

UBC Social Ecological Economic Development Studies (SEEDS) Sustainability Program

Student Research Report

**Bicycle Share's Effect on UBC Property Trust Residential Bicycle Storage**

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**PLAN 550**

**Themes: Transportation, Buildings, Climate**

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## Executive Summary

This project, *Bicycle Share's Effects on the UBC Property Trust Residential Bike Storage*, is a student-led collaboration with SEEDS, Campus and Community Planning, and UBC Properties Trust. E3 Eco Group was also involved in this project as the consultant working on behalf of UBCPT.

The goal of this project was to determine the effects, if any, the Campus Bike Share program has had on the UBC Property Trusts class I and class II bicycle storage facilities since the start of the bike share pilot project.

Ultimately, the findings from this project will generate recommendations for UBCPT and provide recommendations for the Bicycle Parking section of the REAP guidelines and the UBC Development Handbook.

To meet this objective, the following methods were used

1. Literature Review focusing on current design guidelines in other cities with Bikeshare
2. GIS Analysis to get a better understanding of trips starting and ending in UBC Neighbourhoods
3. Resident Survey to get an understanding of how UBCPT residents are affected by the Bike Share Program.

### Findings

- Before the bike share pilot began, class I bike storage facilities were already near capacity or overcapacity. (Smith, 2017)
- UBC uses per unit basis to determine the number of class I storage spaces; other cities use a per square foot or per bedroom basis
- The majority of trips from campus neighbourhoods on bikeshare was to central areas of campus and Wesbrook Village; the majority of trips ending in campus neighbourhoods started in central campus and Wesbrook Village
- Survey Results found that there is low ridership for UBCPT residents using Bikeshare (19%), but Bikeshare bicycles were being parked in UBCPT class II parking outside of residences causing overcrowding at bike racks.

### Recommendations

- Find underutilized parking spaces and retrofit to class I indoor storage/parking
- Increase bike storage minimum requirements in REAP and UBC Development Handbook
- Review hybrid bike share options for the next UBC bike share pilot
- Adding bike racks, or specifying racks specifically for bikeshare (havens)

### Future Studies

- Review underutilized parking in UBCPT buildings and possible retrofit for indoor class I bike cages
- Look into bike share and multimodal transportation on campus
- Literature review on Bicycle Storage Management
- A study reviewing the latent demand for biking areas with poor bike storage infrastructure (specifically for Hawthorn Village and Hampton Place)

## Introduction

This project, *Bicycle Share's (Dropbike) effect on UBCPT Residential Bike Storage*, was a student-led university project that worked in collaboration with three stakeholders, UBC Property Trust (represented by E3 Eco Group), Campus and Community Planning, and SEEDS Sustainability program.

The project intends to determine the effects, if any, that the new pilot bike share program has had on class I and class II bicycle parking in UBC Property Trust Buildings. One of the primary outcomes from this project is to provide UBCPT, C+CP, and REAP recommendations for updated guidelines and design standards for bicycle storage/parking.

### Key terms

*Dropbike* – the Bike Share that is operating at the University of British Columbia as a pilot as of August 2018.

*Class I Bicycle Parking*<sup>1</sup> - “Intended for long-term use of residents or employees, and may consist of attended facilities, inside bicycle lockers, or restricted access parking.”

*Class II Bicycle Parking*<sup>2</sup> - “Intended for short-term use of patrons or visitors and may consist of bicycle racks located with natural surveillance in an accessible outside location.”

*Traffic Analysis Zone*<sup>3</sup> - “A Traffic Analysis Zone (TAZ) is a special area delineated by state and/or local transportation officials for tabulating traffic-related data, especially journey-to-work and place-of-work statistics. TAZ is the unit of geography, most commonly used in conventional transportation planning models.” In UBC there are 25 Traffic Analysis Zones numbered 0-24.

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<sup>1</sup> University of British Columbia. *Residential Environmental Assessment Program 3.1* (Vancouver, BC: 2018). Accessed May 8, 2018. <https://planning.ubc.ca/sites/planning.ubc.ca/files/images/planning-services/policies-plans/REAP%203.1%20Reference%20Manual.pdf>

<sup>2</sup> University of British Columbia. *Residential Environmental Assessment Program 3.1* (Vancouver, BC: 2018).

<sup>3</sup> University of British Columbia. “Traffic Collision Analysis for Vancouver” (Vancouver, BC: 2007). Accessed May 8, 2018. [http://ibis.geog.ubc.ca/courses/geob370/students/class07/accident\\_vancouver/methodology.html](http://ibis.geog.ubc.ca/courses/geob370/students/class07/accident_vancouver/methodology.html)

## Literature Review

The literature review emphasized 4 key areas

- Past Bike Storage Studies at UBC
- Other cities Bike Storage Guidelines compared to UBC
- Other cities Bike Share Strategy
- Review of the 2018/2019 Campus and Community Planning (C+CP) Dropbike Survey, and other C+CP resources

### **Cail Smith's Bike Storage in Multi-unit buildings study<sup>4</sup>**

In 2017 a previous SEEDS study took place that reviewed UBCPT class I and class II bicycle storage. The stronger findings made from the study, are that the current state of bicycle storage is not meeting resident's needs, and demand for bicycle parking exceeded supply. In most class I storage facilities, at least 95% of parking spaces were occupied with several rooms above 100% occupancy. The current REAP 3.1 Design Standards work on a per unit (1.5/unit) basis for class I storage.

Since 2017, no changes to the REAP Design Guidelines and UBC Development Handbook for bicycle storage have been made. Smith's project found through an occupancy study and resident survey, that the class I bicycle storage rooms in UBCPT residences were overcrowded, forcing residents to park their bikes in other areas. These included informal locations such as resident's units, decks, and class II parking near their building.

Smith's study recommended that the capacity of the class I be improved with two efforts:

1. Retrofits to include in-unit bike storage, bicycle lockers, and more bike cages in unused auto parking spaces.
2. Changing bicycle parking minimums to a number reflective on the number of residents rather than the number of units.

### **Design Standards**

The Design Standards focused on city's by-laws for required indoor class I and outdoor class II bike racks.

*Figure 1* is a summary of UBC's current design standards from the REAP Guidelines, as well as other cities in the Cascadia Region's bike storage design by-laws. It should be noted that all of these cities have implemented bike share programs.

