CITY OF HAMILTON
PUBLIC WORKS DEPARTMENT
Energy, Fleet and Facilities Management Division

TO:	Chair and Members Public Works Committee
COMMITTEE DATE:	May 31, 2021
SUBJECT/REPORT NO:	Green Fleet Strategy Report & Action Plan (PW03147(e)) (City Wide)
WARD(S) AFFECTED:	City Wide
PREPARED BY:	Tom Kagianis (905) 546-2424 Ext. 5105 Lesley Parker (905)546-2424 Ext 5210
SUBMITTED BY: **SIGNATURE:**	Rom D'Angelo, C.E.T.; CFM Director, Energy, Fleet and Facilities Management Public Works Department 

RECOMMENDATION

(a) That the Green Fleet Strategy Report as identified in Appendix “A” attached to Report PW03147(e) be received;

(b) That staff be directed to proceed with the Green Fleet Action Plan and implement the recommendations as outlined in Appendix “B” to Report PW03147(e);

(c) That funding from the Unallocated Capital Reserve to support Annual Capital requests as outlined in Appendix “D” to Report PW03147(e) to fund the implementation of the Green Fleet Strategy Action Plan that will realize 89 light duty fleet vehicles replaced by electrified vehicles be approved;

(d) That a new reserve fund be established to fund charging equipment replacement as required and will be funded through usage charges to be established by Fleet;

(e) That staff provide annual Communication Updates (accompanied with the Annual Energy Report) on progress of executing the Green Fleet Action Plan recommendations and impacts to Greenhouse Gases (GHG’s) resulting from implemented initiatives;

(f) That the General Manager of Public Works, or their designate, be authorized and directed to submit and sign an application with supporting documentation including an application attestation, on behalf of the City of Hamilton, to Natural Resources Canada (NRCan), in accordance with the terms and conditions associated with the Zero Emission Vehicle Infrastructure Program by June 22, 2021;

(g) That the General Manager of Finance and Corporate Services, be authorized and directed to confirm the City of Hamilton's funding contribution in the amount of $300,000 towards the EV Charging Station Infrastructure Project and sign a Proof of Funding Form to that effect, in accordance with the terms and conditions associated with the Zero Emission Vehicle Infrastructure Program;

(h) That should the City's submission under the Zero Emission Vehicle Infrastructure Program be approved, staff be authorized and directed to tender and implement the EV Charging Station Infrastructure Project upon execution of a contribution agreement between the City of Hamilton and Her Majesty the Queen in right of Canada as represented by the Minister of Natural Resources Canada (NRCan) to receive funding from the Zero Emission Vehicle Infrastructure Program;

(i) That the City Solicitor be authorized and directed to prepare any necessary by-laws for Council approval, for the purpose of giving effect to the City's acceptance of funding from the Zero Emission Vehicle Infrastructure Program for the EV Charging Station Infrastructure Project;

(j) That the Mayor and City Clerk be authorized to execute all necessary documentation, including Contribution Agreements to receive funding from National Resources Canada (NRCan) under the Zero Emission Vehicle Infrastructure Program with content satisfactory to the General Manager, Public Works, and in a form satisfactory to the City Solicitor.

EXECUTIVE SUMMARY

Transportation accounts for a quarter of Canada's greenhouse gas emissions (GHG), of which almost half comes from passenger cars and light trucks.

In April 2020 the City of Hamilton's Fleet Services Section commissioned a consulting firm Richmond Sustainability Initiatives (RSI) to assist staff with a Green Fleet Strategy. RSI who since 2005 has collaborated with fleet managers, technology providers, subject matter experts and automotive manufacturers to find viable solutions, technologies and best management practices for reducing operating costs and vehicle emissions.

The purpose of the Green Fleet Strategy report submitted by RSI (attached hereto as Appendix "A" to Report PW03147(e)) was to provide the Fleet Services Section with recommendations and alternatives actions that will align to the Motion adopted by City Council on March 27th, 2019 (Item 3 of the Board of Health Report 19-003, March 18th , 2019) an Accelerating and Prioritizing Climate Action in Response to the Climate Emergency as well as, endorsing a clear direction from the Bay Area Climate Change Summit that allows Hamilton to meet climate change targets, notably, "that all diesel vehicles be decommissioned by 2030 and all vehicles electrified by 2050."

