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April 12, 2023

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Dear Mr. Maclang,

I am currently an undergrad student at the University of British Columbia and I have recently completed a report on the feasibility of implementing pedestrian safety measures on the Arbutus Greenway. With the increased use of electric bicycles and scooters in Vancouver, and on this popular urban pathway, the purpose of this report is to highlight the need for immediate implementation of advanced safety measures.

I have learned a great deal about the history and popularity of the Arbutus Greenway, as well as the significant increase of electric bicycle and e-scooter use on a global scale. It is my hope that with the data I have collected, analyzed, and presented, the City of Vancouver will consider an accelerated approach to ensuring pedestrian safety.

Thank you for taking the time to review this report. If you have any questions, or would like to discuss any of the findings, please do not hesitate to contact me at jennndunbarprod@gmail.com.

Sincerely,

Jenn Dunbar

Jenn Dunbar

**Implementing Pedestrian Safety Measures
on the Arbutus Greenway**

for

Niño Maclang P.Eng., PE

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Vancouver, British Columbia

by

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April 12, 2023

PEDESTRIAN SAFETY ON ARBUTUS GREENWAY

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ABSTRACT

Urban pathways have become increasingly popular in many cities across Canada, and around the world. Allowing people of all ages and ability to enjoy the great outdoors on foot or wheels, while improving physical and mental health, maintaining fitness and retaining social interactions make them a welcomed addition to any city. The Arbutus Greenway in Vancouver is no exception.

The popularity of this 8.8km paved pathway, which runs from False Creek to the Fraser River, is used by hundreds of residents and visitors daily. However, its appealing design has also attracted the use electric devices, especially e-bikes and e-scooters. While the original vision by the City of Vancouver of being active and using eco-friendly modes of transportation was achieved, the safety measures along the greenway remain temporary and inadequate.

This report explores the increase of e-bikes and e-scooters on the Arbutus Greenway, the current safety measures that are in place and the public's opinion on both pedestrian safety and e-device use. In addition, it highlights the immediate need for additional safety measures to be implemented.

The findings suggest that e-bike and e-scooter use has increased significantly on the Arbutus Greenway, and that further safety measures are strongly supported by public due to their discomfort in sharing the pathway with high-speed motorized devices. Given these findings, this report recommends:

- Signage outlining City of Vancouver Bylaws for e-bikes and e-scooter use at all zone intersections.
- Speed limit signage along greenway, acting as a reminder between zone intersections.
- Safety barriers between pedestrian and cycling lanes.

INTRODUCTION

A. Background on the Arbutus Greenway

In 2016, the City of Vancouver purchased 8.8 kilometers of land from the Canadian Pacific Railway to transform it into a public corridor for walking, running and cycling. Officially known as the Arbutus Greenway (AG), this urban pathway currently runs from False Creek to the Fraser River. Phase 1 has been completed, with phases 2 through 4 scheduled for completion in 2034 (City of Vancouver, n.d.).

The City of Vancouver’s original vision was to encourage active and sustainable modes of transportation and social experiences (Point, 2018). Its undeniable popularity reveals that to date, this goal has been achieved as it has become a significant piece of the Vancouver landscape. The design of the Arbutus Greenway consists of eight zones (Table 1), and is situated on the unceded traditional homelands of Musqueam, Squamish, and Tsleil-Waututh Nations (MST). Development to date, and all future phases, includes collaboration with the MST Nations to ensure historical and cultural diversity continued (Arbutus Greenway, 2018).

Zone	Design Theme/Name	Location
1	Harvest Table	West 6th Ave @ Fir Street to West Broadway
2	Electric Alley	West Broadway to West 16th Ave
3	The Ridge	West 16th Ave to West King Edward Ave
4	Woodland Bend	West King Edward to West 37th Ave
5	Kerrydale Pass	West 37th Ave to West 49th Ave
6	Garden Path	West 49th Ave to West 57th Ave
7	Marpole Meander	West 57th Ave to SW Marine Dr
8	The Lookout	SW Marine Dr to Milton Street

Table 1. Zones 1-8, Arbutus Greenway.

B. Background on the Increase of Electric Bicycle and e-Scooter Use

Like many cities worldwide, Vancouver has seen a notable spike in the use of electric bicycles and e-scooters. Moreover, as research shows, their popularity is expected to increase over the next seven years (Figure 1). Contributing to the incline of use includes the public’s desire to use eco-friendly alternatives, rapidly increasing fuel prices, and overall health and fitness (E-bike Market Size, Trends, Growth, Report 2022-2030). Moreover, the COVID-19 pandemic played a significant role as many who used public transportation no longer felt safe in commuting on public transportation. The entire 8.8km distance of the Arbutus Greenway currently consists of two marked lanes: one for pedestrians and one for personal wheel transport. such as traditional bicycles, scooters, skateboards and roller blades. While this ensures that a diverse group of people can enjoy the space, electric transport devices (ETDs) such as e-bikes, e-scooters, e-skateboards, Segways, hoverboards and one-wheels are also permitted. The increased presence of these motorized devices arguably impacts the dynamic of one’s experience, in positive and negative ways.

