City of Richmond

Report to Committee

To:	Public Works and Transportation Committee	**Date:**	March 29, 2016
From:	Tom Stewart, AScT. Director, Public Works Operations	**File:**	02-0780-00/Vol 01
Re:	**Green Fleet Action Plan – 2015 Progress Report**		

Staff Recommendation

That the Future Opportunities and Planned Actions, as outlined in the Green Fleet Action Plan – 2015 Progress Report from the Director, Public Works Operations dated March 29, 2016, be endorsed.

Tom Stewart, AScT.
Director, Public Works Operations
(604-233-3301)

Att. 1

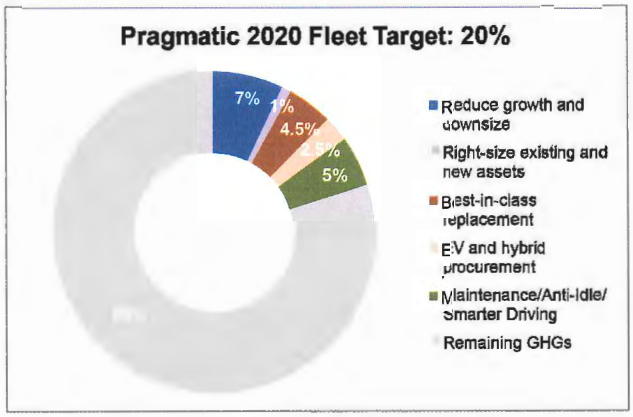
REPORT CONCURRENCE		
ROUTED TO:	**CONCURRENCE**	**CONCURRENCE OF GENERAL MANAGER**
Sustainability	☑	
REVIEWED BY STAFF REPORT / AGENDA REVIEW SUBCOMMITTEE	**INITIALS:** DW	**APPROVED BY CAO**

Staff Report

Origin

At their October 28, 2013 meeting, Council approved the City's Green Fleet Action Plan. This plan established a target to reduce GHG emissions 20% by 2020 through various strategies as outlined in Figure 1. The reduction target of 20% is based on an annual reduction of 2% per year, starting in 2010.

Figure 1: Richmond's GHG Emissions Reduction Target



This report presents a progress report of actions and results to date, as well as outlines current and planned initiatives designed to further reduce GHG emissions from the City's corporate vehicle fleet.

This report supports Council's 2014-2018 Term Goal #4 Leadership in Sustainability:

> *Continue advancement of the City's sustainability framework and initiatives to improve the short and long term livability of our City, and that maintain Richmond's position as a leader in sustainable programs, practices and innovations.*
>
> *4.1. Continued implementation of the sustainability framework.*

Analysis

Background

Corporately, the Green Fleet Action Plan is a component of the Corporate Energy and GHG Reduction Program identified in the City's Sustainability Framework that addresses all greenhouse gas emissions and energy use from City operations. Fleet and building related emissions account for the vast majority of corporate GHG emissions, and the reduction of fossil fuel use aligns with broader City targets relating to greenhouse gas reduction.

Key challenges in reducing corporate fleet emissions result from managing growing service demands due to population/infrastructure growth, and the dynamic nature of the City's fleet. To perform various service level functions, the City's fleet is made up of non-traditional units such as grass cutting equipment, street sweepers, snow plow equipment, excavating equipment, and trucks with specialized outfitting and supplementary power requirements for running auxiliary tools, etc. As detailed in

Figure 2: Fleet Assets by Mode

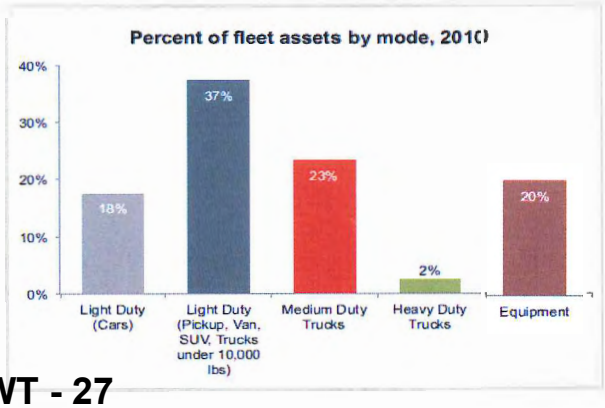


Figure 2, only 18% of the City's fleet are cars, whereas light, medium and heavy duty trucks and equipment make up 82% of the fleet.

