Clarington

Clarington's Five-Year Electric Vehicle Action Plan (EVAP)

Introduction

In March 2020, the Municipality of Clarington set targets to reduce corporate greenhouse gas (GHG) emissions 35 per cent by 2030 from 2018 levels and achieve net-zero emissions by 2050. The 2018 corporate GHG emissions inventory shows that municipal fleet vehicles are responsible for 13.8 per cent of municipal GHG emissions.

Similarly, the 2015 Durham Community Energy Plan shows that the transportation sector is responsible for 47 per cent of region-wide emissions. By transitioning Municipality's fleet from internal combustion engine vehicles (ICEs) to electric vehicles (EV)s and by helping the public to also make the switch, the Municipality is taking an important step to reduce carbon emissions and respond to climate change.

The switch to EVs is already underway. In June 2021, the Federal government set a target for all passenger vehicles sold in Canada to be electric by 2035. All major auto manufactures now have models of EVs available, many of which are less expensive to operate and maintain than ICE vehicles. More models of EVs, including transport vans and pickup trucks are coming online in 2022.

This Electric Vehicle Action Plan (EVAP) was created to guide the Municipality's corporate transition to EVs over the next five years (2022 to 2026). The EVAP maps out the Municipality's annual EV purchases and infrastructure needs and makes recommendations for the timing and ideal locations for EV charging stations. EVs offer Clarington an opportunity to significantly reduce GHG emissions and fuel costs from the municipal fleet while simultaneously encouraging community-wide uptake of EVs by demonstrated leadership in adoption and investment in charging infrastructure.

The implementation of this plan will require interdepartmental coordination as the Municipality adapts to a new vehicle type and fueling system. The public charging aspect of this plan is intended to serve the long-term needs of the community on Municipal properties.

There is a gap in public EV charging in Clarington that needs to be filled.

Objectives

On March 2, 2020, Council passed resolution #C-066-20: "*That it be policy for all future car and SUV purchases be electric vehicles or similar vehicles without tailpipe emissions where practicable.*" This plan puts Clarington on a path to fulfill this resolution. The objectives of this plan are: 1) to transition Clarington's municipal fleet to EVs; 2) provide public EV charging on municipal properties to fill the current public EV charge station service gap, and 3) reduce corporate GHG emissions as part of the Municipality's efforts to achieve net-zero carbon emissions by 2050.

This plan will also satisfy action 1.30 of the Clarington Corporate Climate Action Plan, to update the Municipal Green Fleet Strategy and establish a five-year plan to electrify municipal fleet vehicles where practicable. This plan is intended to guide the transition of the municipal fleet to include at least 25 low carbon electric hybrid vehicles (hybrids),

plug-in hybrid electric vehicles (PHEVs) and electric vehicles (EVs) over the next five years.

In addition to transitioning the municipal fleet to electric, the installation of public EV charging stations will demonstrate Clarington's commitment to serving the public. The EVAP proposes 60 charging points to be installed across the Municipality by the end of 2026 to meet the needs of municipal fleet and public vehicles. The installation of public EV stations will bridge the current service gap in Clarington and contribute to Ontario's much-needed network of public EV charging stations. *Figure 1* illustrates the current gap in charging infrastructure in Clarington.

Figure 1 - EV charging stations in Southern Durham Region, illustrating the service gap in Clarington

About EVs and EV Charging

Electric Vehicle Basics

Unlike traditional internal combustion engine (ICE) vehicles, which rely on gasoline or diesel fuel to power an engine to move, electric vehicles use an internal battery and electric motor to operate. Because of this, there are no tailpipe emissions from electric vehicles. By switching to EVs, electricity providers can reduce overall transportation emissions by integrating renewable, low carbon energy sources into electrical grid, such as wind, solar, hydroelectric, and nuclear. The below chart describes the main types of light-duty zero and low emissions vehicles currently available.

Type of Vehicle	Description
Hybrid Vehicle	A vehicle with a gasoline engine and electric motor, both of which are used to power the car. These models cannot be plugged in to charge and typically rely on regenerative braking to charge the battery.
Plug-In Hybrid Electric Vehicle (PHEV)	Like hybrids, PHEVs employ both a gasoline engine and an electric motor. The main difference is PHEVs use a wall plug to charge, have a larger battery, and (therefore) can go further using only battery power, using the gasoline engine as a backup.

Zero Emissions Vehicle (ZEV)	A zero emissions vehicle is any vehicle that does not directly produce emissions from operating (what would be considered 'tailpipe emissions' from the above vehicle types). Most ZEVs use an electric battery and motor, but hydrogen fuel cell vehicles also fall into this category (given the lack of options and available infrastructure, hydrogen vehicles have not been considered as part of this plan).
Electric Vehicle (EV)	An electric vehicle is powered solely by a large internal battery and electric motor. They can use wall plugs to charge or use fast charging infrastructure to replenish the battery faster. The motors are much less complex than ICE's and a fully electric car has a substantially farther range than a PHEV does using solely it's battery. These are also referred to as battery electric vehicles or BEVs.

Table 1 - Types of Electric Vehicles

EV Charging Stations

To fuel Clarington's electric vehicles, charging stations will need to be installed across the Municipality at convenient locations, with enough grid capacity to accommodate them. There are three kinds of EV chargers which the Municipality could install for fleet and public use. Each has different infrastructure requirements and price points.

Level 1 AC Chargers (120V)

The slowest of the three charging options. Level 1 charging involves plugging the electric vehicle into a standard 120-volt wall outlet and is a popular choice for overnight charging at home as it does not require any additional infrastructure or electrical capacity. The rate of charge or 'Range Per Hour' (RPH) is 8km/h. Level 1 chargers are best suited for vehicles that are driven less than 100 kilometres a day and can be left to charge overnight. This entry-level charger usually operates on a standard 15 or 20-amp circuit. Level 1 chargers do not come at an extra cost as the 120-volt outlet is a household standard, and the charging cable is included with the EV.

Level 2 AC Chargers (240V)

Level 2 chargers are also common for overnight at-home charging of EVs and are increasingly common in public parking lots where drivers stay for relatively long periods, such as outside a mall or grocery store. Level 2 chargers are the most common type of public or fleet charger. They require dedicated infrastructure and electrical capacity to operate and are most useful for vehicles that will be plugged in for at least an hour. At 240 volts, Level 2 chargers deliver an RPH between 19 to 40 kilometers depending on the model of charger and EV type. These chargers can range from 20 to 80 amps (32 amps being the most common). The installation costs for the infrastructure can range from $2,500 to $15,000.

DC Fast Chargers (480V)

Direct current fast chargers (often called Level 3 chargers) can deliver an RPH charge of over 160k/h; some EVs can have their battery charged to 80 per cent in as little as 30 minutes. They are commonly installed along highways or long-distance routes where it is expected an EV will need to recharge and time is a factor. It should be noted that not all EVs are equipped with a DC fast-charging port, and some can only utilize Level 1 and 2 chargers. These chargers have the highest installation price point as they have higher electrical requirements, and more electrical infrastructure is required as they can operate anywhere from 60 to 800 amps. The typical installation price of a Level 3 charger is $75,000 and up.

Networked vs. Non-Networked Stations

Another consideration when installing EV infrastructure is whether to invest in networked or non-networked chargers. The main benefit to non-networked stations is the purchasing and servicing costs are lower than networked stations. Non-networked stations do not feature an internet connection and therefore do not have the ability to charge a user fee, committing those who install them to provide free charging.

By contrast, networked stations give the Municipality the capability to apply user fees (to supplement maintenance and replacement costs) and track fleet fuel consumption by car for accurate departmental billing. Networked stations are slightly more expensive to purchase and require a fee to be paid to a service provider. Networked stations provide powerful use-management tools that give the Municipality the ability to set charge and idling fees, send reminders to users whose batteries are fully charged, restrict public use of fleet chargers during specified periods, and collect data on usage trends.

After consideration of the above charge station capabilities and the most likely usage patterns for fleet and public charging, the chargers which will be primarily used in Clarington will be networked, Level 2 chargers. These chargers will allow fleet and public usage to be tracked and billed appropriately while also monitoring wider usage trends, which will inform future installation decisions. As fleet vehicles will sit idle overnight, their battery will have time to fully recharge before they are needed the next day. These chargers will be useful to residents visiting municipal buildings or public parking lots for 30 minutes or more. According to research conducted by Trent University, networked Level 2 chargers balance cost and reliability and are the appropriate choice for Clarington.

Rationale for Switching to Electric

Direction from Council

On March 2, 2020, Council passed Resolution #C-066-20: "*That it be policy for all future car and SUV purchases be electric vehicles or similar vehicles without tailpipe emissions where practicable.*"

On March 3, 2020, Clarington Council approved Resolution # GG-083-20, declaring a climate emergency, stressing the need to act to respond to the threats that climate change present to the Municipality.

On March 2, 2021, Council's direction to transition the municipal fleet to zero-emission vehicles was further strengthened with the endorsement of the Clarington Corporate Climate Action Plan (CCCAP). The CCCAP sets targets for the Municipality to reduce corporate GHG emissions 35 per cent by 2030 and achieve net-zero emissions by 2050 from 2018 levels – a goal which is only possible with the adoption of EVs across the fleet. Action 1.30 in the CCCAP calls for the creation of a green fleet strategy and a plan to electrify the corporate fleet. More broadly, the CCCAP supports climate actions that reduce corporate energy use and GHG emissions.

Alignment with the Region of Durham

Clarington's push to switch its fleet to EVs and develop EV charging infrastructure is supported by the Durham Community Energy Plan (DCEP), which was endorsed by Clarington Council on November 25, 2019, through Resolution #GG-551-19.The DCEP sets a goal to support the transition of the transportation sector in Durham to electric.

Clarington has already collaborated with the Region of Durham, Ajax, Whitby, and Oshawa, on two applications to the federal Zero Emissions Vehicle Infrastructure Program (ZEVIP) for funding to install EV charging infrastructure across the region. Both applications have been awarded.

EV Support in Ontario

As referenced in the Made-in-Ontario Environment Plan, the Provincial Government has signaled its support for an EV transition by investing $295 million into the Ford Oakville Assembly Complex. The investment will transform the automobile manufacturing facility into a battery electric vehicle production facility.