This report presents the options and seeks City Council's approve of a phase-in strategy of 89 internal combustion type-engines to be converted to Battery Electric Vehicle (BEV) to be replaced in 2022 to 2024. The first phase is to target light-duty vehicles. The development and implementation of the BEV strategy is a critical component of transitioning the City of Hamilton to a low-carbon city and its journey to meeting aggressive targets by 2050.

In order to successfully transition to BEV's, the City will have to invest in Electric Vehicle (EV) charging infrastructure. Natural Resources Canada (NRCan) is receiving applications towards a Zero-Emission Vehicle Infrastructure Program (ZEVIP), with a deadline of June 22nd, 2021.

Based upon the program guidelines, the EV Charging Station Infrastructure Project (EV Project) has been recommended for Council's endorsement to be submitted under the ZEVIP. The EV Project with a total cost of $600 K would result in the installation of a total of forty-nine (49) charging stations. Should the City's submission be successful, the ZEVIP will fund $300 K with the City's 50% share to be funded via an Unallocated Reserve account.

The purchase of 89 BEV's and charging infrastructure will require a $2.5M incremental investment over the next 3 years (2022-2024), approximately a 62% premium above the conventional internal combustion type-engine vehicle equivalent.

Implementation of all the initiatives outlined in this report can reduce the City's GHG's by 18.4% by 2024.

Alternatives for Consideration – See Page 12

FINANCIAL – STAFFING – LEGAL IMPLICATIONS

Financial: The replacement cost of the vehicles (for internal combustion type-engines) that are scheduled for renewal will be funded from the Fleet Reserve with a base investment of $3.04M for 89 light-duty vehicles. If approved by Council, the replacement investment will go towards a conversion strategy from internal combustion engines to electric vehicles.

The action plan outlined in Report PW03147(e) will result in additional annual capital fund requests for the incremental cost to purchase BEV's and charging equipment (approximately a 62% premium on the BEV acquisition). The additional funding that will be required above the base investment to purchase the same class of vehicle in a BEV powered configuration as outlined in "Appendix "D" to report PW03147(e).

The cost of the charging station equipment and the BEV incremental cost will be requested through the Annual Capital Budget process as a one-time request in the respective years as illustrated in Appendix "D" to report PW03147(e) for the 89 electric vehicles & 49 charging stations, to be funded from the Unallocated Capital Reserve. This will be for the initial purchase only. Subsequent replacement of BEV's will be funded through the existing Vehicle and Equipment Fleet reserve that will be adjusted and funded from the operating department's annual contribution to the reserve.

Schedule 1:

Vehicle Annual (Incremental) Contribution to Fleet Reserve (est.)	
Vehicle – 8-year Life Expectancy	Annual Contribution to Fleet Reserve
Two Wheel Drive SUV	$3,750
Two Wheel Drive SUV-BEV	$6,060

Schedule 2 - BEV's will have decreased operating costs on fuel and maintenance:

Two Wheel Drive SUV-BEV Annual Operating Cost (est.)	
Maintenance	$250
Gas (less kwh)	$1000

Staff are preparing an application submission for a grant funding program to purchase and install charging station infrastructure. The Government of Canada, under the Department of Natural Resource Canada (NRCAN) has released a Rebate Program for "Zero-Emission Vehicles" that will provide up to 50% off the total project costs. The project must include installation of a minimum twenty (20) EV charging stations

including a minimum of two (2) fast chargers or a combination of chargers of all charging levels (Level Two and Level Three).

A new reserve fund will be established in the future to fund charging equipment scheduled replacement. This reserve will be funded through usage charges.

Staff will establish the cost/kwh and add a premium that will fund the reserve to facilitate future replacement of charging stations. Cost/kwh will impact each operating department's operating budget and will be approved through the annual operating budget approval process.

Periodic requests to additionally fund the reserve will be made to provide redundancy and install or enhance supply lines and backup generator systems.

Maintenance to charging station equipment will be funded from a newly established operating expense account in Fleets Services operating budget.

Staffing: Not Applicable.

Legal: It is anticipated that the City will be required to enter into a contribution funding agreement to receive ZEVIP grants and may need to enter into other ancillary agreements or pass by-laws to receive funding.