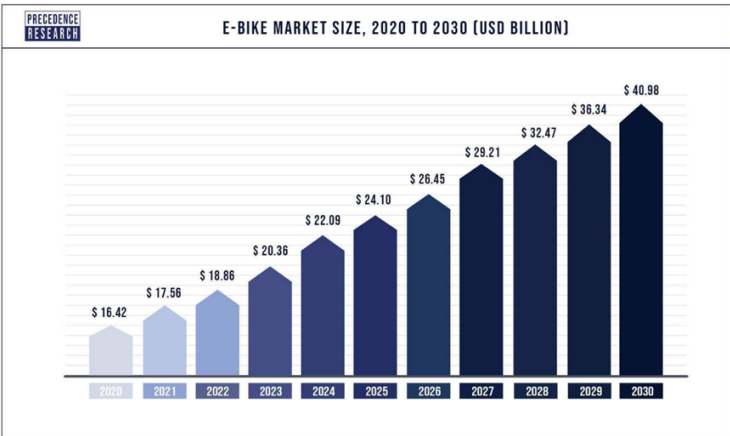


Figure 1. Projected E-bike market growth from 2020 to 2030.
Source: E-bike Market Size, Trends, Growth, Report 2022-2030)

C. Purpose of Report and Intended Audience

The purpose of this report is to assess public opinion surrounding the use of e-bikes and e-scooters on the Arbutus Greenway, the comfort level of pedestrians sharing this pathway with these motorized devices, and the overall safety measures that are currently in place. In addition, it will highlight the immediate need for additional safety measures to be implemented to reflect the current increase of ETD use, providing recommendations such as speed limits, signage and physical barriers for the City of Vancouver to consider while it works toward finalizing the next three phases.

The primary audience for this report is Niño Maclang, Senior Transportation Engineer for Traffic & Data Management at the City of Vancouver. The secondary audience is Dr. Erika Paterson, Professor of ENGL 301 at the University of British Columbia.

D. Description of Data Sources and Methods of Inquiry

Primary data for this report consists of an anonymous and voluntary online survey via Reddit that assesses how the Arbutus Greenway is viewed by the public in terms of use and safety. The completed and analyzed survey, which was created on Qualtrics and consisted of nine multiple choice questions (Appendix 1), collected data from various demographics and included twenty-nine respondents. In addition, data sourced through observation of e-bike and e-scooter use on the greenway is presented, confirming the increased use of e-bikes and e-scooters versus traditional bicycles. This observational data was obtained over a three-hour period (10am – 1pm) on two separate days (March 26, 2023 & March 27, 2023) on the Arbutus Greenway. Information was also sourced through email correspondence with Nino Maclang, Senior Transportation Engineer at the City of Vancouver, providing background information on the

current safety measures in place, a current three-year pilot program for e-scooters, and insight into the future steps being taken for pedestrian safety on the Arbutus Greenway.

Secondary sources include publications and reports on ETD use, the increase of e-bike and e-scooter use, the potential dangers that they pose on urban pathways and successful safety measures that have been implemented in other cities within Canada.

E. Limitations of the Report

A limitation to this report includes the lack of data collected from an important demographic. Of the twenty-nine completed surveys, none captured data from those aged 25 – 44 years.

Therefore, this report fails to reflect a significant number of those assumed to be using the Arbutus Greenway, e-bikes and/or e-scooters.

F. Scope of Inquiry

This report covers five main points of inquiry:

1. What rules and regulations are currently in place for electric bike and e-scooter use in Vancouver?
2. Do any of the future phases of the Arbutus Greenway development include additional safety measures?
3. What is the public's opinion of the current safety on the Arbutus Greenway regarding electric bicycles and e-scooters?
4. What is the average number of electric bikes and e-scooters that use the Arbutus Greenway daily?
5. What other cities have benefited from setting speed limits and/or barriers to public bike paths?

DATA SECTION

A. Sources of Potential Injury

The use of personal Electric Transport Devices (ETDs) has increased significantly worldwide (E-bike Market Size, Trends, Growth, Report 2022-2030), and in Vancouver, rates have doubled since 2019 (Electric Bikes, n.d.). Bike share companies such as Mobi by Shaw Go, added 500 e-bikes to their inventory in September 2022 (Chan, 2022), reflecting the overall popularity and demand in Vancouver. On the Arbutus Greenway, e-bikes and e-scooters are arguably the most popular choices, and in a March 2023 report on the top five choices for electric bicycles, all models have 500w motors and reach a top speed of 32 km/h (YouTube, 2023). With high speeds and the potential lack of experience by those renting these motorized devices, the potential for injury to both the pedestrian and rider is imminent.