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<sup>4</sup> Smith, Cail. "Making Spaces: Bicycle Storage in Multi-Unit Residential Buildings on the University of British Columbia Campus." University of British Columbia, 2017. Accessed: May 1, 2019  
[https://sustain.ubc.ca/sites/sustain.ubc.ca/files/seedslibrary/BicycleStorage\\_FinalV1\\_Aug3.pdf](https://sustain.ubc.ca/sites/sustain.ubc.ca/files/seedslibrary/BicycleStorage_FinalV1_Aug3.pdf)

Figure 1: Bicycle Storage Design Standards<sup>5 6 7 8 9</sup>:

Location	Class I Storage Min	Class II Storage Min
UBC (Development Handbook 2018)	1.5/ Unit + 0.25/unit for Credit	0.5 / Unit
City of Vancouver (2019)	1.5-3.0/unit	1/unit = <20 units; > 20 = Min. 6
Portland (2017)	1.5	1/ 20 Units ; Min 4
Seattle (2018)	1 / unit	1/20 units
Victoria (2011)	1 per unit	6 space rack

Generally, speaking UBC is quite progressive when referring to its bike storage design standards. The findings from this show that UBC is either at par with most cities or requires a higher number of parking/units. However, with issues noted about overcapacity from previous studies done at UBC, these progressive standards aren't meeting resident's needs.

The City of Vancouver's 2019 standards work on a sq. m. basis ranging anywhere from 1.5-3.0/unit. As the unit increases in size, the bike storage requirements per unit increase. With a design standard similar to this, an effective number of class I parking spots would be provided.

Another alternative to the class I per unit basis would be to utilize standards designed on a per bedroom basis. With a specific number of bikes required per bedroom (e.g. 1 / bedroom), UBCPT would be better prepared to tackle to bike storage capacity problem.

### Bike Share Strategies

For this project, two other bike share strategies were reviewed. The two programs that were reviewed were Biketown in Portland, Oregon, and U-Bicycle in Victoria, BC. These programs

<sup>5</sup> University of British Columbia. *UBC Development Handbook*. (Vancouver, BC: University of British Columbia, 2018) <https://planning.ubc.ca/sites/planning.ubc.ca/files/documents/planning-services/development/UBC%20Development%20Handbook%20-%20April%202018.pdf>

<sup>6</sup> City of Vancouver. *City of Vancouver 2019 Parking By-law Update Summary*. (Vancouver, BC: City of Vancouver, 2018) <https://vancouver.ca/files/cov/city-of-vancouver-2019-parking-by-law-update-summary.pdf>

<sup>7</sup> City of Portland. *33.266 Parking, Loading, and Transportation And Parking Demand Management*. (Portland, Oregon: City of Portland) <https://www.portlandoregon.gov/bps/article/53320>

<sup>8</sup> Seattle Department of Transportation. *Seattle Bicycle Parking Guidelines* (Seattle, BC: Seattle Department of Transportation, 2018) [https://www.seattle.gov/Documents/Departments/SDOT/BikeProgram/SDOT%20Bicycle%20Parking%20Guidelines\\_6.11\\_WO\\_RKING\\_DRAFT.pdf](https://www.seattle.gov/Documents/Departments/SDOT/BikeProgram/SDOT%20Bicycle%20Parking%20Guidelines_6.11_WO_RKING_DRAFT.pdf)

<sup>9</sup> City of Victoria. *Bicycle Parking Strategy*. (Victoria, BC: City of Victoria) <https://www.victoria.ca/assets/Departments/Engineering~Public~Works/Documents/parking-bicycle-strategy.pdf>

were reviewed as they are both in the Cascadia region, and have dealt with operational issues related to parking.

The Biketown model in Portland is a hybrid model, meaning it allows for dockless parking at a rack, but also provides docks. If a bike were to park at a non-dock location, a small additional fee would be charged on the ride. This strategy is successful, as it creates an incentive not to park at a rack, but also funds operations for the rebalancing of non-dock parked bikes.



Figure 2: Image of U-Bicycle Virtual Drop Zone

The City of Portland also has a policy that allows for the substitution of motor vehicle parking space minimums. The policy allows for the substitution of “15 docks built, and 10 shared bicycles for every 3 substituted vehicle spaces.”<sup>10</sup> Although this method isn’t directly applicable to UBC as they have parking space maximum’s in their guidelines rather than minimums. However, the idea of providing credit to developers for a type of bike share parking space would apply to a UBC.

U-Bicycle, the other bike share program reviewed, in Victoria, has also implemented a new strategy using a Virtual Drop Zone.<sup>11</sup> With a similar idea to the havens that UBC is currently using, the Victoria bike share has made it mandatory for bicycles to be parked in the virtual drop zones (havens). This strategy would solve many issues regarding Dropbikes overcrowding parking in class II bicycle storage racks. Alternatively, if developers were to design buildings

with bikeshare haven locations in mind, parking in a haven might become more attractive than parking at a bike rack.

### Review of 2018/2019 Dropbike Survey and other C+CP resources

UBC Campus and Community Planning put out a survey to residents with the intentions of getting a stronger understanding of bikeshare ridership. Some of the key findings were that 65% of respondents, (sample size of 49) own or have access to a personal bike use on campus while only 50% of users had used Dropbike before.<sup>12</sup>

The survey also found that the most common type of usage for the Dropbike was either 1-3 times per semester or 1-4 times per month, which shows that the acceptance rate of Dropbike

<sup>10</sup>City of Portland. *Substitution of bike share station for required parking – Admin Rule Draft Language*. (Portland, Oregon: City of Portland) <https://www.portlandoregon.gov/bds/article/592992>

<sup>11</sup>City of Victoria. *Bike Share* (Victoria, BC: City of Victoria) <https://www.victoria.ca/EN/main/residents/transportation/cycling/bike-share.html>

<sup>12</sup> Campus and Community Planning. *Dropbike Survey Results (2018/2019)*

is still quite low. The majority of rides were used to get to a from work/class or for exercise/social purposes.

Q14 - If Dropbike hadn't been available on your most recent trip, how would you have made it?

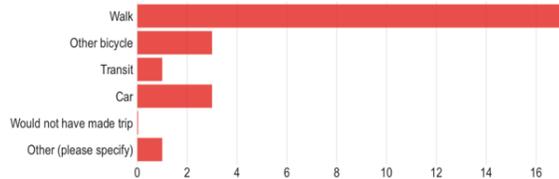


Figure 3: C+CP Dropbike Survey Graph on Trip Replacement

collected data that included how Dropbikes were parked throughout campus. The majority of parks were at bike racks, or on hardscape. Better explaining why there is a large amount of clutter in many class II bicycle racks outside of UBCPT residences. Ultimately, C+CP’s goal is to have the majority of bikes parked in havens.<sup>13</sup>

The survey also asked participants what types of trips Dropbike was replacing. The results from this can be seen in *Figure 3*.