On November 17, 2021, the provincial government announced that it will work with the auto industry to prioritize EVs in Ontario by: 1) supporting vehicle and parts production for electric vehicles; 2) establishing and supporting an electric battery supply chain ecosystem; 3) innovating on EV development; and 4) investing in auto workers. Investment in domestic electric vehicle production is a positive indicator that the provincial government has confidence in the growing EV market.

Direction from the Federal Government

On June 29, 2021, the Federal Government announced a plan to ban the sale of light duty ICEs by 2035, accelerating their previous target to have 100 per cent EV sales in Canada by 2040. New interim targets are currently under development, though it is expected that they will be more ambitious than the previous plan's goal of converting 10 per cent of all light-duty vehicle sales to ZEVs by 2025 and 30 per cent by 2030. This mandatory target is part of the federal government's plan for nationwide carbon neutrality by 2050 and is supported by a series of policies and incentives to help consumers, manufacturers and governments prepare for the transition.

To spur demand from consumers, the federal government has committed $587 million to the popular federal EV rebate program, which offers those who buy zero-emissions vehicles up to $5,000 in purchasing rebates. To ease the transition for the automotive industry, tax cuts and strategic partnerships are being rolled out for affected businesses.

The Federal Government has also committed $460 million to build EV charging infrastructure across the country. The Zero Emissions Vehicle Infrastructure program (ZEVIP) (from which Clarington has already benefited) will distribute $240 million of the total committed funds to subsidizing EV charge station purchase and installation costs. With this plan in place, Clarington is in an ideal position to access for federal funding to install EV stations for public and fleet use.

Environmental Benefits

GHG emissions from vehicles (tailpipe emissions) are some of the easiest emissions to pinpoint and eliminate, as they come from a single source and can be easily quantified. Unlike ICEs, which burn fossil fuels and emit GHGs during operation, EVs rely on the electricity grid for their energy. As such, EVs are as ‘clean’ as the electricity grid used to power them. Most of Ontario’s electricity is produced from low or no carbon sources, including nuclear, hydro, and renewable energy sources; with some backup power coming from natural gas ‘peaker plants,’ which compensate for spikes in energy demand. A transition to EVs will realize emissions reductions, reduce air pollutants, and significantly contribute to achieving the Municipality’s net-zero emissions target.

The public switch to EVs is already taking place. Current trends in vehicle purchases, coupled with the federal government’s pledge to ban the sale of ICEs by 2035, indicate that public adoption of EVs will increase sharply in the coming years.

Auto manufactures are also pushing the switch to EVs. All major auto manufactures are now selling EVs, with over 50 models of EVs for sale in 2022. All major auto manufactures have publicly committed to continuing the transition to EVs.

The EVAP includes options for installing public EV charge stations in strategic locations on municipal properties to support the public to transition to EVs. By installing publicly accessible chargers, the Municipality is providing the community with needed EV charging infrastructure and actively promoting the reduction of community GHG emissions that contribute to climate change.

Community Benefits

Clarington residents face barriers to widespread EV adoption, including a lack of charging infrastructure and a lack of trust in the reliability of EVs. Clarington can address some of these concerns by educating the public about EV technology and providing EV charging stations for the public to use. The visible presence of more charging stations and EVs on Clarington’s roads will also help to normalize the EVs as a trusted option for consumers.

In a report completed by Trent University in 2020 for the Municipality of Clarington, range anxiety was identified as one of the principal concerns cited by those considering

an EV purchase, a city-led effort to build out local charging capacity will accelerate the community adoption to EVs.

A community-wide transition to EVs will benefit the community in several ways: The electric motors in EVs are much quieter than ICEs. Therefore, reducing the number of ICE vehicles on Clarington roads will reduce noise pollution in urban neighbourhoods; switching to EVs will reduce the number of vehicles emitting tailpipe emissions, improving air quality across the Municipality; Reducing (and eventually eliminating) tailpipe emissions will reduce greenhouse gases (most notably carbon dioxide and methane) and local air pollutants (notably carbon monoxide, sulfur oxides and volatile organic compounds).

Beyond air and noise pollution, electric vehicles will bring increased reliability and decreased operating costs to owners. The simplicity of an electric motor and the reduced number of moving parts in an electric car means that EVs have been found to be more reliable and require less regular maintenance than ICEs. Lower maintenance costs are coupled with cheaper fuel prices to bring a lower total cost of ownership after the upfront purchase price is taken into consideration (Appendix C – Vehicle Cost of Ownership).

The public EV stations proposed in the EVAP are intended to be revenue-neutral, ensuring fueling costs for residents stay low. As maintenance and replacement costs for the charging stations are well known, EV fueling costs from municipal charging stations will remain predictable and relatively unchanging over the coming years. While gasoline and diesel prices are anticipated to rise with the federal carbon tax, EV drivers can expect to benefit from low fuel costs relative to petroleum-based alternatives.

Cost Considerations

Shifting Vehicle Lifecycle Costs

Transitioning to an EV fleet requires a reconceptualization of municipal vehicle budgets. Currently, electric vehicles have higher Manufacturer Suggested Retail Prices (MSRP) than similar ICE models. Despite their higher MSRPs, EVs offer lower fuel and maintenance costs over the lifespan of the vehicle.

While maintenance costs between ICEVs and EVs vary significantly depending on vehicle make, model, drive cycle and other factors, research shows that EVs have substantially lower maintenance and fuel costs. EVs contain fewer moving parts and have fewer fluids to change than ICE vehicles.

The Ontario Ministry of Transportation estimates that, for a car driven 20,000 km/year, the average yearly fueling cost for EVs is approximately $530; a similar size ICE would cost $2,500. The estimates assume overnight (off-peak) charging and a gasoline price of $1.20/L (2020).

A 2018 report from the 2 Degree Institute estimates that combined fuel and maintenance costs are 66 per cent less per year for EVs than they are for similar ICEs in Ontario. Taking into consideration upfront purchase cost, fuel, and maintenance, EVs

cost on average $27,000 less than ICEs over a 15-year life of life of the vehicle (250,000km)

Most municipal vehicles in Clarington are replaced within 7 years, before they require serious or ongoing repairs. However, EVs offer savings on routine maintenance costs as the electric motor and drive train do not need regular servicing (such as the oil changes and engine maintenance required by ICEs). The relative simplicity of EVs compared to ICE vehicles reduce the risk of unexpected malfunctions.

A 2001 report by the Clean Air Partnership, which compares EV and ICE vehicles in fleet applications in London Ontario and The Frasier Valley Regional District, all-electric EVs save more than $3,000 from reduced fuel and maintenance costs, compared to ICE vehicles the current fleet vehicles (based on average 13,000km/year and service life of 7 years).

With current government incentives, current carbon tax, and reducing EVs prices, and increasing petroleum fuel prices it is probable that EVs would outperform ICEVs on total cost of ownership as fleet vehicles in Clarington.

As such, and departmental budgets will need to account for a higher upfront purchasing cost for EVs with the understanding the Municipality will likely save money over the 7-year replacement life of the vehicle. See Appendix C for more information about these figures.

Purchasing Incentives

To encourage electric vehicle purchases, the Government of Canada has launched the Incentives for Zero Emissions Vehicles Program (iZEV), which offers rebates of up to $5,000 on the purchase of new electric vehicles. The federal government has committed to the iZEV program through the 2022 fiscal year, but at this point, further funding has not been announced.

Federal Electric Vehicle Incentives (July 2021)

Type of Vehicle	Financial Incentive (rebate)	Eligibility Definition
Battery Electric Vehicle, Hydrogen Fuel Cell Vehicle, or Long-range Plugin Hybrid Electric Vehicle	$5,000	All zero-emissions vehicles or Plug-in hybrids with a battery capacity greater than 15kWh, with a base model MSRP of $45,000 or less.
Short-range Plugin Hybrid Electric Vehicle	$2,500	All Plug-in hybrid vehicles with a battery capacity lower than 15kWh, with a base model MSRP of $45,000 or less.

Table 2 - Federal Electric Vehicle Incentives (July 2021)

Charger Installation Costs

To fuel the EV fleet and offer charging options to residents, Clarington must invest in EV charging stations in advance of electric vehicle purchases. Many factors must be considered when costing new charging stations, including site design, transformer and panel upgrades, site preparation, EV station hardware, repair, and maintenance. A detailed breakdown of anticipated costs by location can be found in *Appendix A – EV Charger Installation Costs*.

Fleet Charging Stations

To provide predictability for staff, each fleet EV will be assigned a centrally located parking/charging spot, where the vehicle will charge each night. The number and location of charging stations has been mapped out as part of the EVAP process to provide predictability and security to departments purchasing EVs. Each department will continue to be responsible for budgeting for the purchase, maintenance, and fuel costs for the vehicles their department uses. *Appendix B* outlines by year the location and number of fleet stations to be installed, as well as the department(s) which will be using them and therefore responsible for including them in their budgets.

Public Charging Stations

As a service to the community, public EV chargers will be installed at high-traffic locations across the Municipality. Ideal public EV charge station locations were identified based on a set of criteria based on research conducted for the Municipality Trent University (outlined below). *Appendix B* identifies the location and number of public charging stations to be installed by year. These stations are primarily intended to be used by the public while they are accessing the nearby facilities, services, and businesses. While these chargers are considered public, they may be utilized by municipal fleet vehicles during the workday if needed. Fleet vehicles will be expected to charge overnight at their designated charging space.

As public stations will be located at municipally owned recreation complexes, buildings and parking lots, funding for public stations will be included in the Community Services department yearly budget. Council should consider increases to Community Service annual budget to accommodate the additional expenses associated with the installation and maintenance of community EV charging stations as a service to the community. Public charging stations are considered ancillary services offered to residents as an added benefit to residents accessing municipal facilities.

While seed funding will be needed to make the initial purchase for public EV stations, user fees will be applied to offset the maintenance, repair, and replacement costs for public stations. Fees for the use of public stations are intended to be revenue-neutral, encouraging public EV adoption while maintaining a reasonable fee for use.

EV Charge Station Incentives

The federal government has made funding available to assist with the proliferation of EV charging infrastructure through the Zero Emission Vehicle Infrastructure Program (ZEVIP). Through the ZEVIP program $280 million has been committed until 2024 to

subsidize 50 per cent of the costs associated with installing charging infrastructure up to $5000 per charge point.