B. City of Vancouver Bylaws

According to the City of Vancouver bylaws, certain restrictions are in place for e-bikes and e-scooters (Table 2). Currently, both devices can share paved pathways with pedestrians. Electric bikes cannot have a motor capable of exceeding 500 watts, or 32 km/h. Furthermore, riders must be sixteen years old and wear a helmet (Electric Bikes, n.d.). E-scooters have similar bylaws, however, they cannot exceed speeds of 24 km/h. Additionally, both devices must have a breaking system and lights, and a helmet must be worn (E-scooters, n.d.). In July 2021, the Province of B.C. approved a three-year pilot program for e-scooter use on local streets and protected cycle lanes (E-scooters, n.d.). While these bylaws are to be enforced by the Vancouver Police (E-scooters, n.d.), the main concern that the project team has been receiving from

Vancouver residents is “how to increase safety between e-scooters and pedestrians” (Maclang, 2023), highlighting the importance of this report.

	e-Bicycles	e-Scooters
Maximum Speed	32km/h	24km/h
Max. Motor Power	500w	500w
Minimum Age of Use	16yrs	16yrs
Breaking System & Lights Required	Yes	Yes
Helmet Required	Yes	Yes

Table 2. City of Vancouver by-laws for e-bikes and e-scooters.

C. Current Safety Measures on Arbutus Greenway

The July 2018 design vision for the Arbutus Greenway indicates sufficient separation between the pedestrian and cycling lanes, providing physical barriers to avoid lane drifting and accidents (Point, 2018). However, the current phase of the greenway does not include these structures. Currently, the pathway is shared with a single painted line separating the pedestrians from the cyclists, providing no deterrent from crossing over the line. Furthermore, there fails to be any measures encouraging slower speeds such as signage displaying City of Vancouver bylaws or specific speed limits. With the absence of these safety measures, ETD users are left to assume the rules of the greenway versus following bylaws that are in place to protect pedestrians and themselves.

D. Electric Transportation Devices Causing Pedestrian Injury

Pedestrian injury has increased with the rise of ETDs, with powdered bicycles carrying higher risk of severe injury versus traditional bicycles (Chander, 2019). A 2019 report reveals that individuals with vision and hearing impairments, young children, the elderly and those distracted

by mobility devices are the most likely to sustain injuries from incidents with e-bikes and e-scooters (Sikka, 2019). In the United States, hospital visits related to e-bike and e-scooter injury increased from “4881 in 2014 to 29,628 in 2019” (Lin, 2023) highlighting an unsettling trend that is likely reflective of increased use in Canada.

E. Analysis of Collected Data & Feasibility Discussion

Over a period of two days between 10am and 1pm, observational data was collected on the Arbutus Greenway. On March 26, 2023, a total 103 traditional pedal bicycles and 42 e-bikes were recorded crossing at the intersection of Zones 4 and 5 (Arbutus Street and West 37th Avenue in Vancouver). On March 27, 2023, the numbers were slightly less; 67 bicycles and 33 e-bikes. E-scooter use was significantly less, with 18 recorded on March 26, 2023 and only 8 recorded on March 27, 2023. While it can be assumed that traditional bicycles continue to be more popular due the high costs of e-bikes, increased popularity of products tends to bring prices down, which could eventually result in more e-bikes being purchased.

Data from twenty-nine completed surveys revealed that half (47%) of the participants feel the current safety measures for pedestrians on the greenway are low and in need of improvements; with another 47% feeling they are only satisfactory, and some improvements could be made (Figure 2).



Figure 2. Public opinion on the need for improvements on the Arbutus Greenway

Data also reveals that 79% of participants have noticed a significant increase in the use of e-bikes and e-scooters on the greenway (Figure 3). Furthermore, 42% have witnessed incidents between pedestrians and e-bikes and/or e-scooters, with another 42% revealing they themselves have been involved in one (Figure 4).

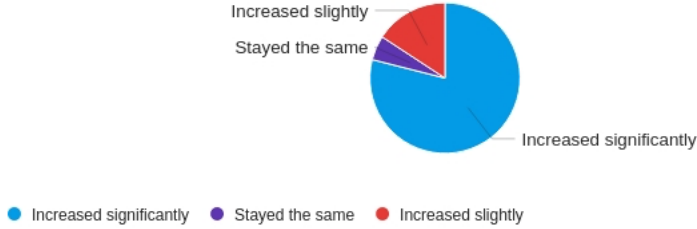


Figure 3. Awareness of increased use of electric bicycle and e-scooter use on AG

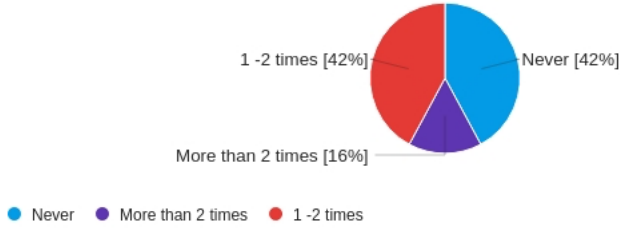


Figure 4. Witnessing or being involved in an incident with e-bikes or e-scooters on AG.