HISTORICAL BACKGROUND

In 2004 Council approved Report Fleet Services Operational Review Report and Presentation by TkMC (PW03147) - (City Wide) directing staff to implement the Central Fleet Strategic Plan. This plan included preparing a Green Fleet Transition Plan to provide an affordable way to use new vehicle and fuel technology to reduce fuel consumption and exhaust emissions.

In June of 2005 Council approved the Green Fleet Implementation Plan (PW03147(b)) - (City Wide) (Item 8.2). This first phase was to start in 2006 for a term of two years and included the introduction in the use of Biodiesel and the purchase of hybrid electric vehicles.

Phase II Green Fleet Implementation Plan (PW03147(c)) was approved in May 2009 for a term of two years until 2011. The second phase approved the continuation of previously approved strategies and identified other potential technologies and improved business practices that could be incorporated.

Although no further phases were approved after 2011, Fleet continued to take steps in improving efficiencies and providing options for operating departments to decrease their

carbon footprint. Fleet Services' focus on a greener fleet was limited to what was scarcely available in the automotive industry. Staffs prudent approach was based on what could be reasonably implemented by balancing greater environmental impact while being fiscally responsible. Staffs strategy up to now was based on industry best practices, with a proactive focus on:

- Right sizing;
- decreased lifecycles;
- new technology demonstrations;
- alternative powered options.

In March 2019, Council approved a declaration that "a climate emergency exists that threatens the city, region, province, nation, civilization, humanity and the natural world." In response, the City's Green Fleet Strategy includes recommendations and alternative actions to reduce the City's impact on our local environment, including the following, proposed by the Bay Area Climate Change Summit and adopted by City Council on March 27, 2019:

- decommissioning all diesel vehicles by 2030;
- all vehicles be electrified by 2050.

In April 2020 the City of Hamilton's Fleet Services Section issued a Request for Quotation (RFQ) for the services of a consultant to provide the city with an ambitious roadmap that is achievable for the Energy, Fleet & Facilities Management Division within Public Works to reduce GHG emissions from Fleet Services vehicles and equipment. The scope of the study did not include HSR, Fire or EMS. The successful consulting firm was Richmond Sustainability Initiatives (RSI) who since 2005 has collaborated with fleet managers, technology providers, subject matter experts and automotive manufacturers to find viable solutions, technologies and best management practices for reducing operating costs and vehicle emissions.

POLICY IMPLICATIONS AND LEGISLATED REQUIREMENTS

Corporate Energy and Sustainability Policy

- The Green Fleet Strategy will dovetail with the Corporate Energy and Sustainability Policy with the strong focus on lower emission vehicles. NOTE: Fleet and Transit contribute the most to the Corporate emissions (49% based on 2018 emission data). The Green Fleet Strategy Action Plan will align to the Corporate Energy and Sustainability Policy targets and Fleet will report annually with an accompanying report to the Annual Energy Report.

RELEVANT CONSULTATION

The following departments provided input into the development of this report or provided input/comments to the consultant's report:

- Corporate Services: Financial Planning, Administration and Policy Division, Legal Services Division and the Procurement Section of Financial Services
- Planning and Economic Development Department
- Healthy & Safe Communities Department (Air Quality & Climate Change)
- Public Works Department: Energy, Fleet and Facilities Division
- Corporate-Wide Survey: The Green Fleet Strategy Report recognized the value of stakeholder engagement and user group participation on gaining staff perspectives on environmental issues and green fleet initiatives.

External consultation included:

- Consulting Firm: Richmond Sustainability Initiatives provided a Green Fleet Strategy Report (attached hereto as Appendix "A" to Report PW03147(e));
- City of Hamilton Corporate Contract Vendor, Ark-tech Electrical Contractor;
- Charging Station providers to gain an understanding of available products, requirements, software platforms, and budgetary figures.

Staff surveyed other municipalities on use of Biofuels and challenges or concerns.

ANALYSIS AND RATIONALE FOR RECOMMENDATION

The consultant reviewed one year of fleet data and determined that fleet vehicles produce 9,371 metric tonnes of GHG's annually.

