Attachment 2
Zero-Emission Outdoor Power Equipment Stakeholder Consultations

May 2025

Prepared by: City of Toronto
Based on commissioned work done on behalf of the City by Clean Air Partnership and Landscape Ontario

TORONTO

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Tables and Figures

Introduction

As part of TransformTO and Toronto's Net Zero Strategy, the City of Toronto is committed to transitioning towards zero-emission outdoor power equipment, including eliminating all corporate-owned gas-powered small engine equipment. In July 2023, City Council expressed its support for a ban on the use of fossil fueled (gas-powered) two-stroke engine equipment, such as leaf blowers, as a precaution against the cumulative adverse impacts to human health and climate (2023.IE5.1) from noise and air quality. As part of the activities stemming from this Council direction, stakeholder consultations in the form of a public survey, business survey and interviews were conducted from September 2024 to January 2025. These consultations included the consideration of the diverse needs and challenges of both residents and businesses who use two-stroke engines for their own use, and commercial operators who provide services using two-stroke engine equipment, along with a phased-in approach to the implementation of a ban based on the ability of user groups to comply. The resident and business stakeholder consultation details are presented below.

Key Findings

Through the stakeholder consultations it was found that there is a high support for a ban among residents, 73 per cent (4,818 out of 6,567) of respondents agree or strongly agree that Toronto should transition to zero-emission outdoor power equipment for all residents, businesses, and City of Toronto operations. Additionally, many landscape sector businesses surveyed and interviewed indicated that a ban, with a sufficient phase-in period (5+ years) and with some equipment exemptions, would be feasible.

Resident Stakeholder Consultation

The City engaged Clean Air Partnership to undertake a resident stakeholder consultation process to assess attitudes, challenges, concerns, level of support and ideas for enforcement of a potential bylaw. The objective of the consultation process was to assess public support for phasing out gas powered equipment and transitioning to zero emissions alternatives as well as to help inform the development of a two-stroke engine phase out that is reasonable, feasible and enforceable for the public and businesses.

Methods

A resident survey launched on November 6, 2024 and closed on November 30, 2024. It was published on the City of Toronto website and advertised widely across many channels and media to encourage a diversity of respondents and opinions. The primary audience for the survey were Toronto residents with lawns and yards. The survey was promoted through targeted social media advertisements to increase traffic and feedback (Figure 1). A total of 14 social media posts were made, including eight Tweets, five Facebook posts, and one LinkedIn post. Facebook posts were the top source of traffic to the survey. Additionally, Clean Air Partnership circulated the survey to homeowners' associations within Toronto. City Councillors were notified, and several sent out notifications about the survey to their constituents via email. The survey included 32 questions and consisted of three parts: resident perceptions; lawn care practices; and demographic questions (Appendix 2.a).

Figure 1: City of Toronto Facebook advertisement for the transition to zero-emission outdoor power equipment survey.

Results

There were 6,567 survey respondents, 97 per cent of which reached the end of the survey. The high response rate indicates significant public interest.

Resident perceptions

The survey found that 17 per cent (1,122 out of 6,567) of respondents agree and 56 per cent (3,696 out of 6,567) strongly agree (73 per cent or 4,818 total) that Toronto should transition to zero-emission outdoor power equipment for all residents, businesses, and City of Toronto operations (Figure 2). Only 6 per cent (396 out of 6,567) agree and 17 per cent (1,122 out of 6,567) strongly agree (23 per cent or 1,518 total) that two-stroke engine equipment use should continue to be allowed (Figure 3).

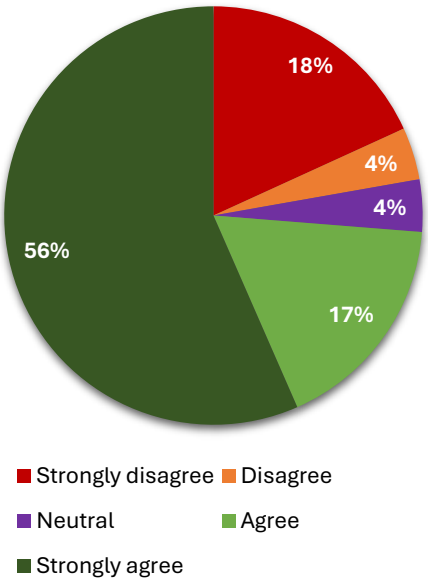

Figure 2: Responses to: "Toronto should transition to zero-emission outdoor power equipment for all residents, businesses, and City of Toronto operations". Percentages are based on 6,567 respondents. Values are approximate.

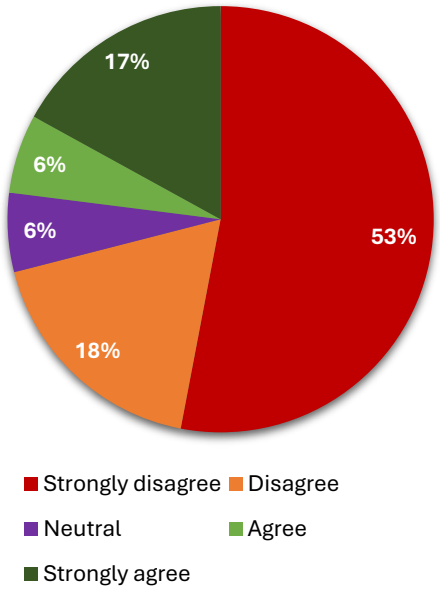

Figure 3: Responses to: "Toronto should allow the continued use of two-stroke engine equipment for all residents, businesses, and City of Toronto operations". Percentages are based on 6,567 respondents.

Furthermore, 24 per cent (1,584 out of 6,567) of respondents agree and 52 per cent (3,432 out of 6,567) strongly agree (76 per cent or 5,016 total) that air quality is negatively impacted by two-stroke engine equipment, while 16 per cent (1,056 out of 6,567) agree and 59 per cent (3,894 out of 6,567) strongly agree (79 per cent or 5,214 total) that there are negative impacts on human health caused by two-stroke engine equipment.

Nearly half (49 per cent or 3,217 out of 6,567) of survey respondents indicate that they are extremely concerned about the use of two-stroke engine equipment in their neighborhood, an additional 18 per cent (1,182 out of 6,567) express moderate concern and 445 (seven per cent) are somewhat concerned. Noise pollution (78 per cent or 5,122 out of 6,567), air pollution (72 per cent or 4,728 out of 6,567) and contribution to climate change (54 per cent or 3,546 out of 6,567) are the most prominent concerns.

When given the opportunity to identify additional concerns respondents associate with the use of two-stroke engine equipment, several recurring themes emerged in the written responses (Table 1).

While most responses focus on the consequences and risks of two-stroke engine equipment use, some highlight apprehension around imposing restrictions on such equipment. Specifically, some respondents voice concern regarding imposing restrictions without rebates or other financial incentives, and others emphasize that City funds should be directed toward other operations and services, such as roads and police services.

Table 1: Responses to "What concerns do you associate with the use of two-stroke engine equipment?" categorized by key recurring themes.

Category	Example statements from respondents
Environmental impacts	
Harm to wildlife	• Impact on habitat--they have a cataclysmic effect on macrofauna and the larger creatures that eat them. • Disruption of the microbiology and insect ecosystems that the fallen leaf canvass helps nurture.
Soil health	• Processed materials that should be left to nourish the soil. • It's the worst practice, eroding the soil, killing insects, blowing away organic matter.
Flood risk	• Workers blowing leaves to the street where they will plug the drainage system. • Flooding hazard: Gas leaf-blowers led to flooding on my street after two properties had landscapers blow their leaves into the road. Three leaf-clogged drains put 15m of street and sidewalk underwater during the Nov 20 rain. This practice of blowing leaves into the road is typical of gas leaf blower users and not of other methods.
Water contamination	• Water pollution from spilled oil. • Oil leakage and spillage on driveway, going into waterways.
Health Impacts	
Worker safety	• Long-term health of people working regularly with two-stroke engine pollution and noise. • Harmful effect on the operator's hearing. Possible tinnitus in future.
Noise pollution	• Danger to children's and babies hearing. • I have tinnitus and I'm autistic, the decibel level is so high I have to wear earplugs when one is operating nearby.
Airborne particles	• Dust and dirt blown into the air, making asthma worse. • Because of severe allergies, I suffer from the increased dust, pollen and leafy matter that is blown into the air.
Mental well-being	• Physical and mental health issues from the noise. Trauma triggering. • The noise pollution impairs learning in the school. It also contributes to stress and reduces mental health.