Clarington has already benefited from federal ZEVIP funding. In Fall 2019, Clarington, in partnership with Durham Region, Ajax, Oshawa, and Whitby, successfully applied to Natural Resources Canada (NRCan) for funding through ZEVIP. This application secured 60 Level 2 charge points for the region, kickstarting a region-wide push for EV adoption. Clarington received approximately $21,400 from NRCan, subsidizing the cost of five public charge points in downtown Bowmanville.

In the Spring of 2020, Clarington, Whitby, Scugog and the Region of Durham successfully applied for a second round of ZEVIP funding to install a further 42 stations across the region. Clarington received approval for $82,000 from NRCan to subsidize the installation of 18 charge points across the Municipality ($4,554 per charge point). By the end of 2022, Clarington will have 21 public charge points and fleet charge stations.

Clarington staff will continue to take advantage of external funding opportunities for EVs and EV charging stations as it transitions its fleet to electric and develops public EV charging infrastructure on Municipal properties.

Other Considerations

Emergency Vehicle Exemptions

During the development of the EVAP Emergency and Fire Services staff expressed concerns regarding electric vehicle performance during emergency situations. Specifically, staff brought forward concerns regarding towing capacity, battery life and vehicle range during prolonged vehicle use in cold weather. Electric pickup trucks have only recently come to market. As such, there has not been a significant amount of time to assess their performance in real-world emergency situations. To ensure the reliability of vehicles during extended emergency situations, Emergency and Fire Services vehicles have been exempted from the EVAP. The EVAP recommends that Emergency and Fire Services prioritize vehicles with high energy efficiency and low carbon emissions when selecting vehicles moving forward. The use of EVs in Emergency and Fire operations will be revisited as more information about the use of EVs in emergency situations becomes available.

Expanding Vehicle Options and Technology

The EVAP includes only light-duty cars, vans, and trucks up to half-ton (equivalent to a Ford F-150). The electric vehicle options coming to market in 2022 and beyond are expanding. This is especially relevant for pickup truck and van replacements, which will provide more options for the Municipality when choosing vehicles. The EVAP will be reviewed annually to evaluate expanding EV availability to assess potential EV options for light, medium, and heavy-duty vehicles. Moving forward, staff will also consider less conventional electric vehicle options such as ice resurfaces, fire trucks, e-mobility scooters, e-bikes, and other ZEV options as they become available.

The goal of the EVAP is to convert Clarington’s fleet EVs across all municipal operations where practicable to do so. As electric vehicles become more prevalent,

more options and lower MSRPs will give the Municipality an expanded range of lower-cost vehicle replacement options. While the range of EVs is already around 400 kilometers per charge, the range if EVs is projected to increase as battery technology continues to improve.

Plan Development Process

Assumptions

The EVAP has been designed based on a set of assumptions about how EVs and EV charge stations will be used by staff and the public. These assumptions are based on best practices identified by staff through research and consultation with stakeholders.

Fleet Charging Infrastructure Assumptions

Assumption	Rationale
Each fleet vehicle will have a designated charge point and parking spot.	Designated EV charge points and parking spaces will provide simplicity and consistency to staff.
Future municipal buildings will be constructed with the inclusion of fleet charging stations, as appropriate.	Clarington will continue to expand its EV fleet beyond the 2026-time horizon of this plan and will require more charging capacity. It is much less expensive to design and build in charging capacity during initial construction than to retrofit buildings at a later date.
All EV stations will be located on municipal property.	Installing EV stations on municipal property simplifies construction timelines, lowers costs, and provides continuity of parking spot availability to staff.
100 per cent of eligible light-duty vehicles set to be purchased in the next five years will be electric.	Direction from Clarington Council requires a transition to EVs wherever practicable.
100 per cent of the municipal fleet will be electric by 2035 where practicable.	The federal government has set a target to ban the sale of light duty ICEs by 2035.
All EV stations will be networked.	Networked stations allow staff to track station use and can be used to charge a fee for public use.
Most of the EV stations will be ‘Level 2’ charging stations.	Fleet Vehicles will be parked there overnight; Level 2 stations balance cost and charging speed. Level 3 charge stations will be considered for charging fleet and public EVs in urgent situations.
Some Emergency and Fire Services vehicles will be exempt.	Concessions will be given for Emergency and Fire Services vehicles due to the lack

	of sufficient data about the use of EVs in emergency situations and the high need for vehicle reliability in emergency situations.
No stations will be located at small community halls.	These locations do not get enough use to be prioritized as part of the EV charge station site selection criteria (see site selection criteria below).
The number of stations installed is based on projected need and transformer capacity.	User needs and grid capacity are limiting factors for the installation of EV charge stations.
Station installations are intended to meet imminent need and prepare for future expansions.	Preparing sites for further rounds of charger installations will reduce the overall installation costs associated with transitioning the municipal fleet to electric.
Some fleet stations may be made available to the public during predetermined hours.	Fleet charging capacity may not be needed during the municipal working day; these stations could be utilized by citizens, maximizing charger utility.

Table 3 - Fleet Charging Infrastructure Assumptions

Public Charging Infrastructure Assumptions

Assumption	Rationale
The Municipality has a role in promoting community EV adoption to reduce GHG emission, noise pollution and air pollution.	By declaring a climate emergency, Clarington has taken a leadership role in fighting climate change. Encouraging the adoption of EVs in the community is a significant step in reducing GHG emissions causing climate change.
Future municipal buildings will include EV public EV charging stations in their design and construction.	Clarington will continue to expand its public charging network beyond 2026. It is much less expensive to design and install EV charging into new buildings than to retrofit existing buildings.
Municipally owned parking lot rehabs that meet the site selection criteria for public stations will be prioritized (see site selection criteria below).	Coordinating EV station installations with scheduled parking lot resurfacing will save on installation costs.
All EV stations will be located on municipal property.	Installing EV stations on municipal property simplifies construction, ensures control and ownership of stations stays with the Municipality.

The installation of public stations is based on community trends toward EV adoption.	EV sales are expected to increase exponentially over the next 14 years. The federal government has set a target to phase out (until the anticipated complete ICE phase-out by 2035)
All Stations are networked.	Networked stations allow the Municipality to track EV station use and allow for the application of a fee for service, based on Clarington's Fee Bylaw and Signage bylaw.
EV Charging stations will be revenue neutral.	The fee charged for the use of public EV stations will only be applied to cover the cost of operating, maintaining, and replacing the stations.
No stations will be located at small community halls	These locations do not get enough use to be prioritized as part of the EV charge station site selection criteria (see site selection criteria below).
The number of stations installed is based on projected need and transformer capacity.	Need and grid capacity are limiting factors for installing community EV stations.
Fleet vehicles can use public charging stations.	During the day, staff may need to charge their fleet vehicles at locations distant from their designated charging station. As the Municipality's primary duty is service delivery to residents, fleet vehicles will be permitted to charge at public stations.

Table 4 - Public Charging Infrastructure Assumptions

Plan Creation Methodology

Electric Vehicle Inventory Methodology

To create this plan the Municipal Interdepartmental Climate Change Working Group (ICCWG) convened to set the objectives of the plan and establish milestone dates. The ICCWG has been updated monthly throughout the creation of the plan to guide the development of the plan and review its content.

To begin, staff created a list of key stakeholders from each department with direct knowledge of future vehicle acquisitions. Identified stakeholders submit a list of all anticipated new and replacement vehicle purchases between 2021 – 2026. This list was analyzed, and all light-duty vehicles with suitable EV replacement options (cars, SUVs, transport vans, and light-duty trucks) were counted to create an anticipated 5-year EV inventory.

Once the number of EVs expected to be purchased over the next five years was established, it was used to determine how many charge points would need to be

installed each year to ensure sufficient charging capacity to accommodate yearly EV purchases. As a precautionary measure, and to leverage available federal funding, the installation of EV charge stations for over the next five years was prioritized for installation early in the 2022-2026 period, with most of the fleet charging locations scheduled to be installed in the next three years.

Once the EVAP was drafted and reviewed by the ICCWG, it was circulated more broadly to department heads for internal feedback. Several one-on-one meetings were also held with key representatives from Community Services, Emergency and Fire Services and Public Works to address the specific challenges or circumstances and incorporated into the plan.

EV Charger Site Selection

The EVAP focuses on retrofitting existing buildings and parking lots to install the charging capacity needed by fleet and public vehicles. It is expected that all new municipal buildings will integrate public and fleet EV charging into their designs, taking into consideration the site selection criteria outlined below.

A list of potential sites was compiled from all municipal properties, including buildings and parking lots. This list was initially assessed and refined by Community Services facilities staff and Public Works staff to eliminate locations that were deemed unsuitable for infrastructure installation. Locations were eliminated because they were remote, unused, or slated for demolition or sale. Small community halls owned by the Municipality were also excluded, as these locations are typically operated by third-party groups, complicating installation processes. The resulting list contained 38 potential sites to install public and fleet charging stations.

The sites were reviewed again and assessed for their suitability for fleet and public charging, creating a list for each. For each list, a set of criteria was developed to guide the site selection process for public and fleet chargers to ensure the optimal placement of EV stations. The site selection criteria were used to rank the remaining options. Sites were scored based on how many of the criteria were met, with grid capacity being a mandatory requirement for consideration. A complete list of sites and assessment criteria can be found in *Appendix B - Projected EV purchases by Year.*

Fleet Charger Suitability Criteria

After from the initial suitability assessment, five criteria were used to gauge the suitability of locations for fleet EV charger installation. Suitability criteria include:

- Near municipal offices or depots
- Near where staff are working
- There are enough parking spaces for staff personal vehicles and fleet vehicles
- There is enough space for an adequate grouping of EV chargers (4-8 stations)
- There is a transformer or electrical panel with sufficient capacity to accommodate the EV chargers

Public Charger Site Selection Criteria

After the initial suitability assessment, five criteria were used to gauge site suitability. Suitability criteria include:

- Significant traffic at the site
- Potential to attract users
- The area underserved by charging stations
- There is enough space for an adequate grouping of EV chargers (4-8 stations)
- There is a transformer or electrical panel with sufficient capacity to accommodate the EV chargers

For each list, locations scoring a 'Medium' or 'High' were prioritized for charge station installation within the next five years. Eight public charging locations and nine fleet charging locations were identified for development between 2021 – 2026. A timeline, broken down by year was created, listing the public and fleet charging stations that would be installed each year. Locations that can accommodate large banks of stations and locations where many fleet EVs can conveniently be parked and charged have been prioritized for early installations.