Pursuing green technologies can prove challenging due to the dynamic nature of the City's fleet, the operational demands that are placed on the fleet to meet service levels (need for power to operate auxiliary equipment, etc.) and the limitations of green alternatives for service-type vehicles. This means that different approaches are required. These include gathering and analyzing accurate vehicle fuel and mileage data to help guide the decision making process around downsizing; selecting vehicles for replacement that generate greater emissions benefit; incorporating anti-idling education and technologies; training drivers on efficient-driving techniques; incorporating alternative fuels, etc. A summary of the actions identified in the Green Fleet Action Plan is included in Attachment 1.

Actions and Results to Date

The City has had a progressive approach over the years, through its Sustainable Green Fleet Policy (Policy 2020) and Green Fleet Action Plan, to implementing various strategies to reduce fleet emissions. These include best value replacements through our vehicle renewal program; acquisition of alternative fuel (hybrid, electric, etc.) vehicles; upgrading equipment to meet higher emission standards (i.e. Tier 3 or 4); reducing fleet growth (where possible); installation of LED lighting on vehicles with auxiliary batteries which negates the need to idle vehicles while lighting is in use; etc. Significant recent actions include:

1. *Fuel Management System*

   This system is in operation at the City Works Yard and ensures fuel security for units fueled at this location. It was enhanced as of June, 2013 to provide robust fuel data for the City's vehicles to allow accurate monitoring of fuel consumption by vehicle, kilometres driven, and idle time. This data is integral to identifying high mileage and/or high idle times by vehicle in order to target specific improvement opportunities. The data capture system achieved through the City's fuel management system is very advanced when compared with other municipalities.

   In total, City vehicles travel about 4 million kilometres per year (2.5 million miles). As part of our aging vehicle replacement strategy to replace vehicles with more fuel efficient units, fuel consumption data shows a 1.9% year-over-year reduction trend in litres of fuel consumed per 100 km driven:

   June, 2013 – July, 2014: 25.32 L/100 km
   June, 2014 – July, 2015: 24.84 L/100 km

   = 1.9% reduction in litres of fuel consumed per 100 km

   While it is recognized that there can be some variations in the data collected due to the large volume of fuel dispensed for City use, the data collected by the fuel system is integral to providing specific information from which to base targeted actions for fuel reduction. This downward trending is positive and indicative of the greater fuel efficiency of new/replacement vehicles as part of the vehicle replacement program.