The results of this figure display that these trips weren’t necessarily affecting trips that would have been completed by bicycle, but trips that were normally done by walking

C+CP also provided the study with manually

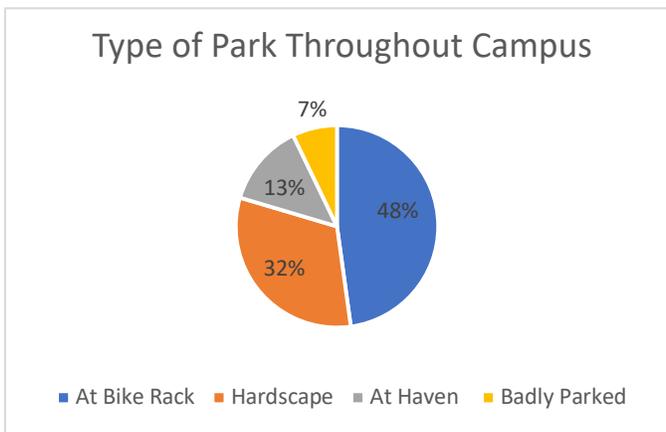


Figure 4: C+CP Manual Bike Parking Audit Graphic

**Conclusions**

Before the current study took place, a previous study determined the state of bike storage in UBCPT buildings. The findings from this study demonstrated that overcapacity was a problem in UBCPT buildings class I bike storage. To better align with the progressive ridership that UBC has, it is suggested that UBC enhance their bike storage design standards to adequately meet building bike storage demand. Conclusions about the Dropbike were also made from this review, as it was determined that the majority of bikes were being parked at racks, rather than havens, and that Dropbike was replacing walking trips rather than trips that would’ve already been done by bicycles. Under this assumption, it is understood that the majority of residents who use Dropbike would not be replacing their personal bike for a Dropbike membership.

**Recommendations Based off Literature Review**

- *Increase bicycle storage capacity requirements in REAP Guidelines and UBC Development Handbook*

<sup>13</sup> Campus and Community Planning. “Dropbike Parking Data: Manual Audit” Accessed: May 10, 2019 <https://portal.gis.ubc.ca/arcgis/home/webmap/viewer.html?webmap=462f65e441e24383b4650d3d719be3da>

- *Allow bicycle storage in-unit and on first- floor deck or patio areas*
- *Develop bicycle storage minimums on a per bedroom or per sq. m. basis rather than per unit basis*
- *Look into hybrid bike shares that promote bicycles being parked in Havens*
- *Retrofit unused parking for class I Bike Cage Storage*

## GIS Analysis

The purpose of the GIS Analysis for the project was to determine where trips were either starting or ending if they started or ended in a University Neighbourhood. This information would give us an idea of the type of trips UBCPT residents took. Although not all trips that started and ended in these neighbourhoods were resident trips, these are trips that do affect the bike storage in each neighbourhood.

## Methodology

For the focus of this study, four of the five University Neighbourhoods were used in this study. Those being, East Campus, Hampton Place, Hawthorn Village and Wesbrook Village. These neighbourhoods were chosen because they are the areas with the majority of neighbourhood bike share trips. The areas of these neighbourhoods can be seen below in *Figure 5*.



Figure 5: University Neighbourhoods Analyzed in Study

The data used in this study was directly from Dropbike collected from the GPS tracker on the bike. This information was provided via C+CP and is cleansed data for a 2-month period from Mid-September to Mid-November.<sup>14</sup> An analysis study was done for trips starting in each of the neighbourhoods, and trips ending in each of the neighbourhoods. There was six analysis done which counted trip start and end points in traffic analysis zones throughout campus. Larger images of the GIS analysis are referenced in Appendix A.

<sup>14</sup> Campus and Community Planning. Cleansed Dropbike Data: (2018)

Investigation was done for:

1. Trips that Started in Wesbrook Village
2. Trips that Ended in Wesbrook Village
3. Trips that Started in Hawthorn Village
4. Trips that Ended in Hawthorn Village
5. Trips that Started in East Campus & Hampton Place
6. Trips that Ended in in East Campus & Hampton Place

For each of the investigations done, the analysis worked by

- Selecting all the start or end points, by drawing a polygon around the neighbourhood being analyzed
- Each start or endpoint was matched to its corresponding endpoint or start point by trip ID
- Trips that started and ended in the same neighbourhood were filtered out, as the majority of trips that started and ended in the same neighbourhood was due to bike error.
- A tally/count of the start or end locations in each Traffic Analysis Zone on UBC campus (25 zones on campus).

## Results

### Wesbrook Village

Trips that started in Wesbrook ended in zone **1, 5, 6, 10, 17, or 20**. All of these zones are central campus, illustrating that the majority of trips starting in Wesbrook were to get to the central part of campus.

Trips that ended in Wesbrook Village had a similar start location compared to the endpoints of trips that started in Wesbrook. These zones were **1, 5, 6, 17, and 20**.

Distribution of Trips that Started in Wesbrook Village



Figure 7: Analysis for Trips Starting in Wesbrook

Distribution of Trips that Ended in Wesbrook Village



Figure 6: Analysis for Trips Ending in Wesbrook

### Hawthorn Village

Trips that started in Hawthorn ended in zones **1, 5, 6, 16, 17, and 21**. Similar to Wesbrook these trips generally ended in central campus. Although a large number of trips from Hawthorn ended in zone **21** (Wesbrook Village)

Trips that ended in Hawthorn had the same distribution as trips that started in Hawthorn. Those zones being **1, 5, 6, 16, 17, and 21**.