Exhaust fumes	• Gas engine exhaust contains VOCs including benzene, 1,3 butadiene, and formaldehyde: all potent human carcinogens. Workers using gas leaf blowers are exposed to VOCs, a well-known contributor to heart and lung disease, stroke, & premature death.
Pedestrian safety	• Debris blown towards streets is hazardous to cyclists and motorists. • People using it often just blow everything out onto the road, where it becomes a skidding hazard for vehicles, bicycles, etc.
Social impacts	
Social cohesion	• The strain on social dynamics in a community. • Dangerous and/or inconsiderate use (example: not turning it off when people walk by, blowing things in their eyes or pets' eyes).

Of 6,567 respondents, over 50 per cent are aware of all healthy landscaping recommendations highlighted in the survey. The most practiced healthy landscaping recommendations across respondents are never using chemical pesticides (60 per cent or 3,940 out of 6,567) and adding plants that attract pollinators (59 per cent or 3,835 out of 6,567). In addition to practicing healthy landscaping, survey results indicate a strong interest in continuing to learn more about sustainable landscaping practices and a belief that the City should advance education for residents and businesses on healthy landscaping (Figures 4 and 5).

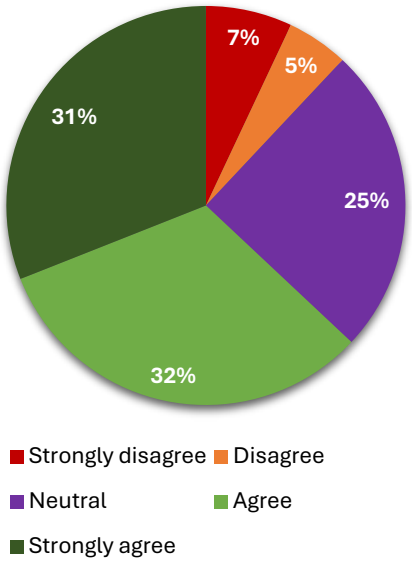

Figure 4: Responses to: "I would be interested in learning more about sustainable landscaping practices." Percentages are based on 6,567 respondents.

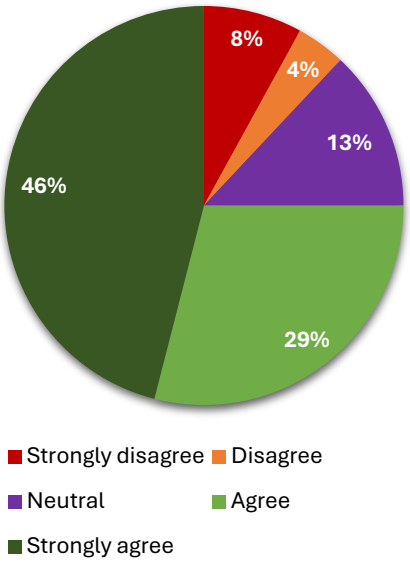

Figure 5: Responses to: "The City of Toronto should do more to teach residents and businesses about healthy landscaping practices." Percentages are based on 6,567 respondents.

Lawn care practices

Lawn care tasks such as mowing, leaf blowing and/or leaf collecting are performed by 72 per cent (4,728) respondents. Of the 4,728, 33 per cent (1,560) mow their lawns every one to two weeks and 20 per cent (951) do not mow the lawn at all. Only nine per cent (440) use a leaf blower every one to two weeks and 2,884 (61 per cent) do not own a leaf blower.

Of the 4,728 who perform yard care tasks, 70 per cent (3,309) do not own or use any two-stroke engine equipment and 27 per cent (1,276) do own or use two-stroke equipment. The remaining five per cent responded as unsure.

The survey found that the most important factor when purchasing two-stroke engine equipment was performance (46 per cent or 601 out of 1,276 respondents who own two-stroke engine equipment). Out of the 3,106 respondents who answered the question, the top two concerns reported with using zero-emission outdoor power equipment are cost to purchase (35 per cent or 1,087) and battery life (33 per cent or 1,024) (Figure 6).

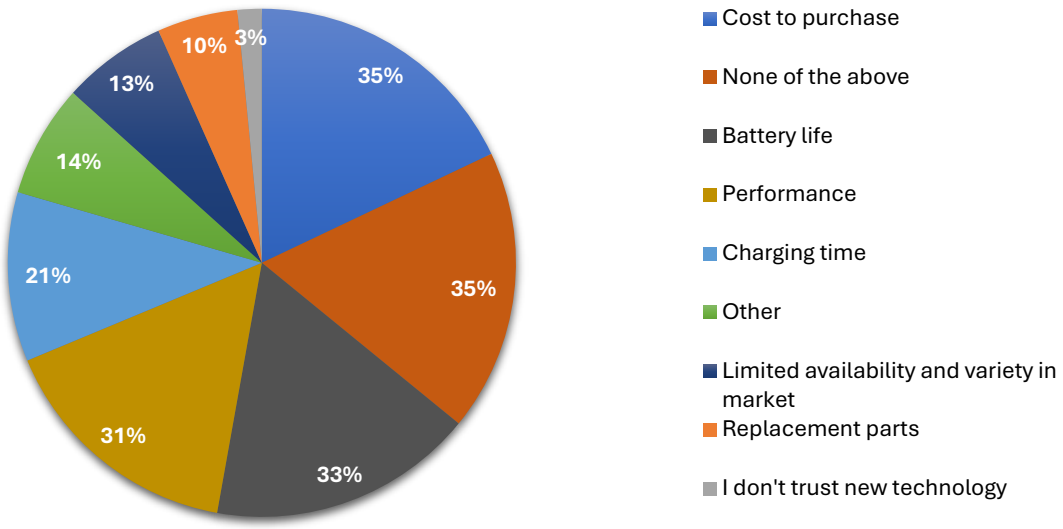

Figure 6: Responses to: "What are your concerns, if any, with using zero-emission outdoor power equipment?" Percentages are based on 3,106 respondents.

Additional concerns, as captured within the written responses, were financial, environmental, safety, and regulation based (Table 2).

Out of the 3,106 respondents who answered the question, a trade-in program was identified as the most likely (43 per cent or 1,336) mechanism for encouraging a switch to zero-emission outdoor power equipment. This was followed closely by financial incentives such as a point-of-sale rebate (38 per cent or 1,180) and longer battery life (35 per cent 1,087).

Out of the 6,520 respondents who answered the question, the survey found that 58 per cent (3,782) of respondents would support a city-wide transition to zero-emission outdoor power equipment, while 15 per cent (978 out of 6,520) would not.

Table 2: Responses to: "What are your concerns, if any, with using zero-emission outdoor power equipment?" Categorized by key recurring themes.

Category	Example statements from respondents
Financial impact	• My landscaper will charge triple because it will take him forever to do the job. • The cost to replace all my equipment, unless you want to offer a full rebate and exchange… I don't use 2 stroke equipment for fun it is the only choice at the moment.
Environmental impact	• Lithium-ion batteries have their own environmental impact. I would love to see the city create parks where nature can just be nature and require minimal upkeep, so we need less equipment overall. • Batteries are not easily recycled and create toxic waste that ends up in bodies of water and soil.
Regulation and control	• Don't like government enforcing so many regulations. • My freedom to choose.
Safety	• Batteries can catch on fire. • Dangerous batteries that burn hot and quickly. Don't want them in my shed or garage.
Replacing equipment	• Buying new equipment when I have a perfectly good gas blower. • Evolution of battery technology is moving forward and becoming outdated in a very short time.

The results reveal an opposition to a mandatory phase out, with concerns expressed regarding the impacts on low-income residents and preference for a gradual transition. There are concerns about affordability and a desire for financial incentives and support. Furthermore, while many respondents generally support a phase out, they were adamant that education is a critical step and should be used first.

To support residents and businesses through the transition, the survey found that residents believe the City should offer education and incentives. Tax credits for businesses, rebates, incentives for retailers, subsidies and buyback programs were all suggested as forms of financial support. These themes align with those previously identified in questions about how to encourage a transition and whether residents support a ban.