2. *Vehicle Replacement Program*

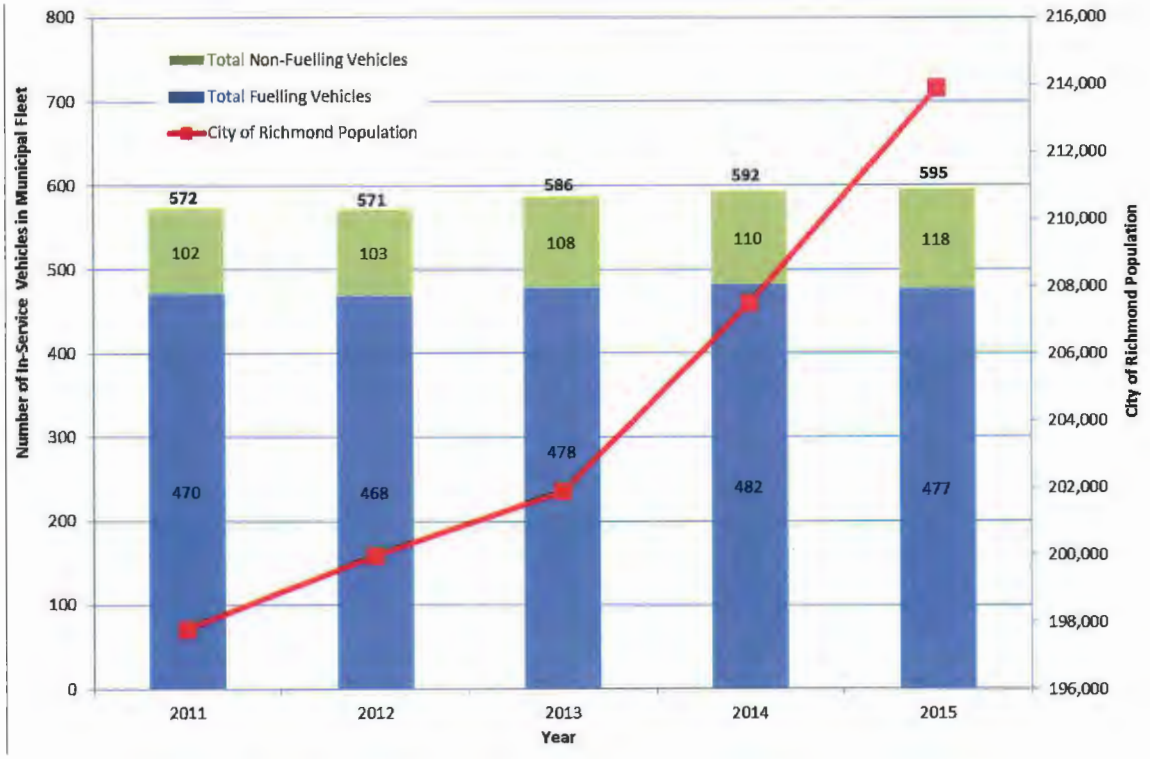
The City has an active vehicle replacement program which targets aging, high fuel consumption units for replacement with those providing best value and meeting City policies. In addition, vehicles due for replacement are evaluated to determine whether they are suitable for downsizing or right-sizing opportunities. Operational needs and requirements are given priority consideration to ensure departmental service levels are adequately supported by the vehicles/equipment provided. Since 2011 approximately 189 fuel-based units were replaced (not including RFR). Of these, the majority were standard fuel efficiency replacements, a number were electric or alternative fuel, many were right-sized, and a few were new assets.

Table 1: Fuel Based Corporate Units Replaced: 2011 to 2015

Fuel Based Corporate Units Replaced – 2011 – 2015 (Summary of Green Fleet Action Plan Categories)						
	2011	**2012**	**2013**	**2014**	**2015**	**Total**
No. of Fuel-Based Units Replaced	18	66	28	49	28	189
Standard Fuel Efficiency	2	26	18	35	18	99
No. EV or Hybrid	4	8	1	1	2	16
No. Right Sized	5	5	3	7	1	21
No. New Assets	1	8	2	2	2	15
No. Downsized	4	0	0	0	4	8
Net New Fuel-Based Assets						7

As noted, overall the City's corporate fuelling fleet has grown slightly, or by 7 units since 2011. Efforts are made to minimize and reduce fleet size where possible, and measures are in place to ensure any growth is warranted to meet service levels. In addition, due to tangible capital assets reporting requirements, any other non-fuel assets over $5,000 are documented as an asset in the City's fleet management system. The City's corporate fleet (excluding RFR) currently has 477 fuelling assets in its fleet and 118 non-fuelling assets, for a total of 595 units.

Figure 3: Annual Corporate City Fleet Asset Count (Excludes RFR Assets)



3. *Electric/High Fuel Efficient Vehicles*

The City has incorporated hybrid, electric and high fuel-efficiency vehicles into its fleet, including passenger vehicles and electric ice resurfacers at all ice arenas. The number of units has expanded to over 50 units in 2015, including:

- 3 Chevrolet Volts Extended Range Electric
- 3 Chevy Malibu Hybrids
- 26 Honda Hybrids
- 1 Saturn Vue Hybrid
- 9 Smart Cars
- 1 Toyota Camry Hybrid
- 1 Ford Fusion Hybrid
- 2 Toyota Prius Hybrids
- 1 Hybrid Freight Liner 5 Ton Truck
- 5 Olympia Electric Ice Resurfacers
- 1 Fully Electric Nissan Leaf

Photos of Hybrid and Electric Vehicle/Equipment


Nissan LEAF


Hybrid Freightliner Truck


Chevrolet Volt

Olympia Electric Ice Resurfacer

In addition, the City installed electric vehicle charging stations for corporate (Works Yard, City Hall Annex) and community use at City Hall, and at the Steveston, Cambie and Thompson Community Centres. The community/public charging stations were installed and activated on March 31, 2013, and use of these stations has increased nearly threefold in each of the last three years.