Distribution of Trips that Started in Hawthorn Village

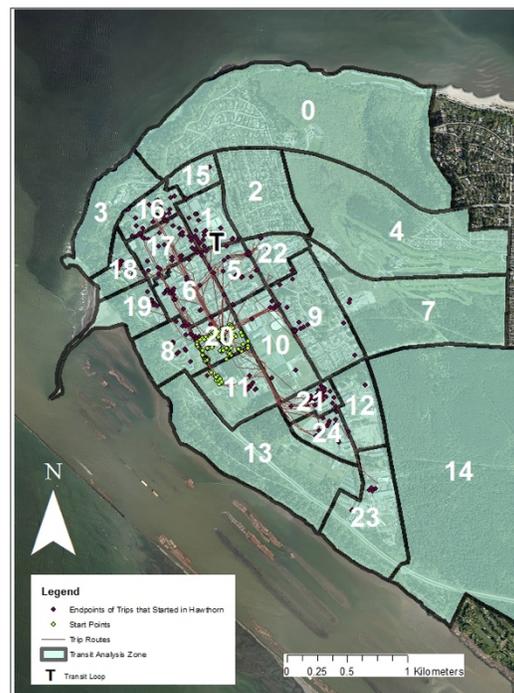


Figure 8: Analysis for Trips Starting in Hawthorn

Distribution of Trips that Ended in Hawthorn Village

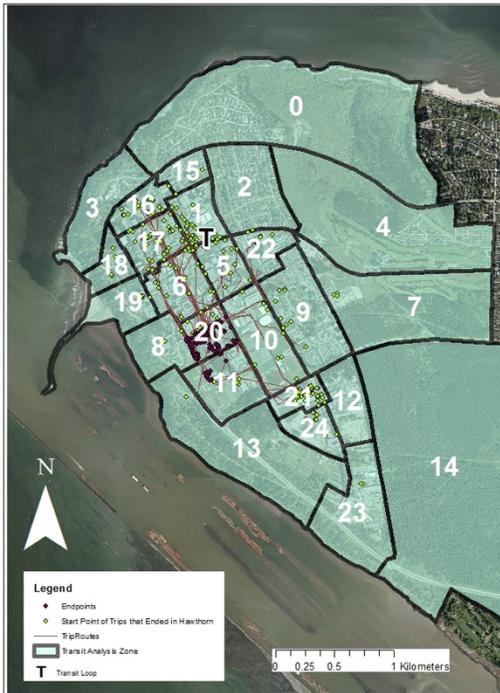


Figure 10: Analysis for Trips Ending in Hawthorn

East Campus & Hampton Place

Trips that started in East Campus and Hampton Place, had the same distribution as the other neighbourhoods. Trips generally ended in zones **1, 5, 6, 17, and 21**, but East Campus and Hampton also had a large % of trips ending in **zone 8** which is the west part of campus. This would make sense as trips were more likely to end in north or west parts of central campus since East Campus Neighbourhood is easily walkable to the central campus.

Trips that ended in East Campus and Hampton Place, had a similar distribution to trips that started in East Campus and Hampton Place. Those zones being **1, 5, 6, 8, 17, 20, and 21**.

Distribution of Trips that Started in East Campus and Hampton Place

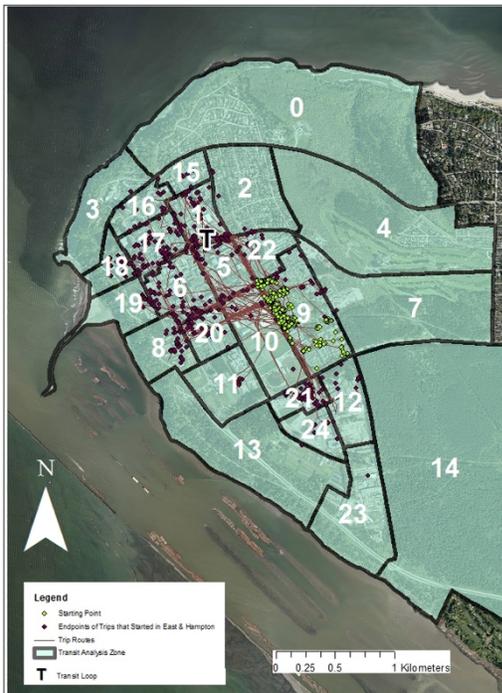


Figure 9: Analysis for Trips Starting in East Campus and Hampton

Distribution of Trips that Ended in East Campus and Hampton Place



Figure 11: Analysis for Trips Ending in East Campus and Hampton

## Summary

One of the main points that could be made from this study is that roughly the same number of trips ended and started in each neighbourhood. This point is an important note as it shows that the trips leaving each neighbourhood generally aren't one-way trips.

It should also be noted that the most popular TAZs were zones **1, 5, 6, 20 (Central Campus) and 21 (North Wesbrook Village)**. This would make sense as the majority of trips are being used to get to and from neighbourhoods, central campus, or the commercial and retail sites located in North Wesbrook Village. With this type of information, bike share operators and campus and community planning can make structured decisions regarding havens and bike parking locations.

## Resident Survey

A 12-question survey was distributed to all the residence in UBCPT buildings via email by UBCPT administration. The survey was created with input from Campus and Community Planning. The goal of the survey was to understand:

1. the residents' views on bicycle storage
2. the effects of Dropbike on resident bike storage
3. the residents' usage of Dropbike.

The questions from the survey are referenced Appendix B.

### Respondent Profile

The survey had a total of 87 responses. The majority of survey respondents were faculty and staff at UBC.

How many people live in your house?

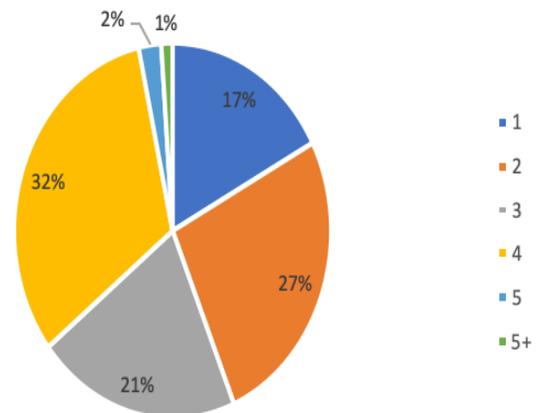


Figure 12: Resident Survey Results

80% of the respondents had anywhere from 2-4 people in the house. Of course, not all respondents had bikes, but with 1.5 spaces per house or unit, this could create issues. Especially when 86% of respondents said they owned a bicycle at home, which is illustrated on the graph in Figure 13.

The majority of respondents also had anywhere from 1-4 bikes in a home with just over 10% of households having 5+ bikes. Figure 14 illustrates this.

How many bicycles do you have within your household?

87 responses

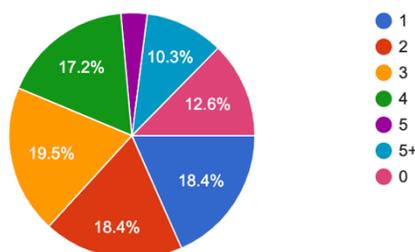


Figure 14: Resident Survey Results

Do you own a bicycle at home?

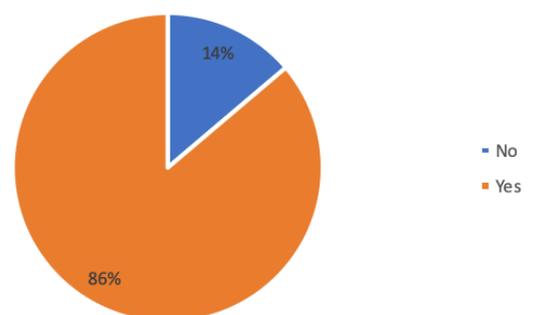


Figure 13: Resident Survey Results

## Current Bicycle Storage Techniques

From the survey, it was found that the majority of residents park their bikes in class I bicycle rooms in their buildings. With that being said, there are high rates of capacity and overcapacity in many of these bike rooms and cages. The overflow of bikes from these rooms are now being stored outside at class II racks outside of buildings. These class II storage racks are generally meant for short term parking for non-residents but are being occupied long term by residents. If not being parked in class I storage rooms, or class II racks, then resident's bikes are being parked informally on decks, patios, and inside buildings dwellings.