CONCLUSION

A. Summary and Interpretation of Findings

The Arbutus Greenway is a welcomed addition to Vancouver's Westside, enjoyed by hundreds of people daily, however, the immediate implementation of additional safety measures would ensure it continues to safely serve residents and visitors across all demographics. While the sample size for the online survey was small, the findings do highlight the public's concern surrounding pedestrian safety along the greenway due to the increase of both e-bikes and e-scooters. Nearly half of the respondents indicated that current safety measures are low and in need of improvements; and approximately half have witnessed or been involved in an incident with an e-device. These findings reveal that immediate installation of signage, speed limits and barriers while awaiting the final development of future phases would provide a safer experience. Through correspondence with The City of Vancouver's engineering department, they are already "exploring ways on how to better separate pedestrians from e-devices and all devices that roll" (Maclang, 2023). This includes physical infrastructure changes (separated lanes), signage, education programs, and coordination with residents, schools, the Vancouver Police Department, Vancouver Coastal Health and academia (Maclang, 2023). Furthermore, they are looking at geofencing (where e-scooters gradually shut down when they travel on a sidewalk, or slow down on certain facilities), as well as implementing slower speeds for new users to decrease potential for user error (Maclang, 2023). The city is clearly aware of the potential issues surrounding ETDs on the Arbutus Greenway and have budgeted accordingly to implement further safety measures, making the feasibility of the recommendations in this report possible.

B. Recommendations

The popularity of ETDs is increasing each year, fuel costs remaining high, and the warmer weather approaching are all factors that influence the number of e-bikes and e-scooters on the Arbutus Greenway. With full completion of the greenway not scheduled until 2034, implementing immediate safety measures would ensure pedestrian safety is achieved in the interim. Through the collection of primary and secondary data sources, this report can provide the following recommendations:

- 1) *Signage outlining City of Vancouver Bylaws for e-bikes and e-scooter use at all zone intersections.*

Assuming the public is aware of the city bylaws surrounding e-bike and e-scooters could lead to improper use of these devices, causing injury for both the rider and pedestrians. Providing visuals alongside the bylaws will aid younger users of the pathway in understanding the rules, as well as those who have limited reading ability due to age or language.

- 2) *Speed limit signage along greenway, acting as a reminder between zone intersections.*

Installing signage along the entire 8.8km distance of the greenway with a recommended speed limit well below the actual capability of the e-bike or e-scooter will remind riders to monitor their speed and slow down.

- 3) *Safety barriers separating pedestrian and cycling lanes.*

Installing either cement barriers or flexible posts, such as channelizer posts, will provide a clear and safe separation of the cycling and pedestrian lanes on the greenway, reducing the chances of lane drifting.

Appendix A

Online Survey Questions

1. What is your current age?
 - 0 - 24 yrs
 - 25 - 44 yrs
 - 45 - 64 yrs
 - 65+ yrs

2. What is your primary mode of transportation?
 - Walk
 - Car/Motorcycle
 - Non-motorized Bicycle
 - Motorized bicycle or scooter
 - Bus / Skytrain

3. How often do you use the Arbutus Greenway?
 - Everyday
 - A few times per week
 - A few times per month
 - A few times per year

4. In general, what are your top three reasons for using the Arbutus Greenway?
 - Exercise
 - Commuting to school and/or work
 - Health and Wellness
 - Relax
 - Spend time with family and/or friends
 - Exercise for my pet

5. Within the past 2 years, the use of electric bicycles and/or electric scooters on the Arbutus Greenway has:
 - Increased slightly
 - Stayed the same
 - Increased significantly

6. In sharing the Arbutus Greenway with electric bicycles and/or scooters as a pedestrian, please rate your experience:
 - Always stressful
 - Moderately stressful
 - Never stressful

7. Currently, the safety measures for pedestrians on the Arbutus Greenway are:
 - Low (in need of improvements)
 - Satisfactory (some improvement could be made)
 - High (no improvements are necessary)

8. In terms of pedestrian safety, electric bicycles and scooter speed limits on the Arbutus Greenway would be:
 - Highly effective
 - Moderately effective
 - Wouldn't make any difference

9. As a pedestrian, I have either witnessed or been involved in an incident with an electric bicycle or scooter on the Arbutus Greenway:
 - 1-2 times
 - More than 2 times
 - Never

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