Total hours these stations were used grew from under 1,000 hours in 2013, to over 8,300 hours in 2015. A comparison of energy consumed vs. GHG savings based on data provided via the ChargePoint system (used for all City electric vehicle stations) is shown in Figure 4, which shows that GHG emissions savings grew from 1.8 tonnes in 2013 to over 15 tonnes in 2015.

Figure 4: Energy Consumed vs. GHG Emissions Savings

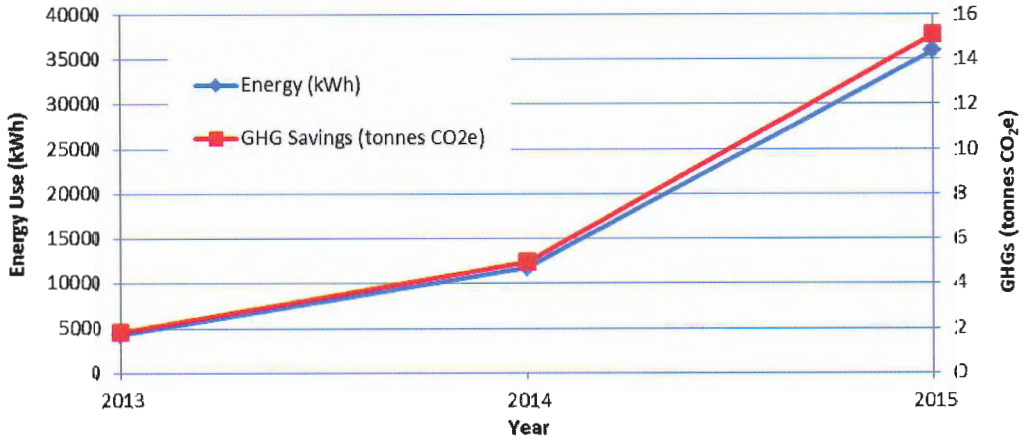


Table 2 shows a summary of station use in each of 2013, 2014 and 2015, and includes energy cost vs. fuel cost savings. For example, in 2015, the energy cost to the City associated with the public charging stations was $3,590.43; however, the gasoline savings to users of those stations was equal to $18,419.61.

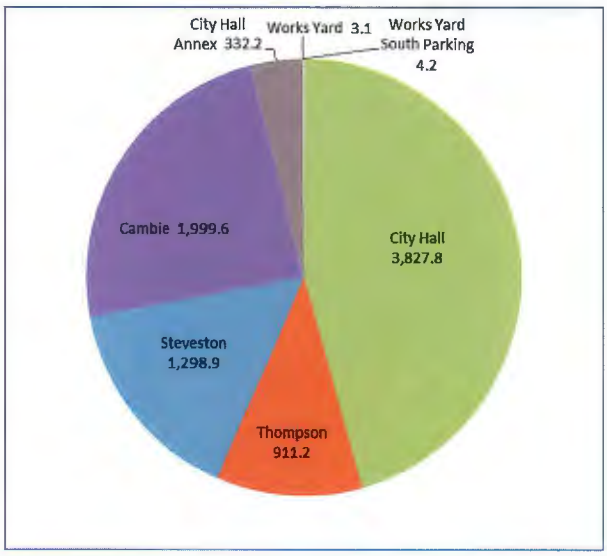
Table 2: Electric Vehicle Station Use – 2013 to 2015