Row Labels	Count of Timestamp
A bike rack outside your building	5
adult bikes in storage room. Kid's bike in kitchen of unit.	1
in apartment	1
In front of my car in my parking spot. Our bike storage room doesn't have enough space to accommodate the bikes. Also I live in Webber house, but that's not a survey option.	1
in my apt. like anyone with an expensive bike	1
in my house	1
locked up on the patio, and also in the bike storage	1
Not Applicable	10
Patio/inside apartment	1
Rack in garage; bedroom	1
Storage Locker/ Bicycle Storage Room	62
Underground warehouse	1
Various - bike storage room/rack outside building	1
<b>Grand Total</b>	<b>87</b>

Figure 15: Survey Result on Bicycle Storage

Figure 16 is an image of a bicycle rack outside of Hawthorn Village. In many neighbourhoods throughout campus, there are bicycles racks with this level of crowdedness.

## Dropbike Usage

Predominately, the Dropbike/bike share program is not being used too heavily by resident users in these residences. 81% of survey respondents had never used Dropbike before.

For the users that had used Dropbike, the results were quite similar to C+CP's survey results as most user's rode 1-4 times/month or 1-3 times/semester.



Figure 16: Photo of Class II rack in Hawthorn Village

## Bike Storage and its relationship with Dropbike

With limited amounts of ridership, the effects of Dropbike and its direct impact on indoor bike storage are quite limited as the bike share program doesn't generally replace personal bike trips and personal bike ownership. Shown in *Figure 3* from the C+CP survey, Dropbike has been replacing walking trips rather than personal bike trips.

When asked if Dropbike has affected resident's usage of the indoor storage, the majority of respondents disagreed with the statement (*Figure 18*). Although, some respondents did note that it had been affecting their usage.

How often do you use Dropbike?

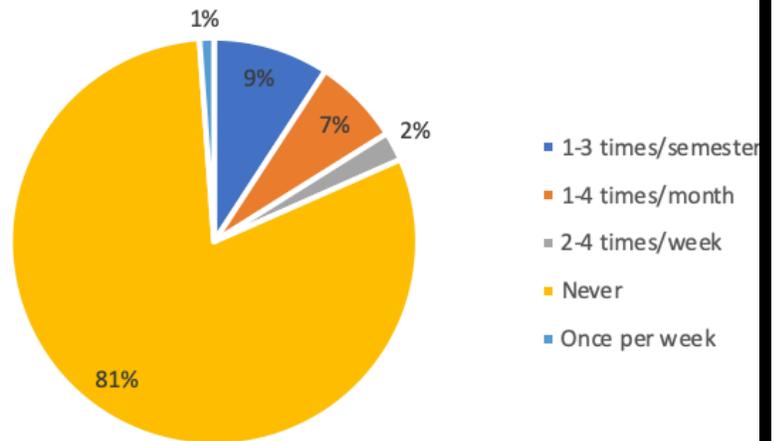
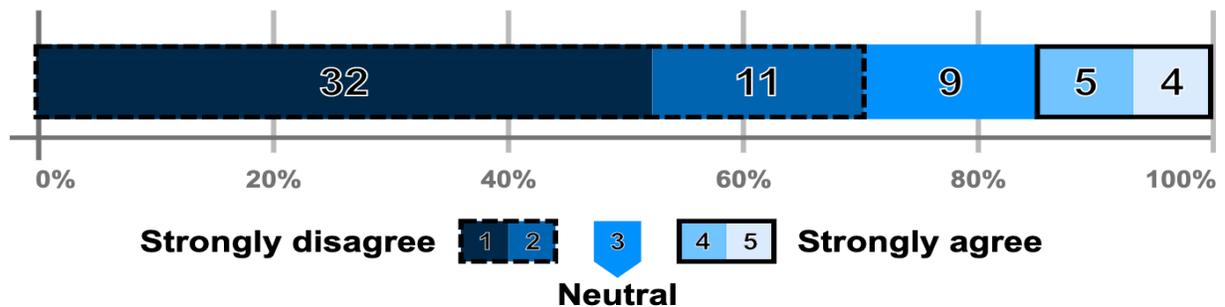


Figure 17: Resident Survey Results

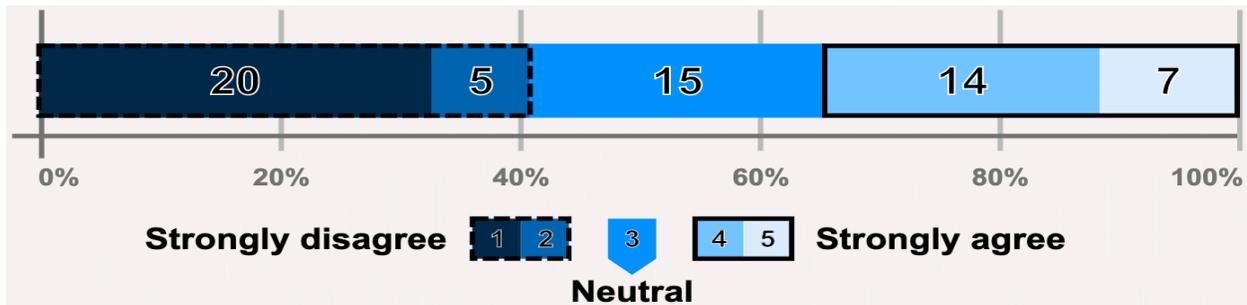
Figure 18: To what extent do you agree or disagree with the following statement: Dropbike has affected my use of the indoor bicycle storage in my building



If personal bike owner's indoor storage was affected by Dropbike, the main reason was due to outdoor class II racks becoming more crowded with Dropbikes, causing many bikes that would typically be parked outside, to be parked in an already crowded class I facility.

When asked if Dropbike had affected resident's usage of outdoor bicycle racks around their building for storing their bicycle, roughly 25% of respondents agreed with this statement.

Figure 19: To what extent do you agree or disagree with the following Statement: Dropbike has affected my usage of outdoor bicycle racks around my building for storing my personal bicycle



### Sources of Error

Possible that there was bias from respondents as this study was relating to bike storage. This bias could have sparked a larger response rate from residents with bike ownership.

A miscommunication issue also occurred when the survey was initially sent out by UBCPT. At the initial release of the survey, not all UBCPT buildings were listed in question 3 of the survey. This issue could have caused respondents from buildings not initially listed to start the survey and not complete it.