Business Stakeholder Consultation

The City engaged Landscape Ontario and Clean Air Partnership to undertake a business stakeholder consultation process to assess perspectives on a potential ban, cost, and barriers to adoption of battery-powered landscape equipment, equipment manufacturers, battery life and recycling options, and to develop case studies highlighting companies that have transitioned to battery-powered equipment. The objective of the consultation process was to consider the diverse needs and challenges of businesses who use two-stroke engines or who provide services using two-stroke engine equipment alternatives as well as to help inform the development of a two-stroke engine phase out that is reasonable, feasible and enforceable for the public and businesses. The business stakeholder consultation included three different approaches: survey, interviews and case studies. One interview was conducted by Clean Air Partnership, the rest of the consultation was carried out by Landscape Ontario.

Methods

Survey

The business stakeholder survey launched on December 9, 2024, and closed on January 15, 2025. The survey was promoted in two weekly enews letters: the Workforce Development enews letter (5,241 email recipients) and the Membership enews letter (8,239 email recipients). Two e-blasts were sent from the Executive Director of Landscape Ontario to 4,198 email recipients. The survey was also promoted in the Landscape Trades national magazine (9,535 email recipients across Canada). The survey was also promoted on social media platforms (Facebook, Instagram, LinkedIn). Direct email requests for participation in the survey were sent to members of the Toronto Chapter, the Golden Horseshoe Chapter, and the Durham Chapter of Landscape Ontario. The survey was also promoted at Landscape Ontario's Congress, Canada's largest and longest running trade show and conference for landscape professionals. The survey was promoted at the Electric Demo Area from January 7-9, 2025, and all Owners, Operators, Presidents, General Managers, and Supervisors that attended received a follow up email to complete the survey after the show (439 recipients).

The survey included 58 questions and consisted of six parts: business demographics; current equipment usage; concerns/barriers to uptake; incentives and supports; an optional opportunity to provide further detail; and a request for interviews (Appendix 1.b). The survey questions were determined through meetings with businesses who had experience in transitioning to battery-powered equipment and members of the Toronto Chapter of Landscape Ontario.

Interviews

Fifteen (15) participants were selected for an interview based on their survey responses which indicated an interest in being interviewed. The purpose of the interviews was to provide further understanding on what was captured in the survey. Interview questions

were developed with guidance and insight from industry professionals that had significant experience with converting to battery-powered equipment that was obtained during meetings in November 2024 (Table 3). The interviews were conducted between December 12-20, 2025.

Table 3: Business stakeholder interview questions.

	Interview questions
1.	Has your company begun to convert to battery-powered equipment? If so, how much of your equipment is battery-powered?
2.	What are your concerns about switching to battery-powered equipment? *
3.	What were the greatest challenges you faced when transitioning to battery-powered equipment? **
4.	Would the site allow you to charge all the necessary equipment? **
5.	Can you share any financial data on what your company has spent on the transition to battery-powered equipment? **
6.	How has your company benefitted from the transition to battery-powered equipment? **
7.	Do you think a seasonal exemption, allowing the use of two-stroke equipment, for spring and fall clean ups would support the industry? **
8.	In your opinion, what types of incentives would support the industry making the switch to battery-powered equipment?
9.	In your opinion, what are the best ways for Landscape Ontario to support the industry to shift towards battery-powered equipment?
10.	If you could give advice to a landscape business owner that has not transitioned any of their equipment to battery, what would you tell them?**
11.	Do you have any further comments?

* Only asked if the participant stated they had not begun to convert to battery-powered equipment
** Only asked if the participant stated they had begun to convert to battery-powered equipment

Clean Air Partnership also conducted an interview to determine if a ban would have disproportionate burden on businesses owned by people who are Indigenous, Black or equity-deserving groups. Twenty-four (24) self-identified landscaping businesses were contacted requesting an interview. Businesses were identified through google searches and websites such as Vanakkam Canada, Yellow Pages, Kijiji, and Facebook. Outreach occurred throughout October and November 2024. The interview included eleven (11) questions (Table 4).

Table 4: Interview questions for businesses owned by equity-deserving groups.

	Interview Questions
1.	Do you use two stroke engine equipment in your landscaping practice, why/why not?

	Interview Questions
2.	How might a phased transition away from gas powered, two stroke engine equipment and towards electric outdoor power equipment affect your business?
3.	Are you currently using or testing out any electric landscaping equipment?
a.	If yes, what has been your experience of its ability to meet your landscaping needs?
b.	What challenges have you encountered?
c.	Which types of electric equipment have been most able to meet your needs re their needed performance?
d.	Which types of equipment have you found to be most challenging in switching to electrical?
e.	If you haven't used/tested out electric equipment, what has been the barrier or rationale for not testing them out?
4.	Do you have concerns about shifting to zero emissions outdoor power equipment and what would you suggest the City of Toronto can do to address these concerns?
5.	How do you think a transition to electric landscaping equipment might affect your competitive position in the market? Positive impacts? Negative impacts?
6.	What supports would you suggest for helping your company plan for a transition towards electric landscaping equipment?
7.	Have you encountered any barriers in building relationships with suppliers or partners as a black/women/immigrant/minority owner? Do you think this might be an issue with obtaining electric equipment?
8.	Do you think there are specific issues your company will experience because of being a(n) Women/Black owned/immigrant run business? Any special considerations we should consider regarding your staff make-up that should be considered in exploration of a phase out on gas powered, two stroke engine equipment?
9.	Do you think the transition to zero emissions outdoor power equipment would disproportionately impact your business as a women/Black owned/immigrant run business? Why/why not?
10.	Do you employ sustainable lawn and yard care practices, such as leaving leaves as mulch, raising the lawn mower blades, planting native plants, etc.?
a.	If yes, do you advertise this to your clients?
b.	Have you experienced any opposition from your clients towards these sustainable practices?
11.	Overall, do you support the development of a phase-out of two-stroke engine equipment?

Case studies

From the participants that were interviewed, Landscape Ontario selected three landscape companies that had implemented battery-powered equipment to complete a

case study to share further details on their experiences. The purpose of the case studies was to identify the challenges that companies faced when converting to battery-powered equipment and how they were addressed, how health and safety and standard operating procedures were affected, the types of battery equipment they have found to be comparable to two-stroke and therefore are easier to adopt, and what should be included in a 'Best Management Practices' guide based on their experiences. The case study consisted of eight additional questions (Table 5).

Table 5: Business stakeholder case study questions.

	Case Study Questions
1.	During your interview, you noted the following challenges with transitioning to battery-powered equipment. Can you please identify how they were addressed? (three sub questions followed based on individual interview responses)
2.	Has the transition to battery-powered equipment required any changes to your Health and Safety policies and/or procedures? Please explain.
3.	Has the transition to battery-powered equipment required any changes for the operator and/or equipment/PPE in order to practice safe ergonomics?
4.	Has your business had to update battery charging, storage and/or transportation infrastructure? What have you put in place to eliminate/reduce risk? Please explain.
5.	How have your standard operating procedures changed since transitioning to battery-powered equipment?
6.	Please share what you have learned: What should be included in a Best Management Practices guide that would support the industry in transitioning to using battery-powered equipment? (ex. importance of keeping battery tools sharp, safe charging, storage and transportation of batteries etc.)
7.	Please complete the chart below to the best of your ability in order to determine which battery powered alternatives are easy to adopt based on performance and cost. For each of the types of equipment listed below please provide as much detail as possible on the electric equivalent's performance, total cost of ownership, and preferred manufacturer: • Hand held leaf blower • Backpack leaf blower • Chain saw • String/line trimmer • Hedge trimmer • Pole saw • Lawnmower push behind • Power brushes/brooms • Power washers • Rototillers • Earth augers

	Case Study Questions
	• Vibratory compactors • Concrete, stone and metal saws • Drills • Pumps (water, sprayer) • Generators
8.	Can you highlight how your company has benefited from transitioning to battery-powered equipment? What are the opportunities for the landscape horticulture industry?

Results

Survey

The largest category of businesses that use gas-powered small engine equipment are landscaping companies. According to Scott's Directory, Canada's foremost business information database, there are approximately 600 landscaping companies operating in the Greater Toronto Area under NAICS code 561730. The business consultation survey received 326 responses from individual businesses who are members of Landscape Ontario. The high response rate indicates significant business interest.