	2013	2014	2015
Times Used (all stations)	776	1974	4599
Charging Time (all stations)	975.3 hours	2,609.4 hours	8,376.9 hours
Energy Used (all stations)	4,345.05 kWh	11,809.75 kWh	35,904.32 kWh
Energy Cost	At $0.10 Per kWh energy cost was $434.50	At $0.10 Per kWh energy cost was $1,180.97	At $0.10 Per kWh energy cost was $3,590.43
GHG Savings (all stations)	1.8 tonnes CO_2e	5.0 tonnes CO_2e	15.1 tonnes CO_2e
Gasoline Savings (all stations)	545.3 U.S. gallons	1,482.1 U.S. gallons	4,506.0 U.S. gallons
	2,064.0 L	5,609.8 L	17,055.2 L
Fuel Cost Savings	At $1.30 per L, fuel cost savings was $2,661.97	At $1.25 per L, fuel cost savings was $7,180.54	At $1.08 per L, fuel cost savings was $18,419.61

Details of Figure 3

The highest used station is City Hall, followed by the Cambie, Steveston, and Thompson community centres, as shown in Figure 5.

Figure 5: 2015 Electric Vehicle ChargePoint Usage
Charging Time by Station (hours)



4. Implementation of Fleet Management System

A dedicated fleet management system, FASTER, was installed in 2014 to track vehicle and equipment assets, as well as all related costs including repairs, fuel, insurance, etc. This system not only provides an important repository of vehicle/equipment asset information, but also allows for vehicle predictive preventative maintenance schedules to

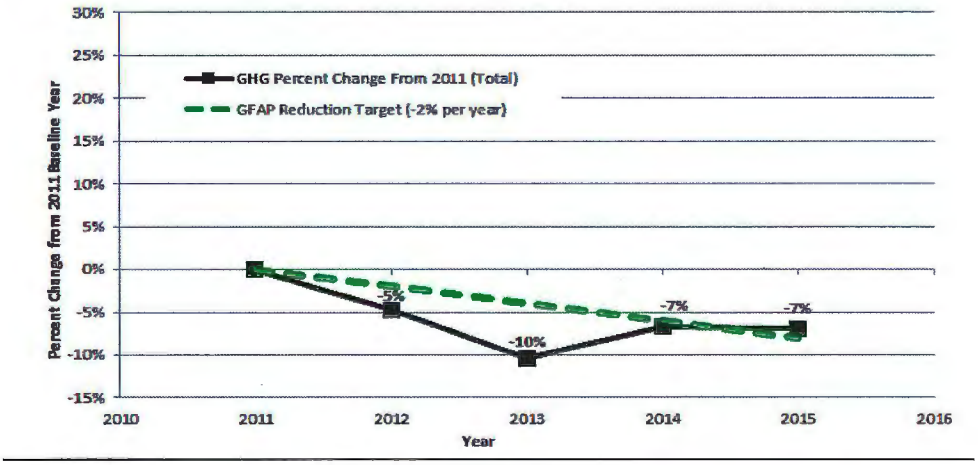
be maintained. This is important since well maintained vehicles run more efficiently and are more fuel efficient compared to when vehicles are repaired due to reactive maintenance (breakdowns). This also benefits operations by reducing downtime due to vehicle or equipment mechanical failures. Moving forward, this information will be able to be applied when purchasing replacements so that in addition to purchase price, maintenance, fuel, and downtime costs associated with vehicles as a whole are also considered. This information allows for more informed purchasing decisions to determine if a particular vehicle is worth the purchase, and not just the purchase price.

Impacts Results to Date

To measure the results of all of the City's actions and the overall impact on GHG emissions reduction, an assessment of performance versus established targets was undertaken, a reporting tool to measure progress moving forward was developed, and a future action plan was formulated. As part of this review, it is recommended that the baseline year be changed to 2011 in light of key structural differences in data gathering methods. In 2010, benchmark data was based on a top-down approach (purchase records) versus 2011 data which allows for more robust bottom-up reporting due to improvements in fuel usage reporting from the fuel management system. This analysis, therefore, compares to 2011 baseline data. Note that the fuel consumption excludes estimated construction-related activities in accordance with provincial reporting requirements.