Once a list of prioritized locations was identified, it was circulated for feedback to members of the ICCWG and departmental staff whose fleet vehicles will be replaced with an EV during the plan's five-year time horizon. The finalized timeline of station installations can be found in *Appendix B - Projected EV purchases by Year*.

EVAP Adaptability

The EVAP is intended to be a living document, with amendments expected over the course of the five-year plan. Any changes made throughout the life of this plan should be made with the goal of expanding Clarington's fleet of EV charging infrastructure. Changes to the EVAP will be based on the availability of funding, the expansion of EV model availability, improvements to EV charging infrastructure and increased ambition by Municipal Council.

Yearly EV and Charge Station Breakdown

The following section summarized the information in Appendices A and B. The information contained herein is subject to change as departments and Council may shift priorities or ambitions regarding the below purchases. Vehicle purchasing years are especially subject to change as departments may opt to delay or expedite new vehicle purchases.

Yearly Overview

Year	New EVs/Hybrids purchased	New public chargers installed	New fleet chargers installed
2021	7	5	8
2022	3	6	8
2023	9	8	6
2024	1	8	0
2025	2	2	2
2026	3	10	0
Total	**25**	**39**	**24**

Table 5 - EVs purchased, Public Chargers and New Chargers Installed by Year

Note: The higher number of EVs purchased than fleet chargers installed is not a cause for concern, as the Municipality already has several chargers in operation, which pre-date the EVAP.

EV Charge Station Locations

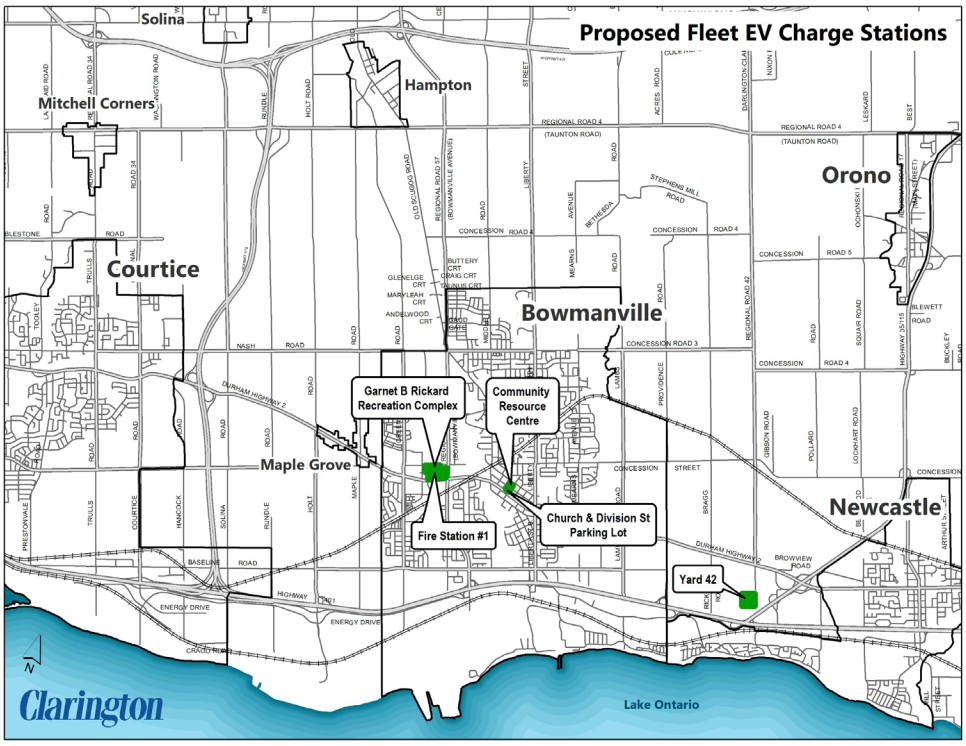


Figure 2 - Proposed Fleet EV Charge Stations

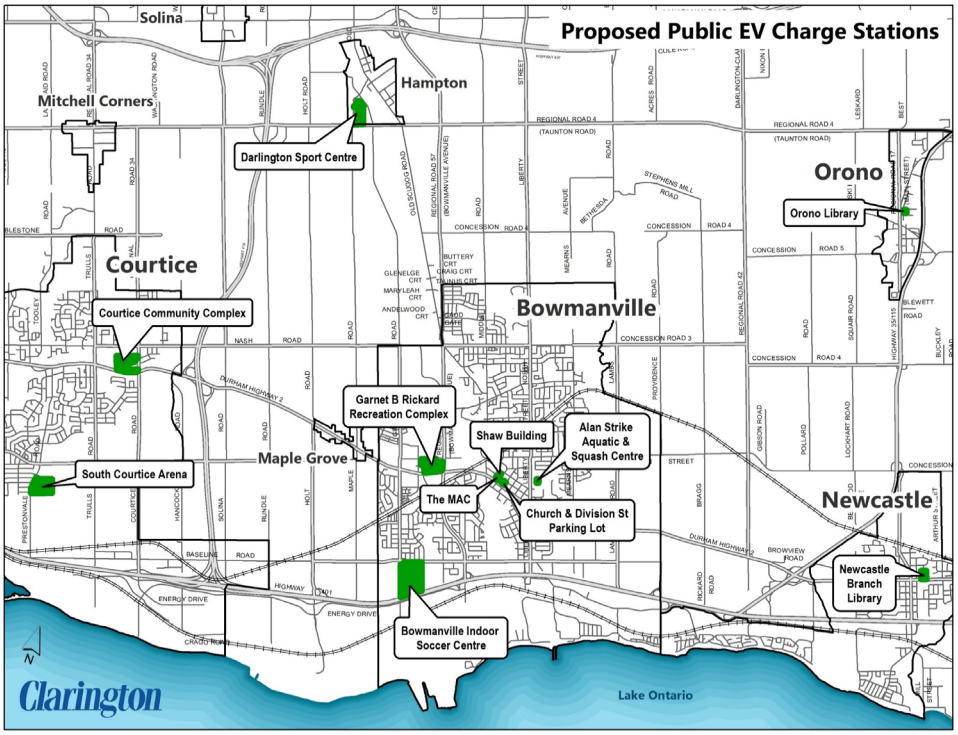


Figure 3 - Proposed Public EV Charge Stations

2021

In 2021, six EVs and one hybrid vehicle were budgeted by the Municipality. All six EVs were purchased by the Planning and Development Services department and will be charged at the fleet chargers located at Garnet B Rickard. The hybrid vehicle was purchased by the Emergency and Fire Services Department.

Vehicle Costs

Department	Vehicle Type and Model	Projected MSRP (Rounded)
Planning and Development Services	EV (car)	$45,000
Planning and Development Services	EV (car)	$45,000
Planning and Development Services	EV (car)	$45,000
Planning and Development Services	EV (car)	$45,000
Planning and Development Services	EV (car)	$45,000
Planning and Development Services	EV (car)	$45,000
Emergency and Fire Services	Hybrid	$45,000
Total	**6 + 1 Hybrid**	**$315,000.00**

Table 6 - 2021 Vehicle Costs

Note – budget does not reflect external funding subsidies that are currently available

Charger Costs

Location	Address	Charger Type	Number of Charge Points	Estimated Cost (Rounded)
Garnet B Rickard Recreation Complex	2440 Highway 2, Bowmanville, ON	Fleet	8	$81,000
Church and Division Street Parking Lot	26 Division St, Bowmanville, ON	Fleet and Public	5	$66,000
Total			**13**	**$147,000**

Table 7 - 2021 Charger Costs

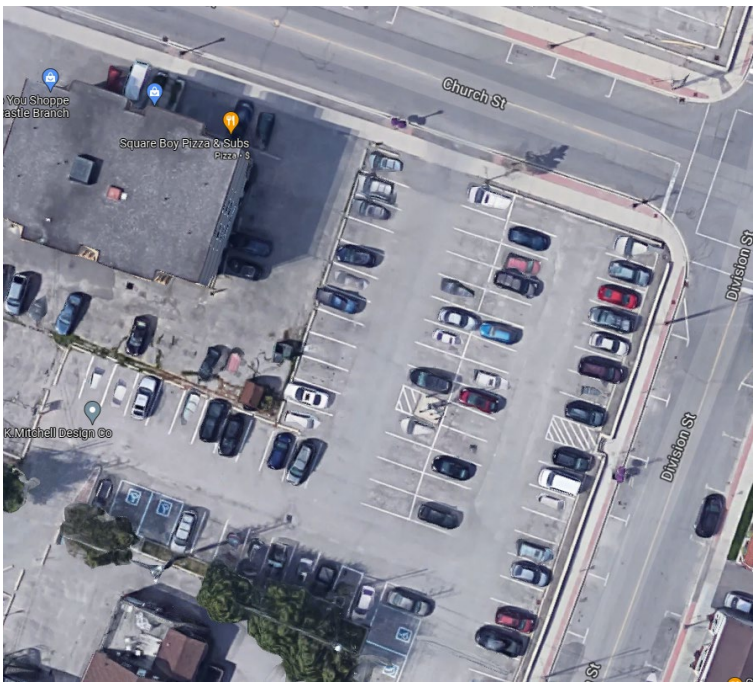
Note – budget does not reflect external funding subsidies that are currently available

Garnet B Rickard Recreation Complex - Fleet Chargers

Garnet B Rickard is slated to receive a group of eight fleet chargers at the East side of the building in late 2021. Six of these chargers are reserved for Planning and Development EVs. The remaining two spots will temporarily be available to the public until the final two Planning and Development Services EVs are purchased in 2022 and 2023, at which time they will become reserved for fleet parking. Garnet B Rickard already has two networked stations to the West of the building and is scheduled to receive more public charging stations in the coming years.

This location was prioritized for a large group of stations because its large parking lot can accommodate eight stations without creating a shortage of parking spaces for other drivers. The Recreation Complex is centrally located and near to where the vehicle users will be working. The building also had sufficient electrical capacity to accommodate the charging stations. Partial funding for these chargers has been granted to Clarington through the federal government’s Zero Emissions Vehicle Infrastructure Program (ZEVIP).

Church and Division St Parking Lot - Public Chargers



The parking lot on the Southwest corner of the intersection of Church and Division St in Bowmanville is the first location under the EVAP to have chargers installed. The location consists of five charge points. One charge point is dedicated to fleet charging for Legislative Services'. Four charge points are reserves for public charging.

