response Vehicle Standards, issued by the Emergency Health Services Branch, of the Ministry of Health and Long-Term Care.

In addition to strategies included in the Consolidated Green Fleet Plan 2014-2018, the following actions are planned:

- Continue to identify vehicles that can be replaced with 4 cylinder vehicles rather than 6 cylinder vehicles within Divisional Specialized Operations - six (6) vehicles were replaced in 2015
- Continue to use more efficient LED emergency lights on all emergency response vehicles, as vehicles are replaced
- Continue to replace full size 8-cylinder senior command emergency response vehicles with midsize 6-cylinder patrol vehicles.
- Continue to add anti-idling modules to each new emergency response vehicle
- Recycle up to twenty (20) modular patient compartments by remounting onto new chassis.

## Fire Services Greenhouse Gases (CO<sub>2</sub>e) and Air Contaminants (CAC) Data Reporting 2016

**Table 6 Fire Services CO<sub>2</sub>e and CACs by Fuel Type, 2016**

Fuel Type	CO <sub>2</sub> e Kg	CO kg	NO <sub>x</sub> kg	PM10 kg	PM2.5 kg	SO <sub>2</sub> kg	VOC kg
DIESEL	3,828,629	3,861	19,609	475	370	65	872
UNLEADED	599,561	15,036	1,233	33	18	8	867
DYED	2,161	2	11	0	0	0	0
<b>Total</b>	<b>4,430,351</b>	<b>18,900</b>	<b>20,853</b>	<b>508</b>	<b>388</b>	<b>73</b>	<b>1,739</b>

Source: 2016 EED results based on FSD data and 2011-UTEC emission factors

**Table 7 Fire Services Fuel Quantity and CO<sub>2</sub>e by Fuel Type, Variance 2016-2015**

Fuel Type	Fuel 2016 Litres	Fuel 2015 Litres	CO <sub>2</sub> e 2015-2016 Variance kg	Fuel or CO <sub>2</sub> e 2015-2016 Variance %
DIESEL	1,422,753	1,438,442	- 42,345	-1.1%
UNLEADED	253,541	279,393	- 60,638	-9.3%
DYED	803.17	1,663	- 2,314	-51.7%
<b>Total</b>	<b>1,677,097</b>	<b>1,719,499</b>	<b>- 105,297</b>	<b>-2.5%</b>

Source: 2016 TFS fuel data and 2015/2016 EED CO<sub>2</sub>e results based on 2011-UTEC emission factors

TFS fuel usage decreased in 2016 following a full year of savings created by the aerial trucks designed with Idle Reduction Technology (IRT). The initial nine (9) units (with four more on order) realized a 23% fuel savings when compared to identical older aerial units built without the IRT units. A modified version of this system will be specified in future Pumper truck models to obtain the similar type of savings across a larger portion of the fleet.

Further savings were realized by the commissioning of a second fire boat, allowing for the use of a more fuel efficient unit when responding to medical calls not requiring significant firefighting water supply or ice breaking.

TFS continues to investigate the use of battery operated firefighting equipment such as auto-extrication tools, ground lighting, power saws, and smoke ejection fans, in a continuing effort to reduce the need for inefficient gas powered equipment.

## Toronto Police Service Greenhouse Gases (CO<sub>2</sub>e) and Air Contaminants (CAC) Data Reporting 2016

**Table 8 Toronto Police Service CO<sub>2</sub>e and CACs by Fuel Type, 2016**

Fuel Type	CO <sub>2</sub> e kg	CO kg	NO <sub>x</sub> kg	PM10 kg	PM2.5 kg	SO <sub>2</sub> kg	VOC kg
DIESEL	785,298	588	2,568	84	68	12	160
UNLEADED	15,226,795	512,346	23,689	905	417	216	26,348
<b>Total</b>	<b>16,012,093</b>	<b>512,933</b>	<b>26,257</b>	<b>989</b>	<b>485</b>	<b>228</b>	<b>26,508</b>