Overall, the City has reduced emissions by approximately 7%. While positive, particularly in light of challenges in keeping pace with service level demands due to growing population trends, this reduction is slightly below our trend target of 2% per year, or 8% as of the end of 2015. The City's targeted vehicle replacement program has helped the City's corporate fleet reduce emissions by 11%. However, Fire fuel emissions have increased by nearly 27% over the five years due to various reasons (operational changes for equipment allocation to maintain coverage for all halls, increased community outreach activities, increased prevention activities, temporary fire hall relocations resulting in increased travel distances, increased call volumes, etc.).

Figure 6: City of Richmond GHGs Percentage from 2011 Baseline Year



Future Opportunities and Planned Actions

Continued progress and initiatives will be needed to not only advance toward the 20% target reduction by 2020, but also to manage emissions moving forward in light of continued population and greater demand for services. Key planned actions moving forward are listed.

1. *Replace high km Vehicles with Hybrid or Electric Vehicles*

Using the fuel management system to analyze highly used vehicles, a review of vehicle replacements and/or reallocations within the fleet will be undertaken to incorporate hybrid or electric vehicles. It is expected that by replacing eight to twelve high use vehicles with hybrid or electric units, the City would save 10-15 tonnes of GHG emissions per year.

Table 3 below is provided for information to show the cost of ownership (excluding maintenance) based on a traditional gasoline vehicle (Chevrolet Cruze) vs. a hybrid (Ford Fusion) vs. a fully electric vehicle (Nissan Leaf). This information is based on actual cost of vehicles as bid through a public tender process in the City's fleet and fuel performance. Note that this analysis does not factor in the cost to install the electric vehicle infrastructure for charging purposes.

Table 3: Actual Total Cost of Ownership Comparison: Gasoline, Hybrid and Electric Vehicles

	2011 Chevrolet Cruze Unit 1450	2016 Ford Fusion Hybrid Unit 1775	2012 Nissan LEAF Electric Unit 1621
City of Richmond Purchase price not including tax	$17,945	$27,191	$35,720
Actual Fuel economy L/100KM	10.6 L/100 KM	5.8 L/100 KM	2.1 Le/100 KM
Fuel/Energy Used Per Year based on 15,000 KM Driven	1,590 Litres	870 Litres	2,343 kWh
GHG Emissions/Year	4.83 tonnes CO_{2e}	2.64 tonnes CO_{2e}	0.0225 tonnes CO_2e
GHG Emissions For 10 Years	48.3 tonnes CO_{2e}	26.4 tonnes CO_{2e}	0.225 tonnes CO_2e
Cost of Fuel/Electricity for 10 Years based on $1.08/L for gasoline	$17,172	$9,396	$2,343
Total Cost of Ownership Excluding Maintenance for 10 Years	$35,117	$36,587	$38,063

2. *Reduce Idling*

A number of vehicles with high idling levels have been identified for review. By reducing idle times on these units, it is estimated that GHG emissions could be reduced

by 60-120 tonnes annually. These units will be reviewed directly with the operating departments they support for idle reduction through technology and/or driver education.

In addition, an anti-idling driver incentive program is being undertaken to promote and raise awareness generally about the benefits of reducing idling. This will include a slogan "You hold the key to be idle free" campaign, which will be used on promotional materials such as t-shirts and key chains to help raise awareness among staff. This campaign will also be promoted during the annual Public Works Open House.

3. *Driver Education*

Driver education can help reduce emissions by emphasizing smarter driving techniques and best practices for vehicle/equipment maintenance. It is estimated that 70-75 tonnes of emissions reduction per year could be achieved through smarter driving. A driver education program, which emphasizes the anti-idling message, smart driving strategies and the importance of vehicle care and maintenance, will all be emphasized as part of staff outreach presentations.

4. *GPS*

A pilot program for approximately 60 units will be undertaken in 2016 where GPS tracking is installed in identified City vehicles. The main purpose of the pilot will be to evaluate how routing efficiency can be maximized to help reduce driving times/trip lengths, etc. Depending on the success of this pilot initiative, the program could be expanded to additional units in future years.