The Church and Division Street parking lot was prioritized for EV charge stations because of its central location in downtown Bowmanville. The location allows EV users to charge their vehicles while visiting nearby businesses, municipal buildings, and the library. The parking lot is large enough to allow for vehicle charging while not substantially reducing the total number of available parking spaces. Partial funding for these chargers was provided to the municipality through the federal government's Zero Emissions Vehicle Infrastructure Program (ZEVIP).

2022

Clarington will add three EVs to their fleet in 2022. Legislative Services will acquire a Plug-in Hybrid EV. The Planning and Development Services and Emergency and Fire Departments will each purchase an additional Chevy Bolts.

A bank of six fleet chargers will be installed at the Community Resource Centre to charge the Legislative Services department's vehicles, which will acquired in 2022 and 2023. Two fleet charge points will also be installed at Fire Station 1. The community is slated to receive six new charge points as well: two at the Orono Branch Public Library, and four at the Courtice Community Complex.

Vehicle Costs

Department	Vehicle Type and Model	Projected MSRP (Rounded)
Planning and Development Services	EV (car)	$45,000
Fire and Emergency Services	EV (SUV) EUV	$60,000
Legislative Services	PHEV (car)	$50,000
Total	**3**	**$155,000**

Table 8 - 2022 Vehicle Costs

Note – budget does not reflect external funding subsidies that are currently available

Charger Costs

Location	Address	Charger Type	Number of Charge Points	Estimated Cost (Rounded)
Community Resource Centre (Firehouse Youth Centre)	132 Church Street, Bowmanville, ON	Fleet	6	$68,000
Fire Station #1	2430 Highway 2, Bowmanville, ON	Fleet	2	$26,000
Courtice Community Complex	2950 Courtice Road, Courtice, ON	Public	4	$52,000
Orono Library	s 127 Church Street, Orono, ON	Public	2	$38,000
Total			**14**	**$184,000**

Table 9 - 2022 Charger Costs

Note – budget does not reflect external funding subsidies that are currently available

Community Resource Centre (Firehouse Youth Centre) - Fleet Chargers

The bank of six fleet charge points to be located at the Firehouse Youth Centre will draw power from electrical transformers located on electrical polls at the site. The site will primarily charge vehicles from the Legislative Services Department, specifically the vehicles purchased in 2022 and 2023 and a further two EVs in 2026. Though the bank of stations is intended for fleet charging, the unassigned charge points at this location will be made available for public charging until to allow for excess capacity should the municipality decide to expand its fleet with more EVs.

This location was selected because the parking lot allows for the installation of a bank of EV charge stations without significantly impacting the total amount of parking spots available to the public. The Firehouse Youth Centre is centrally located near the Municipal Administrative Centre, which is a convenient and central location near to where staff are working.

Fire Station #1- Fleet Chargers

Two additional charge points will be added to Fire Station #1, bringing the total number of chargers at the site to four. They are necessary to meet the needs of the Emergency and Fire Department's expanding fleet of EVs (the department will have a total of four EVs by the end of 2023).

Fire station #1 is situated among the most densely populated areas in Clarington. It has the required electrical capacity to accommodate more chargers and has already undergone electrical work to install the first two charge points in 2020.

Courtice Community Complex - Public Chargers

The Courtice Community Complex has a parking lot large enough to dedicate four spots to EV charging locations while ensuring there is sufficient parking at the site. Currently, there are no publicly available chargers in Courtice. These four charge points will

address a service gap in the community. The Courtice Community Complex hosts a swimming pool and other activities which will keep patrons on the site for at least an hour (on average), making it a suitable location for level 2 chargers. It is a high-traffic location for the community, and the chargers' visual presence at the site will serve as a reinforcement of Clarington's commitment to an EV transition. This location has more than enough panel capacity to accommodate these chargers and future expansions of up to six or more charge points.

Orono Public Library - Public Chargers

Orono does not currently have any EV charge points. Placing two at the library will begin to fill the public EV charging gap for the community and provide a location for municipal fleet vehicles to recharge at night. These charge points may also serve as an indirect method of increasing tourism for the community. The charge points will be located near Highway 115 and the several restaurants, shops, and green spaces. Locally, the availability of EV charging may encourage residents to consider adopting EVs.

2023

The Planning and Development Department will acquire their eighth Chevy Bolt in 2023, at which point all eight charge points at Garnett B Rickard (installed in 2022) will be dedicated for fleet use. Emergency and Fire Services will acquire two new EVs. All four EMS EVS will be parked at Fire Hall #1 for charging. Legislative Services will acquire an electric van and EUV. Lastly, the Public Works Department is slated to replace four light-duty pickup trucks this year two of which were deferred from 2022. These trucks are anticipated to be Ford F-150 Lightnings. The trucks will be parked and charged at

Yard 42, which will have six EV charge points installed this year (later expanded to eight). 2023 will also see the most significant build-out of public chargers to date, with a total of eight being installed in three different locations across the Municipality.

Vehicle Costs

Department	Vehicle Type and Model	Projected MSRP (Rounded)
Planning and Development Services	EV (car)	$45,000
Emergency and Fire Services	EV (EUV)	$47,000
Emergency and Fire Services	Hybrid (car)	$47,000
Legislative Services	EV (SUV)	$47,000
Legislative Services	EV (Cargo Van)	$65,000
Public Works	EV (pickup truck)	$73,000
Public Works	EV (pickup truck)	$73,000
Public Works	EV (pickup truck)	$73,000
Public Works	EV (pickup truck)	$73,000
Total	**9**	**$543,000**

Table 10 – 2023 Vehicle Costs

Note – budget does not reflect external funding subsidies that are currently available

Charger Costs

Location	Address	Charger Type	Number of Charge Points	Estimated Cost (Rounded)
Yard 42	178 Clarke Townline, Bowmanville, ON	Fleet	6	$66,000
Bowmanville Indoor Soccer Centre	2375 Baseline Road, Bowmanville, ON	Public	4	$53,000
Newcastle Branch Library	150 King Avenue East, Newcastle, ON	Public	2	$38,000
Shaw Building	156 Church St, Bowmanville, ON	Public	2	$33,000
Total			**14**	**$190,000**

Table 11 - 2023 Charger Costs

Note – budget does not reflect external funding subsidies that are currently available

Yard 42 - Fleet Chargers

Yard 42 is one of Clarington's main service yards. Used primarily by the Public Works Department, it is the location where service trucks and other vehicles are parked by Public Work's staff. This is an important location for EV chargers, as the municipal EV fleet expands beyond sedans and SUVs. This location will receive a bank of six EV charging points (later expanded to eight) and will be the main charging site for electric trucks. At the time of writing, these are all anticipated to be Ford F-150 Lightnings, though this may change as more electric truck options come onto the market.

Electric trucks and the city staff who operate them have different needs than those with Sedans and SUVs. Yard 42 is one of the main Public Works hubs for Clarington. It makes sense, then, to install charging stations for these and future trucks in the location where they are most frequently used and parked. The fleet chargers at this location will not be accessible to the public and will be for the sole use of city staff. The location is central to where affected city staff operate, and the site has enough electrical capacity to accommodate the six (later expanded to eight) chargers that will operate at Yard 42.

Bowmanville Indoor Soccer Centre - Public Chargers

The Bowmanville Indoor Soccer Centre will host four EV charge points, all dedicated to public use. The site is also a good candidate for future expansions past the EVAPs 2026 time horizon. The Centre is used year-round for indoor and outdoor soccer and lacrosse games and maintains a steady flow of people, especially on the evenings and weekend. While it has not been decided where the chargers will be located, it is assumed that they will be close to the building and the entrance. Situating the stations close to the structure will lower installation and electrical costs while providing a preferred parking benefit for those who use them.

As a large sports centre with continual year-round usage, sufficient electrical capacity and a large parking lot, the Bowmanville Indoor Soccer Centre was deemed to be a highly suitable location for public charging.

Newcastle Branch Library - Public Chargers

The Newcastle Branch Library will have two public charge points installed in its parking lot. Though the location of the chargers has not yet been determined, it is likely that they will be located close to the building to reduce installation and electrical costs.

There is a deficit of public EV charging infrastructure in Newcastle. There are currently no publicly available EV chargers in the community, with the nearest public chargers to be in Bowmanville and Orono. This is likely a deterrent to residents interested in purchasing an EV. Installing EV charge points at the Newcastle Branch Library is a step to encourage community members to adopt EVs. These chargers may offer the side benefit of increased traffic and tourism to local businesses (especially the restaurants in the area), given the community's proximity to Highway 401.

Shaw Building - Public Chargers

The two charge points to be installed at the Shaw building will be in the parking lot on the left side of the building. This building has enough electrical capacity to accommodate a double head charger. The chargers at this site will be designated as public use charge points but given the building's proximity to the Municipal Administrative Centre and several fleet charging stations, the charge points at the Shaw Building have been designated as a backup location for municipal EVs and may be used for overnight fleet vehicle charging if the need arises.

The Shaw building is centrally located in downtown Bowmanville, providing EV charging for residents while they visit the Municipal Administrative Centre or visit location businesses and recreation locations in downtown Bowmanville. This location also offers a benefit to fleet EVs; the chargers at the Shaw building can be used for overnight charging if charge points at the Community Resource Centre require maintenance, replacement or are otherwise offline.

2024

Public Works is the only department expected to acquire a new EV in 2024. With the replacement of another light-duty truck, they will add another Ford F-150 Lightning to the fleet, which will also be charged at Yard 42. The EVAP's goal to install most of the required fleet charging in the early years of the plan means that in 2024, all 10 charge points installed will be designated for public charging. Two double-headed chargers will be installed at the Alan Strike Aquatic and Squash Centre (Alan Strike Centre). An additional four charge points will offer community charging to those using the South Courtice Arena.

Vehicle Costs

Department	Vehicle Type and Model	Projected MSRP (Rounded)
Public Works	EV (pickup truck)	$73,000
Total	**1**	**$73,000.00**

Table 12 - 2024 Vehicle Costs

Note – budget does not reflect external funding subsidies that are currently available

Charger Costs

Location	Address	Charger Type	Number of Charge Points	Estimated Cost (Rounded)
Alan Strike Aquatic and Squash Centre	49 Liberty Street, Bowmanville, ON	Public	4	$52,000
South Courtice Arena	1595 Prestonvale Road, Courtice, ON	Public	4	$52,000
Total			**8**	**$104,000**

Table 13 - 2024 Charger Costs

Note – budget does not reflect external funding subsidies that are currently available

Alan Strike Aquatic and Squash Centre - Public Chargers

The Alan Strike Centre is located centrally in Bowmanville, hosting both a pool and squash courts. There are several parking lots that can be used when accessing the Centre, and while the exact location for the chargers has not been determined, it is likely that the charging spots will be located on the south side of the west parking lot, as that location is closest to the transformer which the power would be drawn from. The four level-2 two charging points will be primarily accessible to members of the public who are using the Alan Strike facility.