This report summarizes a proposed action plan based on the recommendations provided by the consultant. The action plan identifies how the recommendations will be prioritized along with Cost Impacts and GHG emission reductions as they apply to the recommendations.
Fleet will implement the recommendations as identified in the Green Fleet Action Plan beginning in 2021 through to 2024.

This includes:

- 3 year forecast of vehicles that can be replaced with Battery Electric Vehicles (BEV's) and replace as scheduled;
- Coordinate the supply and installation of electric charging infrastructure requirements;

- a pilot on the use of Biodiesel to identify highest blend possible;
- Eco Driving and Anti-Idling training for all fleet operators;
- Anti Idling awareness campaign.

Implementation of BEV's offer the largest impact in reducing GHG's than any other option that is currently available in the automotive market. The City can realize a reduction of 335 tonnes of GHG's annually by replacing the 89 SUV's, Compact Vans and Half Ton Pick Up Trucks that are scheduled for replacement with a fully electric option over the next 3 years.

Fleet staff forecasted which vehicles can be replaced with BEV's in the next three years and beyond. After meeting with major manufacturer representatives in January 2021 a list of vehicle classifications that were expected to be available in BEV configurations up to end of 2024 was determined.

The following Schedule "3" – BEV Replacements 2021 – 2024 shows the number of vehicles scheduled for replacement that are available in a BEV configuration.

Schedule 3 – BEV Replacements 2021 – 2024:

BEV Replacements 2021-2024					
Department	Replacement Year				
	2021	2022	2023	2024	Grand Total
Healthy and Safe Communities		2	1	1	4
Planning & Economic Development	5	12	3	23	43
Public Works	9	8	9	16	41
Total	14	22	13	40	89

Two-wheel drive SUV's are currently available, four-wheel drive SUV's, compact and half ton pickup trucks are expected to be available in 2022 and compact and half ton vans in 2023.

Electric charging infrastructure requirements and locations:

Based on the BEV replacement schedule Fleet Planning worked with the operating departments to determine appropriate charging locations.

As illustrated in Appendix "C" attached to Report PW03147(e) EV Charging Station Hub Locations 2021-2024 shows the plotted locations. Fleet Planning has researched the

market to identify charging station solutions, configurations, hardware, software and scalability options.

To summarize the lifetime cost impacts associated with the purchase and operation of all 89 BEV's refer to Schedule "4" below, BEV & Charging Infrastructure Lifetime Cost Analysis includes most of the defined costs.

Schedule 4 – BEV & Charging Infrastructure Lifetime Cost Analysis:

BEV & Charging Infrastructure Lifetime Cost Analysis	
Cost Centre	Value
Vehicle Premium for Electric (Budget Estimate) (incremental)	$(1.9) M
Charging Infrastructure-Grant Approved	$(300) K
Lifetime Fuel Savings (gas – kwh)	$895K
Lifetime Maintenance Cost Savings (50% of current maintenance cost)	$250K
Total	$(1)M OR $(125) K annually

Note: Lifecycle calculation is based on an 8-year life of the vehicle.

Depending on electrical system requirements, the cost of Level Two, 240-volt chargers including installation is approximately $9 K. Each Level Two charger can serve two (2) vehicles at any time of day; typically charging is done overnight during the off- peak period. For a light-duty BEV with a fully depleted battery with a range of 400 km it will take on average ten (10) hours to fully charge.

The cost to install a Level Three Direct Current Fast Chargers (DCFC) is approximately $85 K. Costs for a fast charging station are dependent on factors such as the electrical supply available at the chosen charging site and site preparation costs. For a light-duty BEV with a range of 400 km discharged to 20% battery charge level (80 km range remaining), it would typically take thirty (30) minutes to fully charge.

Based upon the program guidelines, the EV Charging Station Infrastructure Project (EV Project) has been recommended for Council's endorsement to be submitted under the ZEVIP offered by NRCan. The EV Project with a total cost of $600 K would result in the installation of a total of forty-nine (49) EV charging station, includes; 47 Level Two, 240-volt Chargers and 2 Level Three Direct Current Fast Chargers. Should the City's submission be successful, the ZEVIP will fund $300 K with the City's 50% share to be funded from the Unallocated Reserve account.