Current Equipment Usage

Only 10 per cent (35) of businesses have converted over fifty percent of their gas-powered equipment to battery-powered equipment. Half of the businesses, 56 per cent (181), have converted up to 20 per cent of their equipment and one quarter, 26 per cent (84), have not converted any of their gas-powered equipment to battery-powered equipment (Figure 7).

The number of gas-powered equipment is greater for each type of equipment owned by the businesses, except for drills (Figure 8). Amongst the 326 businesses, there are a total of 548 leaf blowers, 291 mowers, 542 string/line trimmers, 493 chain saws, 242 pole saws, and 512 hedge trimmers that are battery-powered and being used.

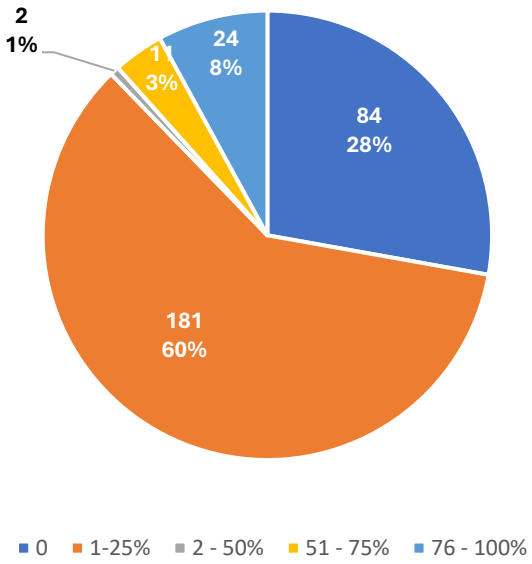

Figure 7: Reported percentage of equipment converted from gas-powered to battery-powered equipment and number of respondents for each percentage range.

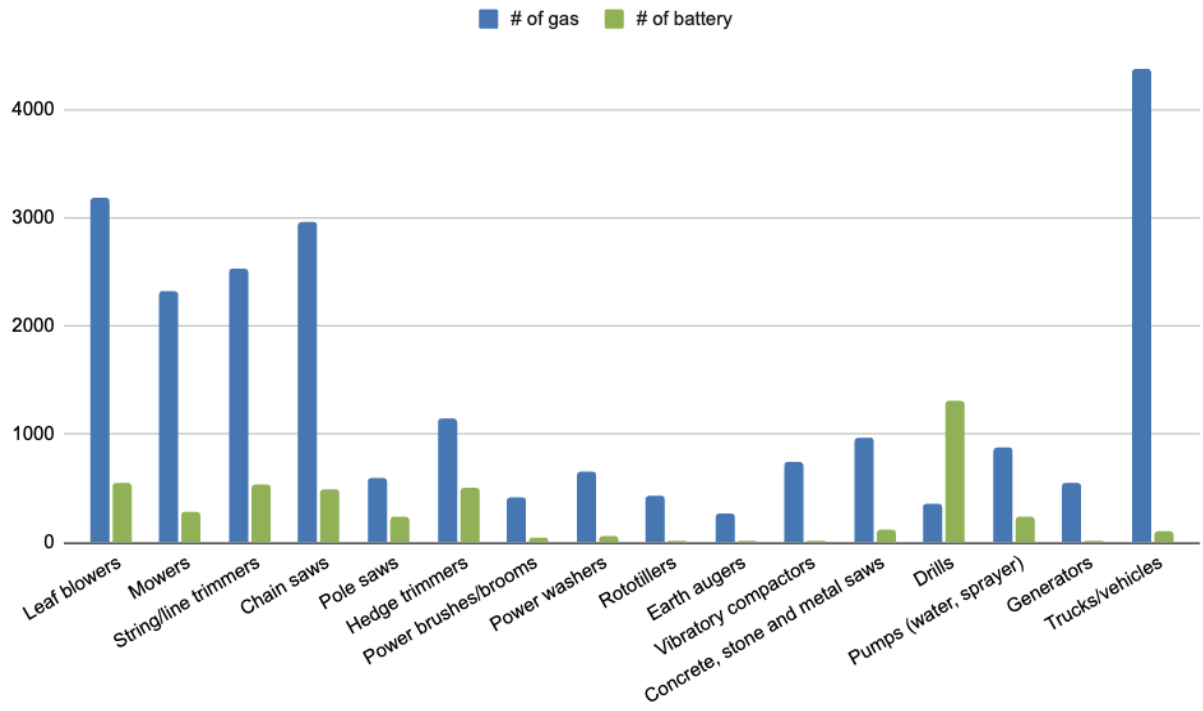

Figure 8: Total number of gas and battery equipment owned and used by business.

Of the 326 businesses, only 14 per cent (45) are in the processes, or already have, transitioned to battery-powered equipment while 15 per cent (50) noted that they will be transitioning to battery-powered equipment as their gas-powered equipment needs to be replaced. However, 72 per cent (231) do not currently plan to switch to battery-powered equipment (Figure 9).

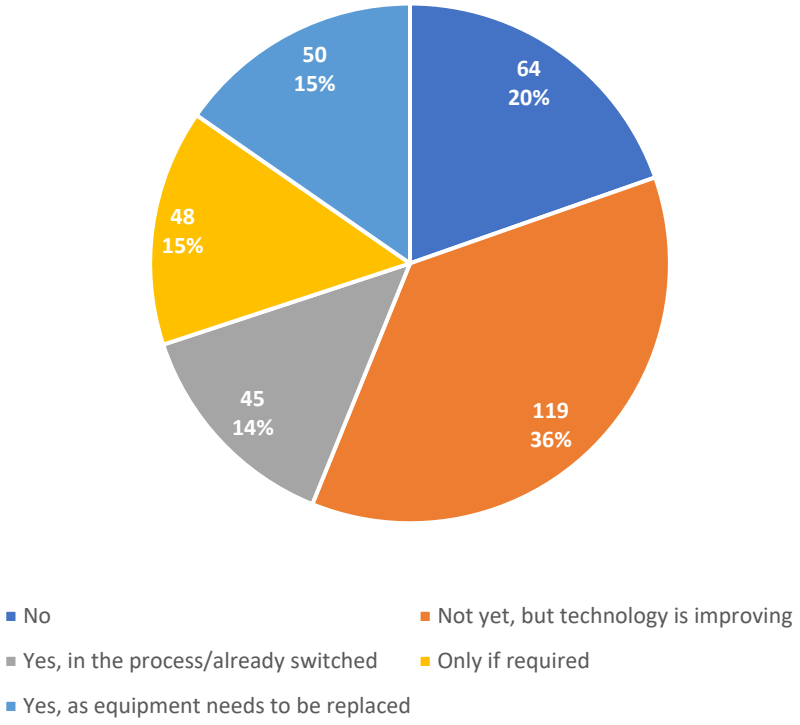

Figure 9:Number and percentage of businesses that plan to make the switch to battery-powered equipment.

Concerns/Barriers to Uptake

Survey respondents were asked to rate fifteen concerns for their business when transitioning to battery-powered equipment. The concerns were ranked from 1 ('not significant') to 5 ('very significant'). The complete results are shown in figures 11-13. Limited battery life/run-time was the most significant concern, while staff training was the least. This can be inferred when all fifteen concerns are listed in order of the number of times the concern was ranked as 'very significant':

- Limited battery life/run-time (70 per cent selected 'very significant')
- Lack of performance for heavy-duty tasks (67 per cent selected 'very significant')
- Battery replacement and/or disposal (51 per cent selected 'very significant')
- Charging infrastructure (49 per cent selected 'very significant')

- Efficiency compared to two-stroke equipment (48 per cent selected ‘very significant’)
- High upfront costs (44 per cent selected ‘very significant’)
- Ability to install/update electrical systems (35 per cent selected ‘very significant’)
- Limited availability of equipment (26 per cent selected ‘very significant’)
- Maintenance or repair (23 per cent selected ‘very significant’)
- Research required to determine best brand for company (23 per cent selected ‘very significant’)
- Upfront planning (22 per cent selected ‘very significant’)
- Inventory management (17 per cent selected ‘very significant’)
- Operational changes (16 per cent selected ‘very significant’)
- Staff resistance (9 per cent selected ‘very significant’)
- Staff training (5 per cent selected ‘very significant’)

When asked if there were any other concerns not included in the fifteen categories, 120 individual responses were received. The top concerns that were brought up were:

- Cost of new equipment (25 respondents)
- Battery-powered equipment isn’t powerful enough (24 respondents)
- Environmental impact of battery and equipment disposal (23 respondents)
- Battery-life throughout the workday (22 respondents)
- Equipment reliability (18 respondents)

When asked if delays were experienced when purchasing battery-powered equipment, 52 per cent of respondents said ‘no’, 14 per cent said ‘yes, manageable delays’ and 8 per cent said ‘yes, significant delays’.