### Conclusion

In brief, there was already a pre-existing issue with resident bike storage before Dropbike was implemented. With a limited amount of Dropbike ridership in UBCPT building, there isn't a direct effect related to Dropbike and class I bicycle storage. However, Dropbikes are directly affecting Class II Bicycle Racks outside of residences. With many residents parking their bikes at these racks on a long-term basis, a large number of racks are at capacity or overcapacity, forcing residents to put their bike in already overcrowded bike storage rooms, and in their dwellings.

### Conclusion

The following recommendations are based on the literature review, GIS Analysis, and Resident Survey.

### Recommendations

- Find underutilized parking spaces and retrofit to class I indoor storage
- Allow bicycle storage in-unit and on first-floor deck or patio areas
- Increase bike storage minimum requirements in REAP and UBC Development Handbook

- Review hybrid bike shares that promote bike shares parked in havens for next UBC bike share pilot
- Adding bike racks, or specifying racks specifically for bikeshare (havens)

**Future Studies**

- A review of underutilized parking in UBCPT Buildings and their possible retrofit to indoor class I bike storage
- Other studies related to bike share and multimodal transportation on campus
- Literature review on bicycle storage management
- A study reviewing the latent demand for biking areas with poor bike storage infrastructure (specifically for Hawthorn Village and Hampton Place)

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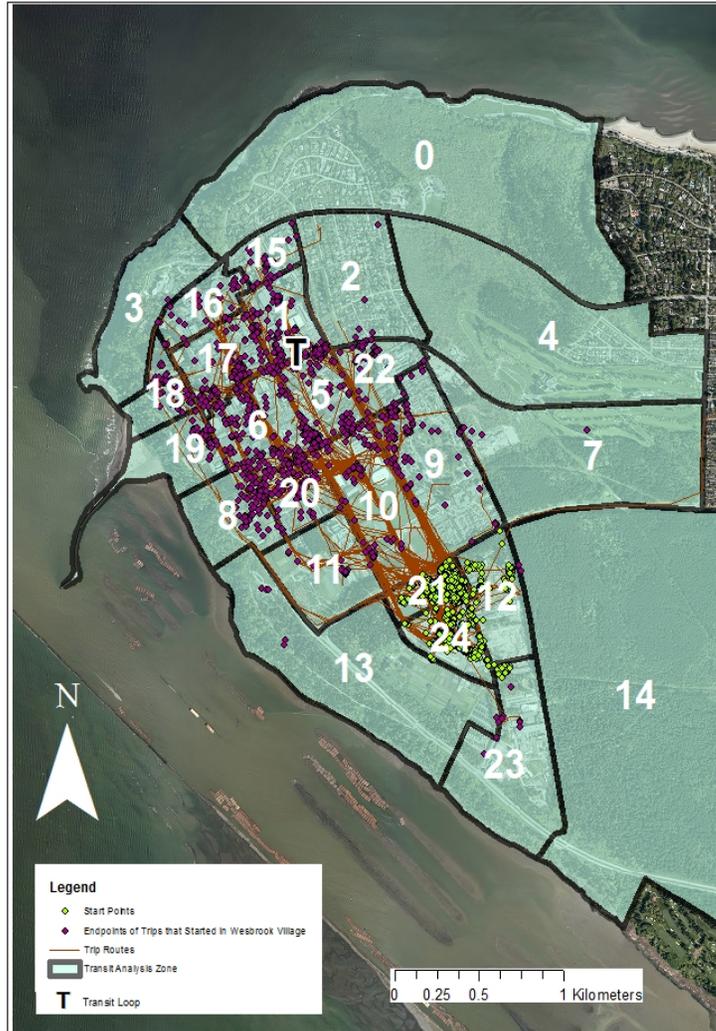
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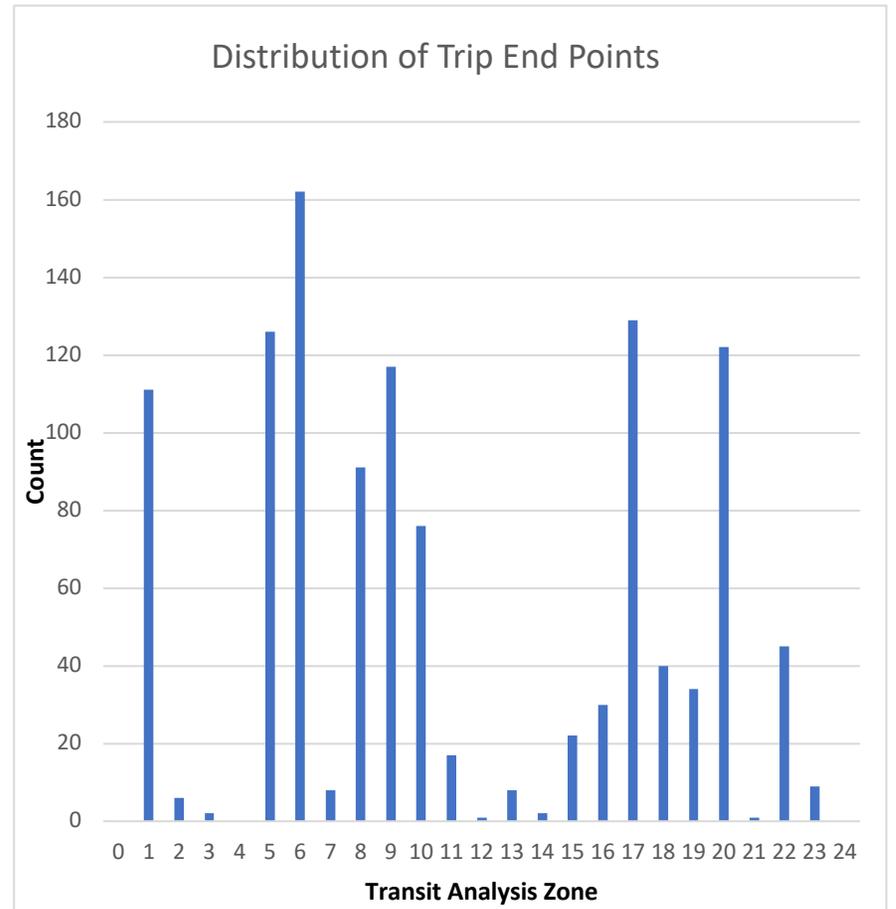
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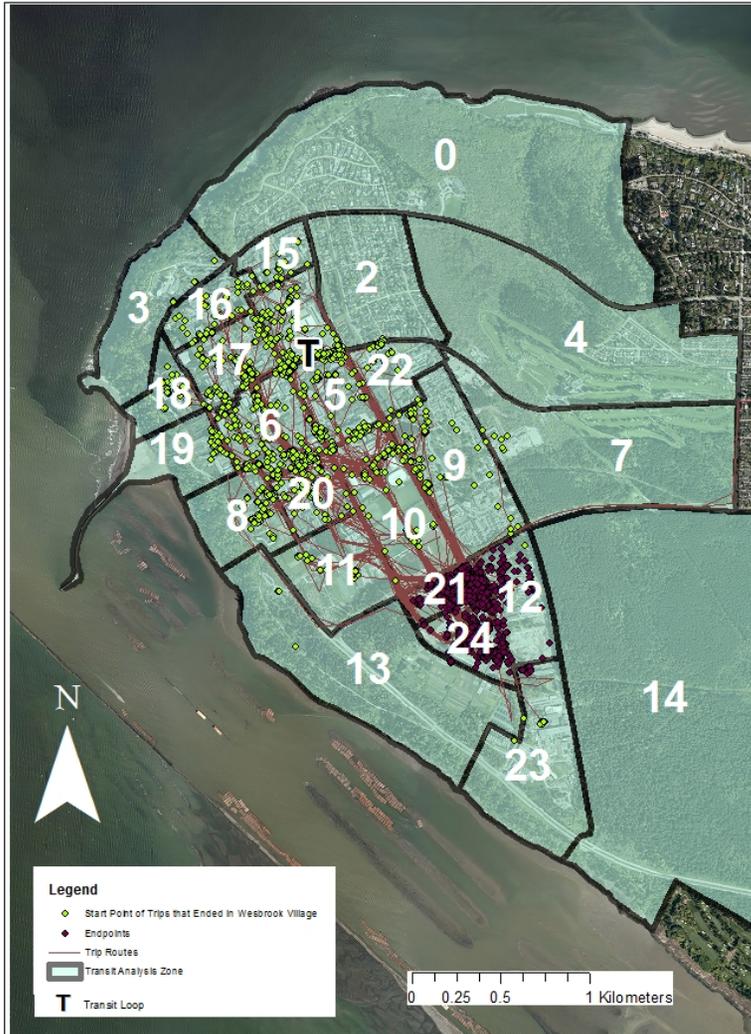
Distribution of Trips that Started in Westbrook Village