The ZEVIP is a 5-year $280 M program ending in 2024 and its objective is to address the lack of charging and refueling stations in Canada, one of the key barriers to EV adoption, by increasing the availability of localized charging opportunities where

Canadians live, work, and play. With the number of electric vehicles on the road positioned to grow at an exponential rate (to reach 30% of the global market share by 2030), it is prudent to expand the availability of EV charging systems across Hamilton. The project must include the installation of a minimum 20 EV charging stations of all charging levels (Level Two and Level Three). Applicants are eligible to receive up to 50% of total project costs, to a maximum of $5 M per project. On March 21, 2021, NRCan opened an application intake to the ZEVIP and is accepting proposal submissions until June 22, 2021.

The consultant provided several alternative fuel options that will provide GHG reductions. The option presenting the fewest operational challenges and no additional capital dollars is biodiesel. This option can be implemented by Q3 2021 as no significant modifications to City owned fuel sites are required and diesel-powered vehicles are not expected to encounter any adverse performance. Assuming an average blend of 12.5% biodiesel to all diesel fuel consumed by fleet vehicles, GHG's will be reduced by 890 tonnes annually. Other strategies that will have an impact and will be adopted are:
Eco-Driver and Anti-Idling training followed by an Anti-Idling awareness campaign that will be launched in 2021.
Pilot on Biodiesel to identify highest level of blend possible:

The consultant provided a full review of Biodiesel with expected reductions in GHG's based on concentration mixtures.

Fleet Staff have reviewed the consultant's report regarding the use of biofuels against various manufacturers warranties and vehicle operation impacts and did not identify any significant areas of concern.

The trial can begin in 2021 for a period of one year. A 20% Biodiesel blend (B20) will be used from mid-April to mid-October and a 5% Biodiesel blend (B5) will be used from mid-October to mid-April.

Fleet Services and the Office of Energy Initiatives met with the current fuel supplier representatives to discuss any operational concerns and precautions that the City can take to implement a trial of B20 use in summer and B5 use in winter.

Biodiesel will thicken in colder temperatures therefore a lower blend mixture is recommended during colder seasonal months.

Biodiesel can act as a detergent on fuel storage tank walls and can also absorb water therefore it was recommended that the City execute a due diligence program to address any water in storage tanks and ensure proper filtration at all diesel dispensers and pumps.

The City Yards at 1301 Upper Ottawa and 330 Wentworth Street North were selected as one (1)-year trial locations. These yards have a mix of both above ground and below ground fuel storage tanks and store vehicles and equipment indoors and outdoors. This will provide data for any operational concerns that may arise.

There is no additional cost for a blend of up to 20% biodiesel and the results of the trial will reduce GHG's by 285 tonnes. Implementation to all diesel-powered Fleet vehicles will result in a GHG reduction of 890 tonnes annually.

Eco Driving & Anti-Idling training for all fleet operators:

The consultant reviewed the City's data and determined that elimination of idling and educating drivers on Eco friendly driving methods could reduce GHG's by more than 1600 tonnes annually.

Fleets Driver Safety and Compliance section will add a 50-minute Eco-Driver training segment to its current Profession Driver Improvement Course.