Source: EED CACs calculation based on Toronto Police Service data

**Table 9 Toronto Police Service Fuel Quantity and CO<sub>2</sub>e by Fuel Type, Variance 2016-2015**

Fuel Type	Fuel 2016 Litres	Fuel 2015 Litres	CO <sub>2</sub> e 2015-2016 Variance kg	Fuel or CO <sub>2</sub> e 2015-2016 Variance %
DIESEL	291,803	273,446	48,908	6.7%
UNLEADED	6,428,74	6,755,489	- 782,907	-4.8%
<b>Total</b>	<b>6,720,552</b>	<b>7,028,935</b>	<b>- 733,999</b>	<b>-4.4%</b>

Source: 2016 Toronto Police Service fuel data and 2015/2016 EED CO<sub>2</sub>e results

The Toronto Police Service has played an active role in monitoring and evaluating evolving technologies and initiatives for over ten (10) years and has consistently met or exceeded goals.

The Toronto Police Service is committed to evaluating new initiatives and technology towards implementing a green fleet. The evaluation must take into consideration the Toronto Police Service's operational requirements, as well as any legislated obligations.

In addition to strategies included in the Consolidated Green Fleet Plan, Toronto Police Service in an effort to reduce idling time has and will take the following actions: Auxiliary batteries have been added to all Patrol Vehicles which have Mobile Work Station and In-Car Camera systems that upload their video via the network at the end of each shift. In order to reduce the necessity of idling of the vehicle for up to two (2) hours per day to perform this task, the use of the auxiliary battery became standard in

2015 and in 2016 Toronto Police Service purchased 100 units at \$550 each. A fuel consumption study demonstrated Toronto Police Service vehicles use 2.0 litres of fuel per hour while idling. With a fleet size of approximately 428 vehicles equipped with the technology, in 2016 estimated fuel use avoidance of 624,880 L.

- LED emergency lights will continue to be added to all uniform patrol cars - being done through vehicle lifecycle replacement (over 600 vehicles)
- Auxiliary heaters, generators and power inverters have been added to all command posts, communities' stations, forensic vehicles and support vehicles.

The 4% decrease in emission realized in 2016 by the Toronto Police Service can be directly attributed to these ongoing initiatives coupled with no major events i.e., Pan Am games requiring extra vehicle deployments.

## Toronto Transit Commission (TTC) Greenhouse Gases (CO<sub>2</sub>e) and Air Contaminants (CAC) Data Reporting 2016

**Table 10 Toronto Transit Commission (TTC) CO<sub>2</sub>e and CACs by Fuel Type, 2016**

Fuel Type	CO <sub>2</sub> e kg	CO kg	NO <sub>x</sub> kg	PM <sub>10</sub> kg	PM <sub>2.5</sub> kg	SO <sub>2</sub> kg	VOC kg
DIESEL	247,969,128	292,862	1,295,567	44,037	39,011	4,764	43,188
UNLEADED	3,179,327	62,488	7,503	183	110	45	3,988
<b>Total</b>	<b>251,148,455</b>	<b>355,350</b>	<b>1,303,070</b>	<b>44,220</b>	<b>39,121</b>	<b>4,809</b>	<b>47,176</b>

Source: 2016 EED CACs results (2011-UTEC emission factors) based on TTC data

**Table 11 Toronto Transit Commission (TTC) Fuel Quantity and CO<sub>2</sub>e by Fuel Type, Variance 2016-2015**

Fuel Type	Fuel 2016 Litres	Fuel 2015 Litres	CO <sub>2</sub> e 2015-2016 Variance kg	Fuel or CO <sub>2</sub> e 2015-2016 Variance %
DIESEL	92,147,272	90,127,805	5,434,352	2.2%
UNLEADED	1,351,315	1,264,129	205,128	6.9%
<b>Total</b>	<b>93,498,587</b>	<b>91,391,934</b>	<b>5,639,480</b>	<b>2.3%</b>

Source: 2016 TCC fuel data and 2015/2016 EED CO<sub>2</sub>e results (2011-UTEC emission factors)

In keeping with City and Provincial initiatives focused on low carbon mobility, public transit plays a vital role in improving Toronto's air quality and reducing GHG emissions. Absolute emissions from public transit (vehicles and supporting infrastructure) need to increase if wider emissions from transportation (personal automobiles) in the City are to be reduced.