When respondents were asked if they would need to implement new infrastructure to transition to battery-powered equipment, 66 per cent said ‘yes’, 19 per cent said they would not need to implement new infrastructure, and 15 per cent were unsure.

When asked how survey respondents plan to, or currently, dispose of batteries, only 11 per cent of respondents said they ship batteries back to the supplier. Forty-four per cent were not sure or were concerned about recycling and disposal. Forty-one per cent of respondents would like municipalities to support battery recycling and/or disposal initiatives. Fifty-eight per cent respondents noted that using battery-powered equipment will affect their efficiency in getting tasks completed. Sixty-four percent of survey respondents noted that they would have to increase their prices to accommodate the use of battery-powered equipment in their business, 21 per cent were unsure and 15 per cent said they would not have to increase prices.

Only four per cent of survey respondents answered that battery-powered equipment can tackle heavy duty jobs such as spring and fall clean ups of large quantities of wet

leaves. While 39 per cent said they were not effective at dealing with wet leaves, followed by 23 per cent indicating that they are not currently effective and request a seasonal exemption until the technology improves (Figure 10).

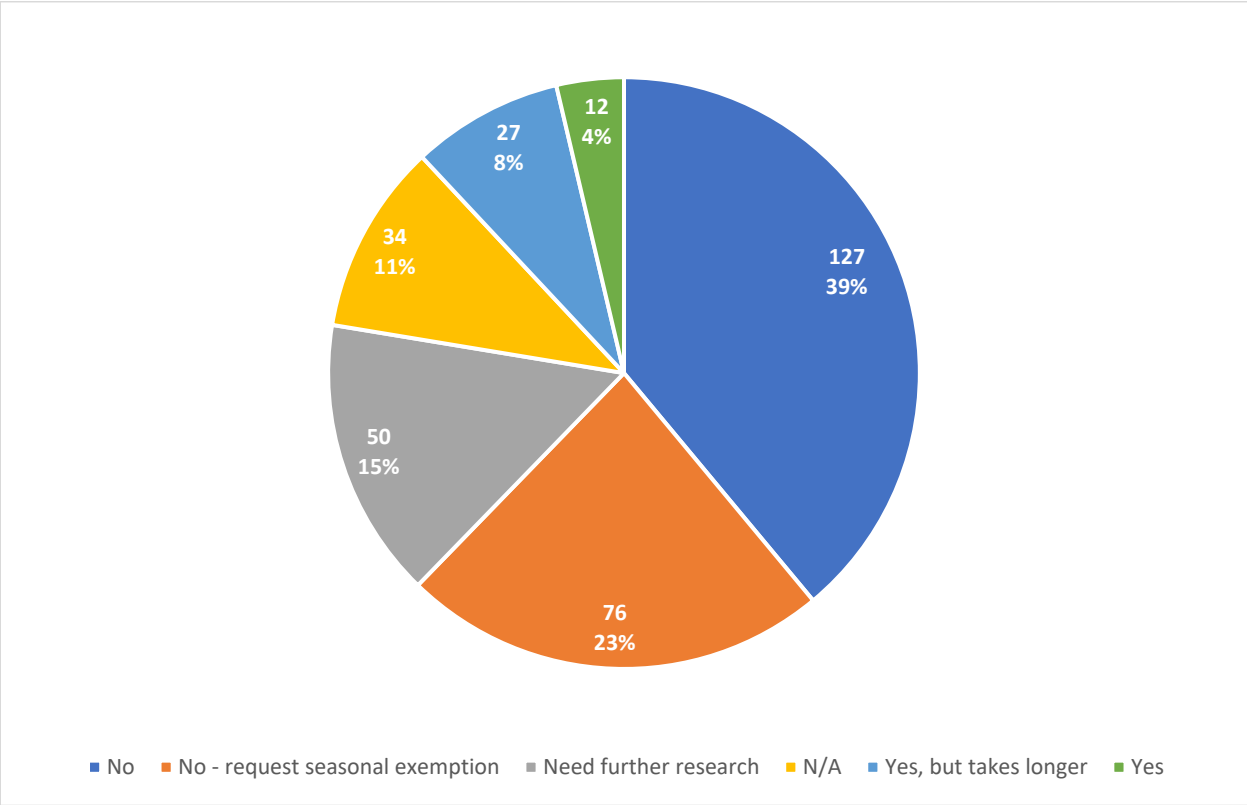

Figure 10: Business perceptions of battery-powered equipment effectiveness on wet leaf clean-up.

Incentives and Supports

When survey respondents were asked if a delayed implementation of a potential ban on two-stroke equipment would support their company to make the change 33 per cent said ‘no’. However, the majority, 77 per cent, said a delayed implementation would help but selected different time frames (Figure 11).

The most selected answers in response to how an immediate ban would affect their businesses were that it would add financial pressure 31 per cent, add stress of changing/updating infrastructure and operations 25 per cent, add pressure to research battery-powered options quickly 20 per cent. Only 6 per cent of businesses noted they would need to close their business if an immediate ban were to take place.

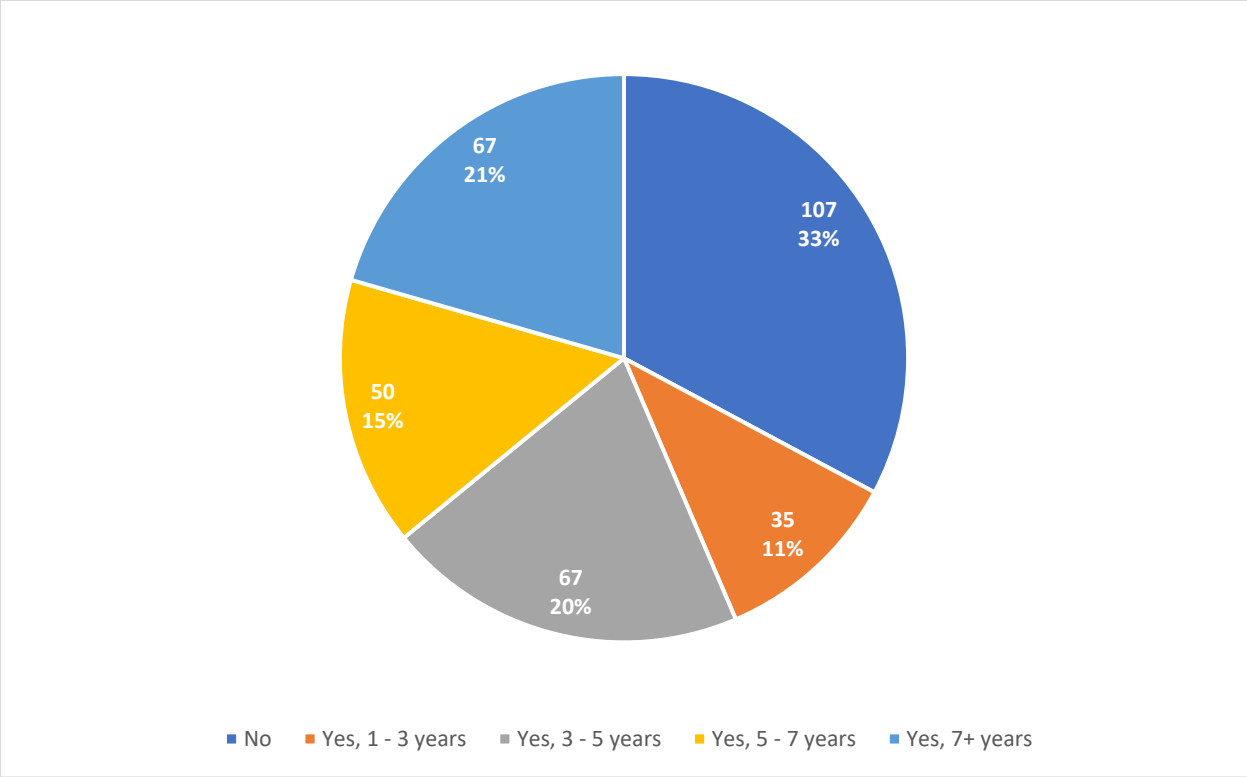

Figure 11: Responses to "Would a delayed implementation of a two-stroke engine equipment ban support your company to make the change?"