The Alan Strike Centre enjoys consistent levels of year-round use, making it a medium-traffic location in Clarington's largest urban settlement area. Publicly accessible charging installations at this facility are part of Clarington's plans to extend EV charging infrastructure to every medium and large-sized municipally owned building. This location was deemed to be of medium suitability due to the building itself not having enough panel capacity to accommodate the chargers, necessitating a separate service be run from a nearby transformer.

South Courtice Arena - Public Chargers

The South Courtice Arena is a year-round public facility with a skating rink, gymnasium, meeting room, youth centre, and a football field, basketball court and dog park, which are accessible in the summer months. The four charge points to be installed at the site will be placed close to the building to reduce installation costs. The four charging spots will be available exclusively for public use for those using the facility.

The South Courtice Arena is a high-traffic location with a steady user base year-round. Its proximity to Oshawa means that it will likely receive more traffic than other locations as the Arena draws in residents from the neighbouring city. The main building offers more than sufficient electrical capacity. The site suitability selection criteria (outlined above) indicate that this site would be a good candidate for future expansions to the charging network. It is likely that Courtice will still be underserved by public chargers in 2024. This central, high-traffic location is an ideal spot for expansion.

2025

At the time of writing, there are only two electric trucks planned for purchase in 2025. Two chargers will be installed at Garnet B Rickard for public use, doubling the number of public chargers currently installed at the site. Yard 42 will receive an expansion of two additional charge points, creating additional charging capacity to accommodate the two new trucks.

Vehicle Costs

Department	Vehicle Type and Model	Projected MSRP (Rounded)
Public Works	EV (pickup truck)	$73,000
Public Works	EV (pickup truck)	$73,000
Total	**2**	**$146,000.00**

Table 14 - 2025 Vehicle Costs

Note – budget does not reflect external funding subsidies that are currently available

Charger Costs

Location		Charger Type	Number of Charge Points	Estimated Cost (Rounded)
Garnet B Rickard Recreation Complex	2440 Highway 2, Bowmanville, ON	Public	2	$24,000
Yard 42 (expansion)	178 Clarke Townline, Bowmanville, ON	Fleet	2	$24,000
Total			**4**	**$48,000**

Table 15 - 2025 Charger Costs

Note – budget does not reflect external funding subsidies that are currently available

Yard 42 (Expansion) - Fleet Chargers

Yard 42 is one of Clarington's main service yards, used primarily by the Public Works Department. Yard 42 hosts many of the service trucks used by Public Work's staff. The expansion of two additional charging points should be a relatively simple task, as the installation in 2022 prepared for this expansion.

As trucks continue to be decommissioned and more mid- and heavy-duty electric truck options become available on the market, the Public Works fleet of EVs will continue to expand. This installation prepares for future purchases, setting up Yard 42 as a central charging hub for Clarington's electric trucks and other heavy-duty EVs.

Garnet B Rickard - Public Chargers

By the end of 2023, the Planning and Development Services Department will acquire two more EVs, which will be charged at the stations in the Eastern parking lot. This will leave only two public charge stations at one of the Municipality's highest traffic public facilities.

In 2025, two public EV charge points will be installed at this location, doubling the public charge points currently installed at the site. These charge points will be located next to the existing public chargers on the site in the building's western parking lot.

Note: As data is collected over the coming years on charger usage, there may be a case for expanding this installation from four to six public charge points. Usage statistics of the existing public chargers should be examined in 2024 to determine whether this expansion is warranted.

2026

In 2026 Legislative Services will replace another one of their cars with an EV. While this is the only vehicle being replaced that currently has a suitable EV alternative, the expansion of available EVs models will mean that more heavy-duty fleet EVs will be available in 2026. Public charging capacity will continue to be expanded in 2026, with charge points at the Darlington Sports Centre and six charge points at the Municipal Administrative Centre (MAC).

Vehicle Costs

Department	Vehicle Type and Model	Projected MSRP
Legislative Services	EV (Sedan)	$45,000
Legislative Services	EV (pickup truck)	$73,000
Emergency Services	EV (SUV)	$47,000
Total	**3**	**$165,000**

Table 16 - 2026 Vehicle Costs

Note – budget does not reflect external funding subsidies that are currently available

Charger Costs

Location	Address	Charger Type	Number of Charge Points	Estimated Cost
Darlington Sport Centre	2276 Taunton Road, Hampton, ON	Public	4	$52,000
Municipal Administration Centre (The MAC)	40 Temperance Street, Bowmanville, ON	Public	6	$66,000
Total			**10**	**$118,000**

Table 17 - 2026 Charger Costs

Note – budget does not reflect external funding subsidies that are currently available

Darlington Sport Centre - Public Chargers

The Darlington Sports Centre is one of the only large, publicly owned buildings in Darlington. The Centre hosts an ice pad, soccer field and skate park, meaning there is a level of usage at the centre year-round. Power for the EV chargers will not come from the centre, as it does not have the necessary capacity. Instead, the power will be drawn from a transformer on the eastern end of the parking lot. Four charging spots will be located as close to the transformer as possible.

Darlington does not currently have any EV charging stations in the area, leaving residents without convenient access to community charging. By installing four charge stations at the Darlington Sports Centre, Clarington will address this service gap.

Municipal Administrative Centre (MAC) - Public Chargers

The MAC offers two small parking lots, each with a hydro meter nearby, which could be used to power chargers at the site. A bank of six chargers at either location would take up many of the parking spots in the lot. Care will need to be taken to balance the Parking needs of ICE and EV drivers. Further study will be needed to ascertain the best location for chargers on this site.

The MAC is the central hub of Clarington's municipal government, providing in-person municipal services to citizens and is in the heart of downtown Bowmanville, close by to shops, restaurants and green spaces. The main branch of the Clarington library is also located at this site. The MAC is a highly suitable location for a bank of six public charge points. Public chargers at this site have been pushed to 2026, as there will already be EV chargers in the area (at the Church and Division Street Parking Lot, the Shaw building, and the Community Resource Centre). The building has sufficient electrical capacity to support EV chargers.

Conclusion

To achieve the Municipality's GHG emissions reduction targets, the municipality must act the transition is fleet to electric. With a boarder community adoption of EVs already underway, the Municipality must also act to ensure community EV charging infrastructure is available.

This Electric Vehicle Action Plan is a guide for the Municipality to electrify its fleet and provide much-needed public EV charging at municipal facilities between 2022 and 2026. Under this plan, the Municipality is set to acquire at least 25 electric vehicles, install more than 60 EV charging spaces, and become a regional leader in EV charging stations. This plan aims to fulfil direction by Council to implement an electric vehicle transition strategy through resolution #C-066-20 which this plan fulfills.

By implementing this plan, the Municipality is taking significant steps to respond to climate change by directly reducing GHG emissions associated with transportation, providing needed infrastructure to meet the community's needs for EV charging, promoting the community wellbeing promoting transportation options that reduce air and sound pollution.

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Appendix A – EV Charger Installation Costs

Summary of EV Charger Installation by Year

Fleet Charge Points Installed				
Year	**Charge Points Installed**	**Total Estimated Cost**	**Potential Grant Contribution**	**Estimated Cost to Clarington**
Pre 2011	2	N/A	N/A	N/A
2021	9	$95,525.00	$40,724.44	$54,800.56
2022	8	$93,550.00	$40,000.00	$53,550.00
2023	6	$66,162.50	$30,000.00	$36,162.50
2024	0	$0.00	$0.00	$0.00
2025	2	$24,137.50	$10,000.00	$14,137.50
2026	0	$0.00	$0.00	$0.00
Total	**27**	**$279,375.00**	**$120,724.44**	**$158,650.56**

Table 18 - Fleet EV Charger Installation by Year

Public Charge Points Installed				
Year	**Charge Points Installed**	**Total Estimated Cost**	**Potential Grant Contribution**	**Estimated Cost to Clarington**
Pre-2021	2	N/A	N/A	N/A
2021	4	$52,025.00	$17,120.00	$34,905.00
2022	6	$89,912.50	$10,000.00	$79,912.50
2023	8	$120,222.50	$40,000.00	$80,222.50
2024	8	$104,050.00	$40,000.00	$64,050.00
2025	2	$24,137.50	$10,000.00	$14,137.50
2026	10	$118,187.50	$50,000.00	$68,187.50
Total	**40**	**$508,535.00**	**$167,120.00**	**$341,415.00**

Table 19 - Public EV Charger Installation by Year

2021

Fleet					
		Garnet B Rickard		Church & Division Lot	
	Unit Cost	No. of Units	Cost	No. of Units	Cost
EV Charger Equipment					
Double-Charge Point Stations - Pedestal Unit (level 2)	$9,000	4	$36,000	0	$0
Single-Charge Point Station - Pedestal Unit (level 2)	$7,000	0	$0	1	$7,000
Insurance and Maintenance (per station)	$350	4	$1,400	1	$350
Shipping (per station)	$150	4	$600	1	$150
Installation					
Panel Upgrades and Electrical Work	$15,000	1	$15,000	0	$0
Hardscaping Excavation Work / m^2	$100	26	$2,600	26	$2,600
'EV Charging Only' Signage (per charge point)	$400	8	$3,200	1	$400
'Municipal Vehicles Only' Signage (per charge point)	$200	8	$1,600	1	$200
Stencil	$500	1	$500	0	$0
Painting (per charge point)	$110	8	$880	1	$110
Bollards (per charge point)	$120	8	$960	1	$120
Site Remediation (road, curb and softscaping) (per station)	$550	4	$2,200	1	$550
Contingency (12% of total costs)	12%	1	$7,793	1	$1,378
HST (13% of Total)	13%	1	$8,442	1	$1,492
Total			**$81,175**		**$14,350**

Table 20 - 2021 Detailed Fleet Charger Costs

	Garnet B. Rickard	Church & Division Lot	Total
Municipal Contribution	$44,731	$10,070	**$54,801**
Grant Contribution	$36,444	$4,280	**$40,724**
Total	**$81,175**	**$14,350**	**$95,525**