Efforts to reduce pollution from the TTC bus fleet have been wide-ranging, including annual emission testing, retirement of inefficient engines, and the application of technologies such as diesel oxidation catalysts, diesel particulate filters, and selective

catalytic reduction systems. These technologies and processes are aimed at reducing emissions of: particulate matter, nitrogen oxides, hydrocarbons, carbon monoxide and other air pollutants.

Generally, fuel use increases as ridership grows and the overall transit system expands to meet customer and city growth needs. TTC's bus fleet expanded in 2016 with the purchase of 108 40' NOVA clean diesel buses. Fleet mileage increased by approximately 7% in 2016 over 2015.

As ridership is still expected to grow, the TTC is not anticipating that the overall Commission carbon dioxide emissions generated by surface vehicles will reduce significantly, in spite of using minimum content bio-diesel fuel, as required by provincial regulation.

As of January 2016, TTC commenced the expanded use of a seasonally blended fuel, on newer vehicles instead of the Number one diesel fuels used on older technology diesel vehicles. The increased energy density of this fuel is expected to positively impact on TTC fuel consumption per km, by lowering the amount of fuel required to travel the same distance. The TTC is also reviewing performance data collected by other agencies who are currently piloting alternate propulsion technologies.

As older buses are retired, they are replaced with the best available technology related to the efficient use of energy and further reductions in engine exhaust emissions will be achieved. New Nova 40' clean diesel buses have a fuel consumption rating of 4.3mpg which is a 10% improvement over older conventional diesels. Additionally, new buses are designed to include features to attract new riders to public transit including PRESTO electronic fare payment, on-board route destination announcements, improved LED lighting, and installation of the new VISION automatic vehicle locator (AVL) system, the TTC app will better inform customers of route schedules in real time.

The TTC plans additional bus fleet growth with an estimated 600 new buses over the next few years, which will incorporate the newest diesel technology available and allow for older technology retirement. The TTC is also continuing to investigate alternate fuels such as natural gas and all electric powered buses; with this new technology shift, an investment in existing infrastructure will be required to take advantage of the continuing evolution of bus technology to improve customer comfort and control the emissions and the efficient use of energy within the City of Toronto.

### **3. City of Toronto Bike Share Program**

At its meeting on September 17, 2015 the Government Management Committee requested data on the current utilization of bicycles in all City Divisions and Agencies; a plan to increase the number of staff using bicycles in each of these Divisions; an assessment of possible areas to expand the use of bicycles by City staff in other divisions; an internal bicycle use marketing plan and other proposals to encourage expanded use of bicycles by City staff to meet transportation for City operations: (<http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2015.GM6.3>)

At its meeting on September 6, 2016 Government Management Committee received a report from the General Manager, FSD providing a progress on FSD's internal marketing plan for promoting the use of Bike Share.

<http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2016.GM14.12>

FSD worked with the Toronto Parking Authority on the Bike Share Program plan objectives and achieved the following:

- Use of bicycles for work trips is now expanded to all City employees who wish to use bicycles as an alternate method of transportation for travel related to City business. This includes travel for day-to-day work activities including meetings, conferences, seminars, and other business events.
- Bike Share Toronto is offering the City an annual membership rate of \$90/Key Fob (FOB)
- The FOB allows an employee to obtain one bicycle from any Bike Share Toronto parking station. The FOB can be shared by all City Staff in a Division or Unit to allow use of the bicycle as often as required at no additional cost.
- All City Divisions and Agencies supervisors or managers manage the use of the bicycle FOB and are responsible for adhering to the City's Health and Safety policy including training, use of proper protective gear, etc.
- The City's Bike Share Use Policy is posted online at: : [http://insideto.toronto.ca/fleet/policies/bikeshare\\_policy.htm](http://insideto.toronto.ca/fleet/policies/bikeshare_policy.htm)
- As of May 2017 eight (8) City managers have registered and received FOBs for use by staff. FSD will continue collaboration with Bike Share Toronto to promote bike sharing as an alternate form of transport for City staff on City business.