5. *E3 Fleet Certification*

The City is currently undergoing a review of its fleet under the Fraser Basin Council's E3 Fleet certification program. The E3 program rates fleets as bronze, silver, gold or platinum based on green fleet initiatives. This certification program evaluates a number of factors for fleets including policies, training, idling, purchasing practices, fuel data management, operations, maintenance, utilization, fuel efficiency and other related factors.

6. *Alternative Fuel Pilot*

Given the large make up of medium and light duty trucks in the City's fleet, this represents a key group of vehicles to target for emissions reduction. A pilot is being considered to convert a small number of these trucks to propane fuel. Propane can reduce emissions by 26% when compared to gasoline.

A review of natural gas was undertaken, however, due to the high costs of vehicle conversions and fuelling infrastructure, it was found that the lack of financial return made the emissions reduction benefit not worthwhile for natural gas conversions. The propane pilot appears more promising due to lower conversion costs, and is still in the development stage.

7. *Car Sharing*

An expression of interest (EOI) has been issued to trial car sharing for City vehicles. Under this pilot, a car sharing vendor would be selected to provide a unit to replace a small number of City vehicles on a trial basis to assess the feasibility of downsizing City vehicles. The car share units would be available for City purposes exclusively during the work day, and available for other users/public after hours and on weekends. The EOI is currently being evaluated.

There is an administration component to this initiative due to the need to administer fob's, provide staff training, monitor invoices and assign charges, as well as related tasks. The resource implications for administering this program may require consideration as part of the pilot and for future potential broader scale implementation.

The above actions will form the basis of work over the next two to three years and is expected to help the City continue to advance fuel and GHG emissions reduction. Through these initiatives, it is expected that our target of 20% emissions reduction by 2020 will be met or exceeded.

Financial Impact

None. Vehicle replacements are funded via the Fleet reserve through annual capital budget submissions.

Conclusion

The City has established a Green Fleet Action Plan to guide initiatives designed to reduce GHG emissions as part of the City's broader corporate reduction program. This plan outlines a target to reduce GHG emissions by 2% per year over the next 10 years, or a total of 20% by 2020. As noted in this report, 2011 has been established as the new baseline year as part of improved data collection associated with the City's fuel management system.

Initial actions have resulted in positive emissions reduction to date, or overall 7%, while meeting the service level needs of a growing population. While this is slightly below target levels at this time (should be at 8% emissions reduction), future actions are planned to continue progress in reducing GHG emissions from the City's fleet intended to meet targeted reduction levels.

Suzanne Bycraft
Manager, Fleet & Environmental Programs
(604-233-3338)

Att. 1: Summary of Green Fleet Actions to Achieve 20% GHG Emissions Reduction by 2020

Summary of Green Fleet Actions to Achieve 20% GHG Emissions Reduction by 2020 (Approved by Council October 28, 2013)

The following is an overview of tactics identified for reducing GHG emissions and fuel consumption, including priority status and anticipated outcomes.

Actions that Support Slowing Growth of Fleet	Status	Impact Assessments
1. Reduce new growth in assets.	Priority	Eliminating new growth in assets could provide up to 16% reductions in fleet emissions, 2010 to 2020.
2. Consolidate and eliminate trips through information technology and route optimization. Report all route optimization programs in order to share learning.	Priority	Reduces vehicle kilometres travelled (VKT).
3. Increase employee public transit use for off-site meetings, or pay for taxis or use personal staff vehicle (with mileage reimbursement) when a passenger car with low VKT has be downsized out of fleet.	Priority	Support action for downsizing low use passenger vehicles.
4. Extend the Works Yard anti-idling to City Hall	Priority	Support Richmond's community-wide anti-idling initiative, demonstrating leadership.
5. Expand driver training to include anti-idling and smarter driver reminders.	Consider	Up to a 10% reduction in emissions from driving when combined with anti-idling and maintenance.
6. Develop a corporate car share program, e.g. with Modo.	Consider	Reduces the need for passenger cars in fleet, enabling downsizing and freeing resources for other service provisions.
7. Expand Sustainable Commute: offer staff transit passes as an employee benefit.	Consider	Demonstrates leadership, reduces community GHG emissions, and enhances employee satisfaction.