Interviews

Fifteen interviews were conducted with businesses who had completed the survey and stated their interest in participating in an interview. The interviews provided details on the benefits, challenges and opportunities landscape companies have faced when converting to battery-powered equipment. In 14 of the 15 interviews, it was agreed that small hand-held landscape maintenance equipment including line trimmers, hedge trimmers and handheld blowers are equivalent in power to the two-stroke options. Many landscape professionals are very satisfied with their small battery-powered equipment. Compared to two-stroke engine equipment, the small hand-held battery-powered equivalents are found to be:

- Lighter
- Free of exhaust emissions
- Produce less vibration
- Eliminate the need to mix, pour or transport fuel

Participants noted however, that the larger backpack blowers are not comparable to the two-stroke in terms of power, nor are they able to push organic matter at the same capacity. Many participants have concerns specifically about fall clean ups when there are large amounts of leaf litter that can be wet and heavy. Nine (9) interviewees

requested an exemption from a potential ban during fall clean ups until battery-powered equipment improves. Of the six individuals that did not request a seasonal exemption, two were arborists and one solely operated under landscape construction and noted that a seasonal ban would not apply to them. For many companies that service large properties with many mature trees, small blowers and hand rakes are not considered to be a feasible option. Most participants believe that this exemption could support grounds management professionals to convert to battery-powered equipment throughout the rest of the year.

The two arborist businesses interviewed noted that there is not a powerful enough battery-powered chainsaw capable of felling a large tree. Arborists work in harsh conditions, year-round and provide essential work keeping our streets safe. The arborists would require an exemption from a potential ban for this work, until technology improves. Similarly, the landscape construction sector has noted that battery-powered stone-saws, plate tampers and quick cuts are not powerful enough to do an efficient or effective job.

Participants requested a delayed implementation of a two-stroke equipment ban to allow businesses time to research the different products and manufacturers and to invest in the equipment and technology, as there is a significant upfront expense. Due to the price of batteries and associated charging infrastructure, operators have found that it is most economical to purchase equipment from one manufacturer. For this reason, it is important to allow time to determine which manufacturer will be chosen.

Another concern that many of the participants shared was battery disposal and recycling, with participants responding with the following:

- Most companies have not had much experience with disposing and/or recycling batteries.
- Most participants send dead batteries back to the manufacturer, but this may not be a long-term solution.
- Not all suppliers take them back.
- Participants are concerned that if contractors are not aware of how to recycle batteries or there is not an easy solution, batteries could end up in a landfill.

In addition to the above interviews conducted by Landscape Ontario, Clean Air Partnership also completed a sixteenth interview. The purpose of the interview was to understand the potential impacts on equity-deserving landscaping businesses, Clean Air Partnership reached out to women-, Black-, immigrant-, and visible-minority-owned landscaping companies. While 24 companies were contacted, only one interview was secured (hereon referred to as Company A to maintain anonymity). According to Company A, while their affluent client base is willing to pay extra for zero-emissions services, many businesses may struggle financially with the transition and would benefit from incentive programs.

The low response rate for these interviews is likely due to outreach occurring during a busy time for landscaping companies involved in fall clean-ups. Furthermore, many of the businesses contacted were small, home-based, and not members of Landscape Ontario, with no official websites. Therefore, these companies may not have the time or resources to participate, further contributing to the low response rate.

Case studies

The case studies provided further insight on the challenges each company faced, and how they were addressed. The three landscape professionals that participated in the case studies all noted that their companies' have experienced many benefits by switching their landscape equipment to battery-powered. Their teams benefit from less exposure to gas, no emissions/fumes during operation, reduced noise, equipment that is easier to start and stop (reducing training time/learning curve), a lot of the smaller equipment is lighter and more ergonomic, which all contribute to the health, wellness, and longevity of the operators. Their businesses have benefited for the following reasons:

- their equipment maintenance costs have decreased significantly;
- the variable expense of fuel has changed to a fixed expense (easier to budget);
- electricity is relatively inexpensive in Ontario;
- reduces noise pollution and emissions (which clients prefer); and
- having battery-powered equipment or zero emissions crews are a great talking point and selling feature for the business, which helps them stand out and attract new clients.

The challenges noted by the participants were:

- Researching manufacturers and available products to determine what will suit cases and equipment needs.
- A team's initial resistance and disappointment to using battery-powered equipment.
- Health and safety concerns about the safety features on battery-powered chain saws.
- The additional weight of batteries for some equipment.
- Battery charging infrastructure and planning.
- The comparison of equipment was also raised, and it was stated that technology is not where it needs to be to replace all equipment.

Several pieces of equipment is comparable and meets their demand including:

- Hedgers
- Trimmers
- Rototillers
- Chainsaws

- Bed definers
- Small pruning saws
- Other hand-operated tools

Other equipment such as larger chain saws are not comparable for heavy duty or arborist use and it was found that battery-powered chainsaws are not suitable for felling large trees. Decreased performance in demanding conditions, frequent battery replacements and oil refills were noted. Pole saws have equivalent performance for grounds management practices but share the same limitations as above for arborist use because they are prone to under powering, binding and dying during use. Additionally, battery-powered chainsaws do not have a safety clutch that activates when the blade touches clothing. In gas-powered chainsaws, the clutch is attached to the motor and will stop the machine immediately if there is contact with clothing. The lack of this safety feature is incredibly dangerous for workers and could lead to serious injury.

Battery-powered hedge trimmers are equivalent or even better than the gas-powered alternative. They have a long runtime and battery replacement is easy. They are effective for ground and ladder use. Staff prefer the battery-powered option due to their light weight and ease of use. Equipment that was considered not equivalent included battery-powered blowers and mowers that can tackle heavy duty fall clean ups. Both the battery handheld leaf blowers and backpack blowers do not have the equivalent electric performance as gas-powered. It was noted that the handheld leaf blowers can cause elbow injuries with limited use (due to weight) and they do not have as much power which increases job duration. The continuous use, (no downtime for battery changes out), greater power and longer runtime still make the gas-powered option more favourable. The battery-powered backpack blowers are not suitable for heavy duty work or extended durations but work well for lighter blowing requirements or summer use.

The battery-powered push-behind mowers were deemed comparable to gas-powered, but comments were made that battery life is limiting and they cannot handle heavy grass in the spring. Battery-powered string/line trimmers are found to be comparable to their gas alternatives and are preferred over gas. However, it was noted that they are not ideal for thick field cuts.

Demographics

Residential stakeholder consultation

Approximately 80 per cent (5,000) of respondents were from Toronto, however no respondents from Wards 1, 7, 21, 22, or 23 completed the survey. 74 per cent (4,700) of respondents were homeowners, and 63 per cent (4,000) were between 30 and 64 years of age.

Business stakeholder consultation

Survey

Of the 326 businesses that completed the survey, 96 per cent (313) operate in Ontario. 15 per cent operated exclusively within the City of Toronto and 38 per cent work in Toronto as well as other municipalities. Most were small businesses; 71 per cent of companies had 1-20 employees and 18 per cent had 21-50 employees. Each survey was completed by an owner, operator, president, general manager or supervisor, who would be able to provide company equipment and operations details. Most, 64 per cent (208) businesses' primary sector was grounds management and 36 per cent (118) of respondents' primary sector was landscape construction. Many companies provide services in more than one sector, including design, hardscape construction, snow, and ice management.

Interviews

Landscape Ontario conducted virtual interviews with 15 landscape professionals, representing 15 Landscape Ontario member businesses. These interviews included members of the grounds management, landscape construction and arborist sectors of the landscape horticulture industry, who have begun to convert to using battery-powered equipment. Thirteen of the fifteen (13/15, 87 per cent) businesses operated within the City of Toronto (13/15, 87 per cent). The two businesses that do not operate within the City of Toronto were chosen because they have converted almost all their equipment to battery-powered and were able to share significant insights.