#### **4. 2016 Actions - Savings Realized and Costs Incurred**

At its meeting on September 17, 2015 the Government Management Committee requested that future progress reports presented to Government Management Committee also include savings realized and costs incurred:

<http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2015.GM6.3>

In the reporting period of 2016 for the implementation of the Consolidated Green Fleet Plan the table below contains the annualized per unit cost and savings as well as the projected savings over the expected life of the vehicles. It should be noted that the benefits of actions taken are realized for the entire life of the vehicles which surpasses the Consolidated Green Fleet Plan term of 2014-2018.



**Table 12 - Estimated Green Fleet Savings Realized and Costs incurred and Projection over Life of Vehicles, 2016**

Green Fleet 2016 Actions	Number of Units	Vehicle Savings or (Cost)	2016 Fuel Savings Estimate	Annual CO2e Reduction Estimate	Useful Life (years)	Fuel Savings over Life of Vehicle Projection *See Note 1	CO2e Reduction over Life of Vehicle Projection
Purchase of Nissan Versa instead of conventional passenger vehicles	31	\$310,000  Savings of \$10,000 per unit	\$14,186  \$458 Fuel saving per unit, annually	32,736 kg  1,056 kg per unit	8	\$105,215	242,804 kg
Purchase of SWMS CNG refuse collection trucks (6 months average operation in 2016) \$304,000 average cost per unit, instead of diesel refuse collection trucks \$274,000 average cost per unit	37	(\$1,110,000)  Incremental cost of \$30,000 per unit for CNG engine	\$94,992  \$5,135 Fuel saving per unit, annually	140,321 kg  7,585 kg per unit	6	\$1,081,362	1,558,767 kg
Purchase anti-idling devices installed on Toronto Paramedic Services ambulances (6 months average operation in 2016)	47	(\$126,900)  Cost of \$2,700 per unit	\$53,768  \$2,288 Fuel saving per unit, annually	248,160 kg  5,280 kg per unit	4.5	\$483,912	1,116,720 kg
Purchase of anti-idling use devices (auxiliary batteries) installed on Toronto Police Service patrol vehicles	100	(\$55,000)  Cost of \$550 per unit	\$151,840  \$1,518 Fuel saving per unit, annually	350,000 kg  3,500 kg per unit	7.8	\$1,184,352	2,730,000 kg
<b>Total</b>		-\$ 981,900	\$314,785	771,217 kg		\$2,854,841	5,648,291 kg

Source: 2016 FSD fuel data and 2015/2016 EED CO2e results (2011-UTEC emission factors).

Note 1: Fuel Economy degradation rate of 2% annually are factored in the projected savings.

**Table 13 Summary of Green Fleet Savings over Life of Vehicles, 2016**

<b>Total Costs incurred in 2016</b>	\$1,291,900
<b>Projected Savings over the Life of Vehicles</b>	\$2,854,841
<b>Net Operating Savings over the Life of Vehicles</b>	\$1,562,941
<b>One Time Capital Cost Avoidance</b>	\$310,000

**Table 14: Summary of Green Fleet Implemented Actions Savings, 2014-2016**

	<b>Total Costs incurred, \$ Actual</b>	<b>Net savings over the Life of vehicles, \$ Projection</b>	<b>GHG CO2e reduction over Life of vehicles, Tonnes - Projection</b>
2014-2015	\$470,000	\$508,760	2,048
2016	\$1,291,900	\$1,562,941	5,648
<b>Total</b>	<b>\$1,761,900</b>	<b>2,071,701</b>	<b>7,696</b>

Source: 2014-2015 and 2016 FSD fuel data and 2016 EED CO2e results (2011-UTEC emission factors).

In 2016 the City of Toronto Consolidated Green Fleet Plan 2014-2018 – Progress Report Third Quarter 2016 provided the net savings for actions taken in 2014-2015 (<http://www.toronto.ca/legdocs/mmis/2016/gm/bgrd/backgroundfile-95665.pdf>)

FSD will continue with right sizing the vehicles, right sizing the fleet, use of alternative fuels, use of vehicle manufacturers' anti-idling technology and monitoring vehicle utilization as best practices to reduce environmental impact.

The Green Fleet Team will continue with the Consolidated Green Fleet Plan implementation and updated data and information will be provided in Q3 2018. The Consolidated Green Fleet Plan final report will be provided in Q3 2019.

## **CONTACT**

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## **SIGNATURE**

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