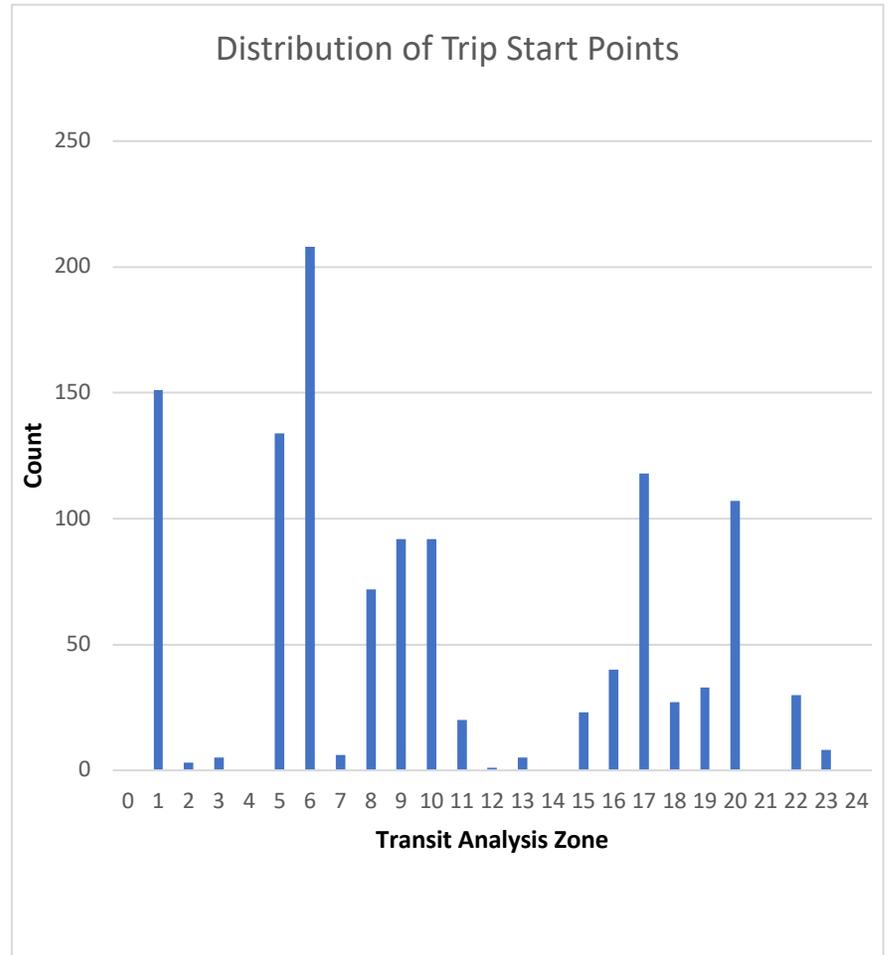
## Appendix A: GIS Analysis



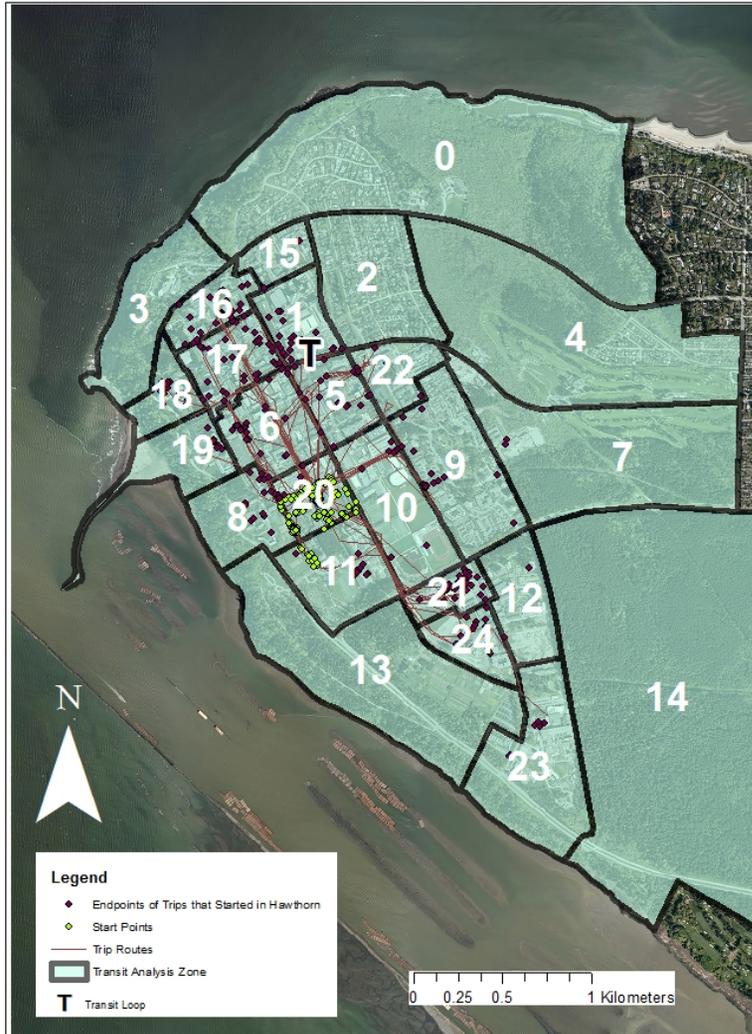
Distribution of Trips that Ended in Wesbrook Village