Maintenance and Management Monitoring and Reporting	Status	Impact Assessments
8. Right-size vehicles for best use on an annual basis.	Priority	Fuel cost savings are maximized when higher capital green fleet vehicles are assigned to users with the highest VKT. Passenger car fuel savings of up to 18% may be possible, with a targeted overall GHG reduction of 1%.
9. Systemize preventive vehicle maintenance with the new Faster Asset Management software.	Priority	Regularly schedule vehicle maintenance saves fuel, ensures worker safety and prolongs vehicle life. Use the Faster Asset Management software will ensure reduced vehicle downtime and ensure continued

Maintenance and Management Monitoring and Reporting	Status	Impact Assessments
		service excellence. Targeted GHGH reduction of 5%, including anti-idling and smarter driving.
Monitor and report on: **10. VKT annual** **11. Sustainable Green Fleet Actions** **12. Joining E3 Fleet Program**	Priority	Supports right-sizing and downsizing of existing assets. Mandatory requirement for E3 Fleet review and rating.
13. Provide a monthly fuel use report to all departments using fleet vehicles.	Consider	Support departments in managing their use of fleet assets.
14. Integrate GHG measurement tools with asset management software.	In Progress	Assures monitoring and reporting of Fleet emissions performance.
15. Make fuel costs transparent to departments in their leasing rates.	Consider	Provides an incentive for departments to reduce fuel use.
16. Provide additional human resources to Fleet during current critical renewal period.	Consider	Ensure implementation of sustainable actions during current renewal cycle.

Efficient Resource Use	Status	Impact Assessments
17. Continue best-in-class fuel-efficient vehicle procurement, with a focus on light-duty trucks. Replace older, low-usage passenger cars with best-in-class compact vehicles.	Priority	Targeted overall GHG reduction of 4.5%.
18. Reduce idling through better vehicle technology: continue the replacement of truck, van, and SUV emergency lights with LEDs and auxiliary batteries; use solar panels where possible to run safety lights.	Priority	Support anti-idling program. By 2020, 100% of vehicles that idle to run emergency lights should be outfitted with LED lights and auxiliary batteries. Older trucks that cannot convert to auxiliary batteries will be retired.
19. Add GPS units to vehicles to aid the route optimization, best use of vehicles and data collection.	Priority	GPS units support improved fleet management and demand side management ensuring fuel and GHG reductions from other actions.

Alternative Fuels	Status	Impact Assessments
20. Purchase electric vehicle for high use cars. Procure hybrid light-duty trucks when possible.	Priority	Fully electric vehicles have zero tailpipe emissions. Up to 5% additional modeled reductions in fleet emissions with high rates of electric vehicles and hybrid adoption in light-duty vehicles including trucks. Targeted overall GHG reduction of 2.5%
21. Monitor emerging technologies in plug-in hybrid trucks, and adopt plug-in purchasing	Consider	Aim to have 10% light-duty truck procurements plug-in hybrid or electric vehicles by 2017.

Alternative Fuels	Status	Impact Assessments
policies for light-duty trucks as soon as the technology is market-ready.		
22. Pursue procurement of diesel-electric hybrids for medium and heavy-duty trucks and buses as the technology matures and become market-ready.	Consider	No cost to monitor and assess.
23. Monitor and assess emerging technologies, particularly compressed natural gas vehicles. Depending on trends, pursue a feasibility study for establishing an alternative vehicles program that would shift medium and heavy-duty vehicles to compressed natural gas.	Consider	GHG reductions from natural gas vehicles may be as high as 25%, but depend on vehicle type and driving cycle. Full life cycle emissions are also impacted by upstream production and distribution emissions.
24. Monitor the advances in biodiesel fuels and consider switching to a higher biodiesel blend when full lifecycle emissions reductions are assured.	Consider	The GHG benefit of biodiesel is in the full lifecycle of the fuel, with estimated savings of 18% for biodiesel 20.