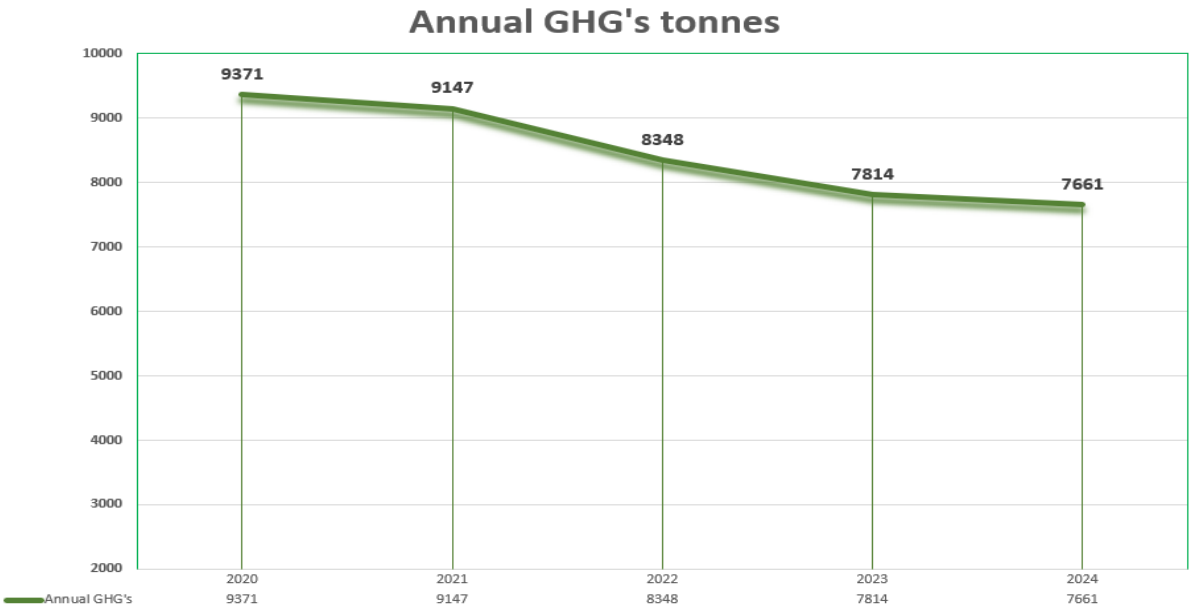
This group will also enhance the City's Driver Safety & Compliance Manual Training presentation to include an Anti-Idling segment.

Additionally, Fleet Services will deliver an Anti-Idling awareness campaign that will include:

- Creation of posters for display in common areas throughout yards and work locations;
- Stickers for vehicle dashboards;
- communication for display on existing monitors throughout the yards and work locations.

Fleet Staff is working with the City's current Automated Vehicle Locating (AVL) software provider to determine what reports can be provided to each Department/Division/Section/Group to track idling. This data will assist in targeting additional training, measuring success and provide leaders with an awareness of operational impacts to GHG's and opportunities to implement mitigating strategies that can include route planning and optimization and trip reductions.

Schedule 5 - Annual GHG's tonnes:



The strategies outlined in this report will be implemented at various times between 2021 to 2024 and as such the calculation of GHG reductions are projected with a very conservative approach. As stated earlier in the report the implementation of all these initiatives can reduce the City's GHG's at an estimated rate of 18.4% by 2024; albeit at a premium investment of 62% higher investment from a traditional replacement cost to an electric vehicle solution that will have a significant and lasting improved impact to the environment.

ALTERNATIVES FOR CONSIDERATION

Alternatives provided by the consultant and detailed in the Green Fleet Strategy Report, attached to Report PW03147(e) as Appendix "A", reference material on pages 133 to 179, Details on Fuel-Reduction Solutions and Best Management Practices, some of which have already been implemented by Fleet Services and many of which are considered as exploratory, potential new, go-forward strategies.

Installing a smaller number of EV charging stations could be an alternative approach, however, purchasing fewer than 20 EV chargers would result in the project being ineligible to be submitted under the ZEVIP offered by NRCan. This alternative is not recommended as the reduced number of new EV charging stations and existing public charging stations may result in an insufficient number of EV charging stations being available across the City to accommodate increasing EV charging demand.

ALIGNMENT TO THE 2016 – 2025 STRATEGIC PLAN

Community Engagement and Participation
Hamilton has an open, transparent and accessible approach to City government that engages with and empowers all citizens to be involved in their community

Economic Prosperity and Growth
Hamilton has a prosperous and diverse local economy where people have opportunities to grow and develop.

Healthy and Safe Communities
Hamilton is a safe and supportive City where people are active, healthy, and have a high quality of life.

Clean and Green
Hamilton is environmentally sustainable with a healthy balance of natural and urban spaces.

Built Environment and Infrastructure
Hamilton is supported by state-of-the-art infrastructure, transportation options, buildings and public spaces that create a dynamic City.

Our People and Performance
Hamiltonians have a high level of trust and confidence in their City government.

APPENDICES AND SCHEDULES ATTACHED

Appendix “A” to Report PW03147(e) - Green Fleet Strategy Report – City of Hamilton
Appendix “B” to Report PW03147(e) – Green Fleet Action Plan
Appendix “C” to Report PW03147(e) – EV Charging Station Hub Locations 2021 – 2024
Appendix “D” to Report PW03147(e) – Green Fleet Strategy Incremental Capital Requirements 2022- 2024