Table 21 - 2021 Fleet Charger Cost Contributions

Public			
		Church & Division Lot	
	Unit Cost	No. of Units	Cost
EV Charger Equipment			
Double-Charge Point Stations - Pedestal Unit (level 2)	$9,000	2	$18,000
Single-Charge Point Station - Pedestal Unit (level 2)	$7,000	0	$0
Insurance and Maintenance (per station)	$350	2	$700
Shipping (per station)	$150	2	$300
Installation			
Panel Upgrades and Electrical Work	$15,000	1	$15,000
Hardscaping Excavation Work / m^2	$100	35	$3,500
Signage (per charge point)	$400	4	$1,600
Stencil	$500	1	$500
Painting (per charge point)	$110	4	$440
Bollards (per charge point)	$120	4	$480
Site Remediation (road, curb and softscaping) (per station)	$550	2	$1,100
Contingency (12% of total costs)	12%	1	$4,994
HST (13% of Total)	13%	1	$5,411
Total			**$52,025**

Table 22 - 2021 Detailed Public Charger Costs

	Church & Division Lot	Total
Municipal Contribution	$34,905	**$34,905**
Grant Contribution	$17,120	**$17,120**
Total	$52,025	**$52,025**

Table 23 - 2021 Public Charger Cost Contributions

2022

Fleet					
		Community Resource Center (Firehouse Youth Center)		Fire Station 1	
	Unit Cost	No. of Units	Cost	No. of Units	Cost
EV Charger Equipment					
Double-Charge Point Stations - Pedestal Unit (level 2)	$9,000	3	$27,000	1	$9,000
Single-Charge Point Station - Pedestal Unit (level 2)	$7,000	0	$0	0	$0
Insurance and Maintenance (per station)	$350	3	$1,050	1	$350
Shipping (per station)	$150	3	$450	1	$150
Installation					
Panel Upgrades and Electrical Work	$15,000	1	$15,000	1	$5,000
Hardscaping Excavation Work / m^2	$100	35	$3,500	35	$3,500
'EV Charging Only' Signage (per charge point)	$400	6	$2,400	2	$800
'Municipal Vehicles Only' Signage (per charge point)	$200	6	$1,200	2	$400
Stencil	$500	1	$500	1	$500
Painting (per charge point)	$110	6	$660	2	$220
Bollards (per charge point)	$120	6	$720	2	$240
Site Remediation (road, curb and softscaping) (per station)	$550	3	$1,650	1	$550
Contingency (12% of total costs)	12%	1	$6,496	1	$2,485
HST (13% of Total)	13%	1	$7,037	1	$2,692
Total			**$67,663**		**$25,888**

Table 24 - 2022 Detailed Fleet Charger Costs

	Community Resource Center (Firehouse Youth Center)	Fire Station 1	Total
Municipal Contribution	$37,663	$15,888	**$53,550**
Potential Grant Contribution	$30,000	$10,000	**$40,000**
Total	**$67,663**	**$25,888**	**$93,550**

Table 25 - 2022 Fleet Charger Cost Contributions

Public					
		Courtice Community Complex		Orono Library	
	Unit Cost	No. of Units	Cost	No. of Units	Cost
EV Charger Equipment					
Double-Charge Point Stations - Pedestal Unit (level 2)	$9,000	2	$18,000	1	$9,000
Single-Charge Point Station - Pedestal Unit (level 2)	$7,000	0	$0	0	$0
Insurance and Maintenance (per station)	$350	2	$700	1	$350
Shipping (per station)	$150	2	$300	1	$150
Installation					
Panel Upgrades and Electrical Work	$15,000	1	$15,000	1	$15,000
Hardscaping Excavation Work / m^2	$100	35	$3,500	35	$3,500
'EV Charging Only' Signage (per charge point)	$400	4	$1,600	2	$800
Stencil	$500	1	$500	1	$500
Painting (per charge point)	$110	4	$440	2	$220
Bollards (per charge point)	$120	4	$480	2	$240
Site Remediation (road, curb and softscaping) (per station)	$550	2	$1,100	1	$550
Contingency (12% of total costs)	12%	1	$4,994	1	$3,637
HST (13% of Total)	13%	1	$5,411	1	$3,940
Total			**$52,025**		**$37,888**

Table 26 – 2022 Detailed Public Charger Costs

	Courtice Community Complex	Orono Library	Total
Municipal Contribution	$32,025	$27,888	**$79,913**
Potential Grant Contribution	$20,000	$10,000	**$10,000**
Total	$52,025	$37,888	**$89,913**

Table 27 - 2022 Public Charger Cost Contributions

2023

Fleet			
		Yard 42 Depot	
	Unit Cost	No. of Units	Cost
EV Charger Equipment			
Double-Charge Point Stations - Pedestal Unit (level 2)	$9,000	3	$27,000
Single-Charge Point Station - Pedestal Unit (level 2)	$7,000	0	$0
Insurance and Maintenance (per station)	$350	3	$1,050
Shipping (per station)	$150	3	$450
Installation			
Panel Upgrades and Electrical Work	$15,000	1	$15,000
Hardscaping Excavation Work / m^2	$100	35	$3,500
'EV Charging Only' Signage (per charge point)	$400	6	$2,400
'Municipal Vehicles Only' Signage (per charge point)	$200	0	$0
Stencil	$500	1	$500
Painting (per charge point)	$110	6	$660
Bollards (per charge point)	$120	6	$720
Site Remediation (road, curb and softscaping) (per station)	$550	3	$1,650
Contingency (12% of total costs)	12%	1	$6,352
HST (13% of Total)	13%	1	$6,881
Total			**$66,163**

Table 28 - 2023 Detailed Fleet Charger Costs

	Yard 42 Depot	Total
Municipal Contribution	$36,163	**$36,163**
Potential Grant Contribution	$30,000	**$30,000**
Total	**$66,163**	**$66,163**

Table 29 - 2023 Fleet Charger Cost Contributions

Public							
		Bowmanville Indoor Soccer Center		Newcastle Library Branch		Shaw Building	
	Unit Cost	No. of Units	Cost	No. of Units	Cost	No. of Units	Cost
EV Charger Equipment							
Double-Charge Point Stations - Pedestal Unit (level 2)	$9,000	2	$18,000	1	$9,000	1	$9,000
Single-Charge Point Station - Pedestal Unit (level 2)	$7,000	0	$0	0	$0	0	$0
Insurance and Maintenance (per station)	$350	2	$700	1	$350	1	$350
Shipping (per station)	$150	2	$300	1	$150	1	$150
Installation							
Panel Upgrades and Electrical Work	$15,000	1	$15,000	1	$15,000	1	$15,000
Hardscaping Excavation Work / m^2	$100	35	$3,500	35	$3,500	35	$3,500
'EV Charging Only' Signage (per charge point)	$400	4	$1,600	2	$800	2	$800
Stencil	$500	1	$500	1	$500	1	$500
Painting (per charge point)	$110	4	$440	2	$220	2	$220
Bollards (per charge point)	$120	4	$480	2	$240	2	$240
Site Remediation (road, curb and softscaping) (per station)	$550	2	$1,100	1	$550	1	$550
Contingency (12% of total costs)	12%	1	$4,994	1	$3,637	1	$3,637
HST (13% of Total)	13%	1	$5,411	1	$3,940	1	$3,940
Total			**$52,025**		**$37,888**		**$30,310**

Table 30 - 2023 Detailed Public Charger Costs

	Bowmanville Indoor Soccer Center	Newcastle Library Branch	Shaw Building	Total
Municipal Contribution	$32,025	$27,888	$20,310	**$80,223**
Potential Grant Contribution	$20,000	$10,000	$10,000	**$40,000**
Total	**$52,025**	**$37,888**	**$30,310**	**$120,223**

Table 31 - 2023 Detailed Public Charger Contributions

2024

No EV stations for fleet are planned for installation in 2024

Public					
		Alan Strike Aquatic and Squash Center		South Courtice Arena	
	Unit Cost	No. of Units	Cost	No. of Units	Cost
EV Charger Equipment					
Double-Charge Point Stations - Pedestal Unit (level 2)	$9,000	2	$18,000	2	$18,000
Single-Charge Point Station - Pedestal Unit (level 2)	$7,000	0	$0	0	$0
Insurance and Maintenance (per station)	$350	2	$700	2	$700
Shipping (per station)	$150	2	$300	2	$300
Installation					
Panel Upgrades and Electrical Work	$15,000	1	$15,000	1	$15,000
Hardscaping Excavation Work / m^2	$100	35	$3,500	35	$3,500
'EV Charging Only' Signage (per charge point)	$400	4	$1,600	4	$1,600
Stencil	$500	1	$500	1	$500
Painting (per charge point)	$110	4	$440	4	$440
Bollards (per charge point)	$120	4	$480	4	$480
Site Remediation (road, curb and softscaping) (per station)	$550	2	$1,100	2	$1,100
Contingency (12% of total costs)	12%	1	$4,994	1	$4,994
HST (13% of Total)	13%	1	$5,411	1	$5,411
Total			**$52,025**		**$52,025**

Table 32 - 2024 Detailed Public Charger Costs

	Alan Strike Aquatic and Squash Center	South Courtice Arena	Total
Municipal Contribution	$32,025	$32,025	**$64,050**
Potential Grant Contribution	$20,000	$20,000	**$40,000**
Total	**$52,025**	**$52,025**	**$104,050**

Table 33 – 2024 Public Charger Contributions

2025

Fleet			
		Yard 42	
	Unit Cost	No. of Units	Cost
EV Charger Equipment			
Double-Charge Point Stations - Pedestal Unit (level 2)	$9,000	1	$9,000
Single-Charge Point Station - Pedestal Unit (level 2)	$7,000	0	$0
Insurance and Maintenance (per station)	$350	1	$350
Shipping (per station)	$150	1	$150
Installation			
Panel Upgrades and Electrical Work	$15,000	0	$0
Hardscaping Excavation Work / m^2	$100	0	$0
'EV Charging Only' Signage (per charge point)	$400	2	$800
'Municipal Vehicles Only' Signage (per charge point)	$200	0	$0
Stencil	$500	1	$500
Painting (per charge point)	$110	2	$220
Bollards (per charge point)	$120	2	$240
Site Remediation (road, curb and softscaping) (per station)	$550	1	$550
Contingency (12% of total costs)	12%	1	$1,417
HST (13% of Total)	13%	1	$1,535
Total			**$14,763**