Case studies

Three businesses were selected to participate in the additional case study questions based on their initial interview responses and willingness to participate. Two grounds management companies that have converted most of their gas-powered equipment to battery-powered, and one arborist company that has experienced challenges with converting gas-powered equipment to battery-powered equipment were selected.

Appendix 1.A Resident Stakeholder Consultation Survey Questions

Transition to Zero Emissions Outdoor Power Equipment: Survey questions.

Prepared and conducted by: Clean Air Partnership

	Part 1: Resident perceptions
1.	How concerned are you about the current use of two-stroke engine equipment in your neighbourhood? 1. Not at all concerned 2. Slightly concerned 3. Somewhat concerned 4. Moderately concerned 5. Extremely concerned
2.	What concerns do you associate with the use of two-stroke engine equipment? (Choose all that apply) a. Noise pollution b. Air pollution c. Contribution to climate change d. Contribution to fossil fuel dependency e. Gasoline handling and storage f. None. I have no concerns. g. Fuel costs h. Winterization and storage i. Other, please specify
3.	Two-stroke engine equipment has negative impacts on air quality. 1. Strongly disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly Agree
4.	Noise from two-stroke engine equipment has negative impacts on human health. 1. Strongly disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly Agree
5.	Toronto should transition to zero emissions outdoor power equipment for all residents, businesses and City of Toronto operations. 1. Strongly disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly Agree
6.	Toronto should allow the continued use of two-stroke engine equipment for all residents, businesses and City of Toronto operations.

	1. Strongly disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly Agree
7.	Are you aware of any of the following healthy landscaping recommendations and do you practice any of them? a. Leaving fallen leaves in the fall and spring to feed soil and as a resource for wildlife b. Using a sharp mulching lawn mower blade c. Raising lawnmower blade to 3 inches to suppress weeds, preserve ground moisture and protect soil d. Never using chemical pesticides e. Replacing grass lawn with a garden and/or natural ground covers f. Choosing trees, shrubs and plants native to Toronto g. Letting your lawn go dormant in the summer h. Adding plants that attract pollinators
8.	I would be interested in learning more about sustainable landscaping practices. 1. Strongly disagree 2. Disagree 3. Neither agree or disagree 4. Agree 5. Strongly agree
9.	The City of Toronto should do more to teach residents and businesses about healthy landscaping practices 1. Strongly disagree 2. Disagree 3. Neither agree or disagree 4. Agree 5. Strongly agree
	Part 2: Lawn care practices
10.	Do you perform any yard care tasks like mowing, leaf blowing, or leaf collecting? a. Yes b. No c. I hire a company for lawn and garden care
11.	How often do you mow your lawn? a. Once a week b. More than once a week c. Every 1 to 2 weeks d. More than every 2 weeks e. I don’t mow grass
12.	How often do you use a leaf blower? a. Once a week b. More than once a week

	c. Every 1 to 2 weeks d. More than every 2 weeks e. I don't use a leaf blower
13.	Do you own or use any two-stroke engine equipment? a. Yes (own and use) b. Yes (own only) c. Yes (use only) d. No e. Unsure
14.	What two-stroke engine equipment do you own or use? a. Lawn mower (own, use) b. Leaf blower (own, use) c. String trimmer (own, use) d. Hedge trimmer (own, use) e. Chainsaw (own, use) f. Other, please specify (own, use)
15.	What was the most important consideration when you purchased or choose to use two-stroke engine equipment? a. Performance b. Market availability c. Ease of use and maintenance d. Does not require recharging e. Cost to purchase and operate f. I don't have access to any other equipment g. Other, please specify
16.	Do you own or use any zero emissions yard care equipment? a. Yes (own and use) b. Yes (use only) c. Unsure d. No
17.	What types of zero emissions outdoor power equipment do you own or use? a. Electric lawn mower (own, use) b. Electric leaf blower (own, use) c. Electric string trimmer (own, use) d. Electric hedge trimmer (own, use) e. Electric chainsaw (own, use) f. Rake (own, use) g. Push mower (own, use) h. Other, please specify (own, use)
18.	What are your concerns, if any, with using zero emissions outdoor power equipment? a. Cost to purchase b. Battery life c. Performance d. Charging time

	e. Limited availability and variety in the market in case I need to replace my device with something similar f. Replacement parts g. I don't trust new technology h. None of the above i. Other, please specify
19.	Which of the following factors would encourage you to switch from using two-stroke engine equipment to zero emissions outdoor power equipment? a. Trade-in program to hand-in my old gas-powered equipment b. Financial incentives such as point-of-sale rebates c. Longer battery life d. More equipment options in the market e. An opportunity to test out electric outdoor power equipment f. Other, please specify
20.	Would you support a city-wide ban to transition to zero emissions outdoor power equipment? a. Yes b. No c. Maybe d. Why or why not? _____ e. Other suggestions _____
21.	What role do you think the City should play in supporting residents and businesses through the transition away from two-stroke equipment?
22.	Along with home use, two-stroke engine equipment is often used in commercial applications, such as by landscaping or construction companies. Do you use two-stroke engine equipment to complete tasks related to your job? a. Yes b. No c. Unsure
23.	What industry do you work in? a. Landscaping b. Groundskeeping and maintenance c. Forestry d. Construction e. Park maintenance f. Other, please specify
	Part 3: Demographic questions
24.	What is your age? a. 16-19 b. 20-29 c. 30-64 d. 65+ e. Prefer not to answer
25.	What is your postal code? a. No fixed address

	b. Don’t know c. Prefer not to answer d. Please provide the first three characters of your postal code (for example, M6P)
26.	What best describes your gender? a. Woman b. Man c. Trans woman d. Trans man e. Gender non-binary (including gender fluid, genderqueer, androgynous) f. Two-Spirit g. Prefer not to answer h. Not listed, please describe:
27.	What best describes your current housing situation? a. Home owner b. Renting c. Permanently living with parent(s) or other family member(s) d. Temporarily staying with others (no fixed address) e. Homeless (staying outside, in a shelter, in a 24-hour respite) f. Prefer not to answer g. Not listed, please describe:
28.	What Toronto Ward do you live in? (List of all wards)
29.	What was your total household income before taxes last year? Your best estimate is fine. Please select one only. a. 0 - $29,999 b. $30,000-$49,999 c. $50,000-$69,999 d. $70,000-$99,999 e. $100,000-$149,999 f. $150,000 or more g. Don’t know h. Prefer not to answer
30.	Which of the following best describes your current employment status? a. Employed – full-time b. Employed – part-time c. Employed – casual, on-call, temporary or seasonal d. Unemployed or looking for a job e. Stay at home caregiver f. Student g. Retired h. Unable to work i. Prefer not to answer j. Not listed, please describe:
31.	Please tell us how you heard about this survey?

	a. Social Media b. Word of Mouth c. Website d. Professional or Community Organization e. Local Councillor or Councillor Email/Newsletter f. Letter or Email from City of Toronto g. City Staff or Project Consultant h. TTC Transit Shelter Ad i. Poster or Flyer j. Other, please specify:

Appendix 1.B Business Stakeholder Consultation Survey Questions

State of the Industry Survey: Battery-Powered vs. Two-Stroke Equipment

Prepared and conducted by: Landscape Ontario

	Part 1: Business demographics
1.	Name
2.	Title
3.	Email
4.	Phone Number
5.	Company Name
6.	Province
7.	Address
8.	Company website
9.	Name of Owner
10.	Does the owner of the business belong to any of the following equity-deserving groups? a. No b. Indigenous peoples c. Black community d. Racialized communities e. Newcomers f. Persons with disabilities g. Women h. Gender minorities i. Members of the 2SLGBTQIA+ community j. Prefer not to say
11.	Number of employees: a. 1-20 b. 21-50 c. 51-100 d. 101-200 e. 201+
12.	What percentage of your employees belong to any of the following equity-deserving groups? (Indigenous Peoples, Black Community, Racialized Communities, Newcomers, Persons with Disabilities, Women, Gender Minorities, Members of the 2SLGBTQIA+ Community) a. 0% b. 1 – 25% c. 26 – 50% d. 51 – 75% e. 76 – 100%
13.	Primary sector: a. Landscape Construction b. Grounds Management
14.	Secondary sector: (check all that apply)

	a. Grower b. Garden Centre c. Design d. Landscape Construction e. Hardscape f. Grounds Management g. Turf Management h. Irrigation i. Lighting j. Interior Plantscape k. Snow and Ice Management l. Horticulturist m. Arborist
15.	Do you operate within the City of Toronto? a. Yes, exclusively b. Yes, and in other municipalities c. No
16.	Do you have multiple locations and/or multiple yards that crews depart from? a. Yes b. No
	Part 2: Current Equipment Usage
17.	Does your company currently have any battery-powered equipment? a. Yes b. No
18.	What percentage of your equipment have you converted to battery-powered? a. 0% b. 1 – 25% c. 26 – 50% d. 51 – 75% e. 76 – 100%
19.	Please complete the following chart to outline the approximate number of each type of equipment you have, for both gas and battery- powered. You will need to enter '0' if you do not have any of a particular piece of equipment. • Leaf blowers • Mowers • String/line trimmers • Chain saws • Pole saws • Hedge trimmers • Power brushes/brooms • Power washes • Rototillers • Earth augers • Vibratory compactors

	• Concrete, stone and metal saws • Drills • Pumps (water, sprayer) • Generators • Trucks/Vehicles *not included in potential ban*
20.	Does your company plan to make the switch to battery-powered equipment? a. Yes, in process/already switched b. Yes, as equipment needs to be replaced c. Only if required d. Not yet, but technology is improving e. No
21.	How likely are you to convert more equipment to battery-powered in the next five years? 6. Very unlikely 7. Somewhat unlikely 8. Neutral 9. Somewhat likely 10. Very likely
22.	What makes you interested in making the switch to battery powered equipment? (Check all that apply) a. Ease of startup/operation/training b. Lighter handheld equipment c. Decreased noise/vibration d. Decreased exhaust exposure for workers e. Fuel savings f. Avoiding mixing/storing fuel and fuel spills g. Reduced equipment maintenance/service h. Environmental impact i. Potential gas powered equipment bans/bylaws j. Attracting new demographic of workers k. I'm not interested in making the switch
23.	Have you experienced any pressure from your clients to make the switch? (Check all that apply) a. Yes, residential clients b. Yes, multi-residential clients c. Yes, commercial clients d. No
24.	Does your municipality have any restrictions on two-stroke equipment? a. Yes, time of operation (noise) b. Yes c. No d. Unaware
25.	What brands of battery-powered equipment would you be most inclined to purchase? a. Stihl b. Kress

	c. Ryobi d. Greenworks e. Husqvarna f. Toro g. Case h. Volvo i. Milwaukee j. Bobcat k. Makita l. Ego m. Ferris n. Exmark o. Other _____
26.	Which brands have you purchased? a. Stihl b. Kress c. Ryobi d. Greenworks e. Husqvarna f. Toro g. Case h. Volvo i. Milwaukee j. Bobcat k. Makita l. Ego m. Ferris n. Exmark o. Other _____
27.	**Part 3: Concerns/Barriers to Uptake**
28.	What concerns do you have with adopting battery-powered equipment and how significant is the concern? If your company has already converted to battery-power, please base your answers off of your experience. Rank each of the following concerns as either: Not Significant; Slightly Significant; Neutral; Somewhat Significant, or; Very Significant. • High upfront cost • Upfront planning • Charging infrastructure • Limited battery life/run time • Inventory management • Efficiency compared to two-stroke equipment • Lack of performance for heavy-duty tasks • Limited availability of equipment • Maintenance or repair concerns • Staff resistance • Staff training

	• Operational changes • Battery replacement/disposal • Ability to install and/or update electrical systems • Research required to determine best brand for company
29.	Do you have any other concerns that were not mentioned above?
30.	If you have purchased battery-powered equipment, did you experience delays in receiving your products? a. Yes, significant delays b. Yes, manageable delays c. No d. N/A
31.	Have you considered what the cost would be for your company to make the switch to battery-powered equipment? a. Yes b. No
32.	How much do you estimate it would cost for you to outfit a crew with all battery-powered equipment?
33.	How much do you estimate it would cost for you to outfit your entire company with all battery-powered equipment?
34.	Approximately how much do you spend on fuel/gas for your current two-stroke equipment per year?
35.	Would your company need to implement new infrastructure in order to make the switch to battery-powered equipment? a. Yes b. No c. Unsure
36.	Are you concerned about training and/or safety of new equipment and/or charging batteries? a. Yes b. No
37.	Are you concerned about storing and/or transporting batteries for any of the following reasons? (Check all that apply) a. Temperature control b. Ventilation c. Protection from elements/weather d. Electrical demand e. Electrical fires f. Theft
38.	How would you/do you dispose of batteries? a. Ship back to supplier for recycling b. Not sure/concerned about disposal/recycling c. Interested in how municipalities will support recycling d. Other _____
39.	Do you have the space required to charge batteries in your shop/yard and transport batteries to job sites? a. Yes

	b. No c. Unsure
40.	Do you have onboard power to charge your equipment on the go if needed? a. Yes b. No
41.	Do you have enclosed trailer(s) to move your equipment from site to site? a. Yes b. No
42.	How many hours a day are your crews on site? a. 4 – 6 hours b. 6 – 8 hours c. 8+ hours
43.	How do your crew members feel about a potential change? 1. Negative/Concerned about change 2. 3. (Neutral) 4. 5. (Positive/Not concerned or looking forward to change)
44.	Are battery-powered and two-stroke engine powered equipment comparable? a. Yes b. Some are, but not all c. Not yet, but technology is improving d. No e. Unsure
45.	Will/does battery-powered equipment decrease your efficiency? a. Yes b. No c. Unsure
46.	Will you have to increase your prices to accommodate the use of battery-powered equipment? a. Yes b. No c. Unsure
47.	Could a potential ban affect current contracts you have in place with clients? a. Yes b. No c. Unsure d. N/A
48.	Does your battery-powered equipment compare to commercial two-stroke engine equipment? a. Yes b. Yes, with spare batteries c. Yes, once crew is trained on technique d. No e. N/A

49.	Spring and fall clean ups bring additional challenges, including moving large quantities of wet leaves. Can battery-powered equipment tackle these jobs? a. Yes b. Yes, but takes longer c. Would need to do more research on available equipment d. No e. No – an exemption for the use of two-stroke equipment at these times of year (ex. March 15 – April 30 and October 15 – November 30) would support our company f. N/A
	Part 4: Incentives and Supports
50.	Would a grant/subsidy to support the cost of new equipment and charging infrastructure support your company to make the change? a. Yes b. No
51.	Would a delayed implementation of a two-stroke equipment ban support your company to make the change? a. Yes b. Yes, 1 – 3 years c. Yes, 5 – 7 years d. Yes, 7+ years e. No
52.	How would an immediate ban of two-stroke equipment affect your business? a. Would need to close business b. Add financial pressure c. Add pressure to research battery-powered options quickly d. Add stress of changing/updating operations and infrastructure e. Upset employees f. Other, please explain: _____
53.	What type of incentives would motivate you to switch to battery-powered equipment? a. Financial subsidies or rebates b. Interest-free loans c. Demonstrations of equipment performance d. Access to affordable leasing or rental options e. Other, please explain_____
54.	What resources would help you adopt battery-powered equipment? a. Guidance on purchasing equipment and updating infrastructure b. Information sessions or workshops on best practices c. Training seminars for staff/crew d. Access to case studies e. Best practices guide f. Support for battery recycling/disposal g. Training/communications from industry associations to support industry shift h. Other, please explain_____

	Part 5: Optional: Opportunity to Provide Further Detail
55.	What is your biggest concern regarding battery-powered equipment?
56.	What opportunities do you see for using battery-powered equipment in your business?
57.	What strategies could help overcome the barriers to adopting battery-powered equipment?
	Part 6: Request for Interviews
58.	Are you interested in having your experience heard? We are looking for 15-20 companies to share their experiences and opinions on moving towards using battery-powered equipment, and how they may be affected by a potential ban. These interviews will be included in the final report. a. Yes, please contact me for an interview b. Not interested