Table 34 - 2025 Detailed Fleet Charger Costs

	Yard 42	Total
Municipal Contribution	$4,763	**$4,763**
Potential Grant Contribution	$10,000	**$10,000**
Total	$14,763	**$14,763**

Table 35 - 2025 Fleet Charger Contributions

Public			
		Garnet B. Rickard	
	Unit Cost	No. of Units	Cost
EV Charger Equipment			
Double-Charge Point Stations - Pedestal Unit (level 2)	$9,000	1	$9,000
Single-Charge Point Station - Pedestal Unit (level 2)	$7,000	0	$0
Insurance and Maintenance (per station)	$350	1	$350
Shipping (per station)	$150	1	$150
Installation			
Panel Upgrades and Electrical Work	$15,000	0.5	$7,500
Hardscaping Excavation Work / m^2	$100	0	$0
'EV Charging Only' Signage (per charge point)	$400	2	$800
Stencil	$500	0	$0
Painting (per charge point)	$110	2	$220
Bollards (per charge point)	$120	2	$240
Site Remediation (road, curb and softscaping) (per station)	$550	1	$550
Contingency (12% of total costs)	12%	1	$2,257
HST (13% of Total)	13%	1	$2,445
Total			**$23,513**

Table 36 - 2025 Detailed Public Charger Costs

	Garnet B. Rickard	Total
Municipal Contribution	$13,513	**$13,513**
Potential Grant Contribution	$10,000	**$10,000**
Total	**$23,513**	**$23,513**

Table 37 - 2025 Detailed Public Charger Contributions

2026

No EV stations for fleet are planned for installation in 2026

Public					
		Darlington Sport Center		Municipal Administrative Center	
	Unit Cost	No. of Units	Cost	No. of Units	Cost
EV Charger Equipment					
Double-Charge Point Stations - Pedestal Unit (level 2)	$9,000	2	$18,000	3	$27,000
Single-Charge Point Station - Pedestal Unit (level 2)	$7,000	0	$0	0	$0
Insurance and Maintenance (per station)	$350	2	$700	3	$1,050
Shipping (per station)	$150	2	$300	3	$450
Installation					
Panel Upgrades and Electrical Work	$15,000	1	$15,000	1	$15,000
Hardscaping Excavation Work / m^2	$100	35	$3,500	35	$3,500
'EV Charging Only' Signage (per charge point)	$400	4	$1,600	6	$2,400
Stencil	$500	1	$500	1	$500
Painting (per charge point)	$110	4	$440	6	$660
Bollards (per charge point)	$120	4	$480	6	$720
Site Remediation (road, curb and softscaping) (per station)	$550	2	$1,100	3	$1,650
Contingency (12% of total costs)	12%	1	$4,994	1	$6,352
HST (13% of Total)	13%	1	$5,411	1	$6,881
Total			**$52,025**		**$66,163**

Table 38 - 2026 Detailed Public Charger Costs

	Darlington Sport Center	Municipal Administrative Center	Total
Municipal Contribution	$32,025	$36,163	**$68,188**
Potential Grant Contribution	$20,000	$30,000	**$50,000**
Total	**$52,025**	**$66,163**	**$118,188**

Table 39 - 2026 Public Charger Contributions

Appendix B – Projected EV purchases by Year

Summary EV Purchases by Year

Year	New EVs/Hybrids purchased
2021	7
2022	3
2023	9
2024	1
2025	2
2026	3
Total	**25**

Table 40 - Summary EV Purchases by Year

2021

Department	Vehicle Type and Model	Projected MSRP (Rounded)
Planning and Development Services	EV (car)	$45,000
Planning and Development Services	EV (car)	$45,000
Planning and Development Services	EV (car)	$45,000
Planning and Development Services	EV (car)	$45,000
Planning and Development Services	EV (car)	$45,000
Planning and Development Services	EV (car)	$45,000
Emergency and Fire Services	Hybrid	$45,000
Total	**6 + 1 Hybrid**	**$315,000.00**

Table 41 - 2021 EV Purchases

2022

Department	Vehicle Type and Model	Projected MSRP (Rounded)
Planning and Development Services	EV (car)	$45,000
Fire and Emergency Services	EV (SUV)	$60,000
Legislative Services	PHEV (car)	$50,000
Total	**3**	**$155,000**

Table 42 - 2022 EV Purchases

2023

Department	Vehicle Type and Model	Projected MSRP (Rounded)
Planning and Development Services	EV (car)	$45,000
Emergency and Fire Services	EV (SUV)	$47,000
Emergency and Fire Services	Hybrid (car)	$47,000
Legislative Services	EV (SUV)	$47,000
Legislative Services	EV (Cargo Van)	$65,000
Public Works	EV (truck)	$73,000
Public Works	EV (truck)	$73,000
Public Works	EV (truck)	$73,000
Public Works	EV (truck)	$73,000
Total	**9**	**$543,000**

Table 43 - 2023 EV Purchases

2024

Department	Vehicle Type and Model	Projected MSRP (Rounded)
Public Works	EV (truck)	$73,000
Total	**1**	**$73,000.00**

Table 44 - 2024 EV Purchases

2025

Department	Vehicle Type and Model	Projected MSRP (Rounded)
Public Works	EV (truck)	$73,000
Public Works	EV (truck)	$73,000
Total	**2**	**$146,000.00**

Table 45 - 2025 EV Purchases

2026

Department	Vehicle Type and Model	Projected MSRP
Legislative Services	EV (Sedan)	$45,000
Legislative Services	EV (truck)	$73,000
Emergency Services	EV (SUV)	$47,000
Total	**3**	**$165,000**

Table 46 - 2026 EV Purchases

Appendix C – EV Ownership Costs

Source: Clean Air Partnership, *Green Fleets business Case Series*, 2001.

EXPLANATION	FORMULA	RESULTS
ANNUAL FUEL COST	9.5L/100km × 13,000km/year **= 1,235L/year** 1,235L/year × 1.35$/L **= $1,667/year**	$1,667/year
LIFETIME FUEL COST	$1,667/year × 7 years **= $11,669**	$11,669
TOTAL MAINTENANCE COST	$684.89/year × 7 years **= $4,794**	$4,794
DEPRECIATE / RESALE COST (LIFETIME)		$4,229
TOTAL COST OF OWNERSHIP	$23,499 + $11,669 + $4,794 - $4,229 **= $35,733**	$35,733

Table 47 - TOTAL COST OF OWNERSHIP OF FORD ESCAPE S (2015)

EXPLANATION	FORMULA	RESULTS
ANNUAL FUEL COST	5.9L/100km × 13,000km/year **= 767L/year** 767L/year × 1.35$/L **= $1,035.45/year**	$1,036/year
LIFETIME FUEL COST	$1,036/year × 7 years **= $7,252**	$7,252
TOTAL MAINTENANCE COST	$684.89/year × 7 years **= $4,794**	$4,794
DEPRECIATE / RESALE COST (LIFETIME)		$3,545
TOTAL COST OF OWNERSHIP	$19,699 + $7,252 + $4,794 - $3,545 **= $28,200**	$28,200

Table 48 - TOTAL COST OF OWNERSHIP OF TOYOTA PRIUS (2015)

EXPLANATION	FORMULA	RESULTS
ANNUAL FUEL COST	4.7L/100km × 13,000km/year **= 611L/year** 611L/year × 1.35$/L **= $824.85/year**	**$825/year**
LIFETIME FUEL COST	$ 825/year × 7 years **= $5,775**	**$5,775**
TOTAL MAINTENANCE COST	$684.89/year × 7 years **= $4,794**	**$4,794**
DEPRECIATE / RESALE COST (LIFETIME)		**$4,707**
TOTAL COST OF OWNERSHIP	$26,155 + $5,775 + $4,794 - $4,707 **= $32,017**	**$32,017**

Table 49 - TOTAL COST OF OWNERSHIP OF FORD FOCUS SE (2014)

EXPLANATION	FORMULA	RESULTS
ANNUAL FUEL COST	7.4L/100km × 13,000km/year **= 962L/year** 962L/year × $1.35/L **= $1,298.7/year**	$1,299/year
LIFETIME FUEL COST	$1,299/year × 7 years **= $9,093**	$9,093
TOTAL MAINTENANCE COST	$684.89/year × 7 years **= $4,794**	$4,794
DEPRECIATE / RESALE COST (LIFETIME)		$2,878
TOTAL COST OF OWNERSHIP	$15,995 + $9,093 + $4,794 - $2,878 **= $27,004**	$27,004

Table 50 - TOTAL COST OF OWNERSHIP OF TOYOTA COROLLA (2015)

EXPLANATION	FORMULA	RESULTS
FUEL ECONOMY	Battery capacity / Distance = 24kWh/135km = 0.177kWh/km **= 0.18kWh/km**	0.18kWh/km
ANNUAL FUEL COST	0.18kWh/km × 13,000km/year × $0.08/kWh **= $187.2/year**	$187/year
LIFETIME FUEL COST	$187.2/year × 7 years **= $1,310.4**	$1,310
TOTAL MAINTENANCE COST	$278.75/year × 7 years **= $1,951.25**	$1,951
DEPRECIATE / RESALE COST (LIFETIME)		$6,081
TOTAL COST OF OWNERSHIP	$33,788 + $1,310 + $1,951 - $6,081 **= $30,968**	$30,968

Table 51 - TOTAL COST OF OWNERSHIP OF NISSAN LEAF SEV (2015)

EXPLANATION	FORMULA	RESULTS
FUEL ECONOMY	Battery capacity / Distance = 33.5kWh/123km = 0.272 kWh/km **= *0.27kWh/km***	**0.27kWh/km**
ANNUAL FUEL COST	0.27kWh/km × 13,000km/year × $0.08/kWh **= *$280.8/year***	**$281/year**
LIFETIME FUEL COST	$281/year × 7 years **= $1,967**	**$1,967**
TOTAL MAINTENANCE COST	$278.75/year × 7 years **= $1,951.25**	**$1,951**
DEPRECIATE / RESALE COST (LIFETIME)		**$6,515**
TOTAL COST OF OWNERSHIP	$36,199 + $1,967 + $1,951 - $6,515 **= $33,602**	**$33,602**

Table 52 - TOTAL COST OF OWNERSHIP OF FORD FOCUS EV (2015)