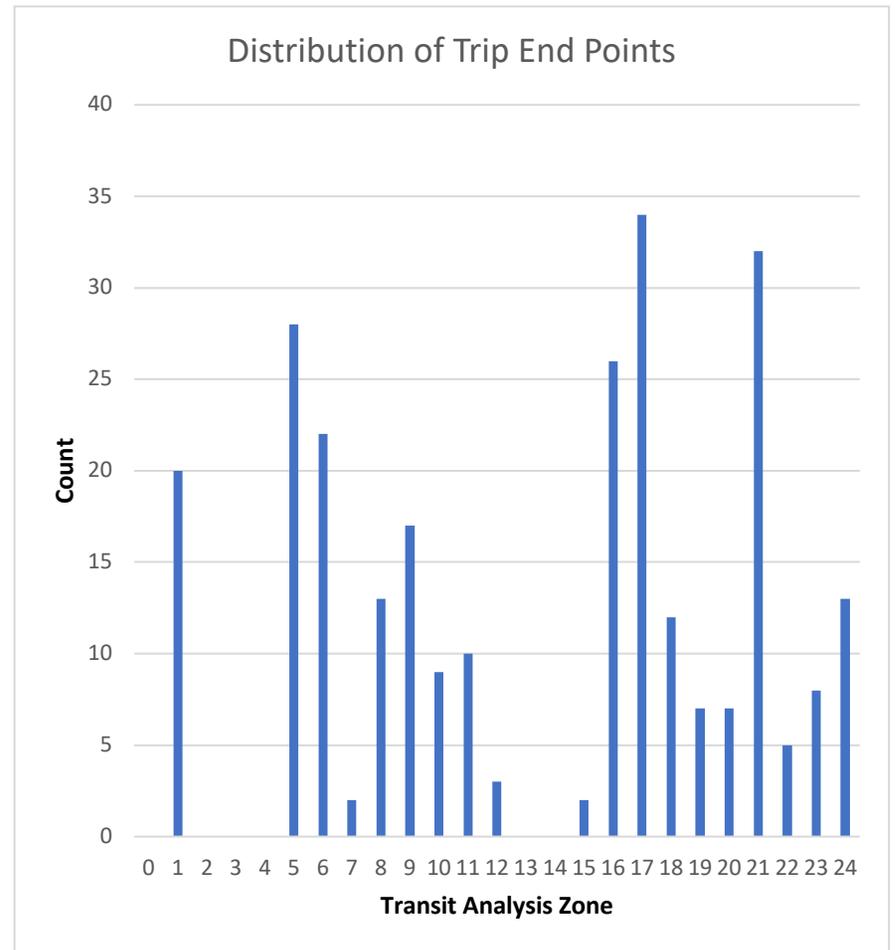
Distribution of Trip Start Points



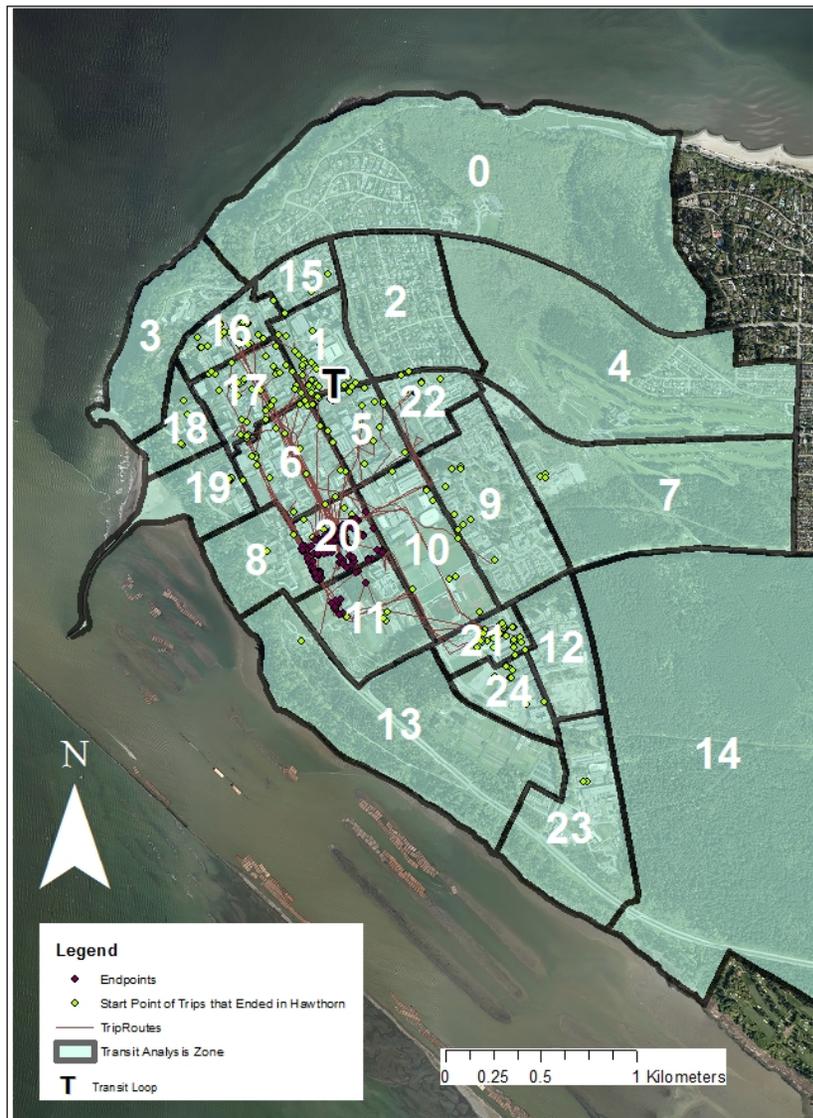
Distribution of Trips that Started in Hawthorn Village



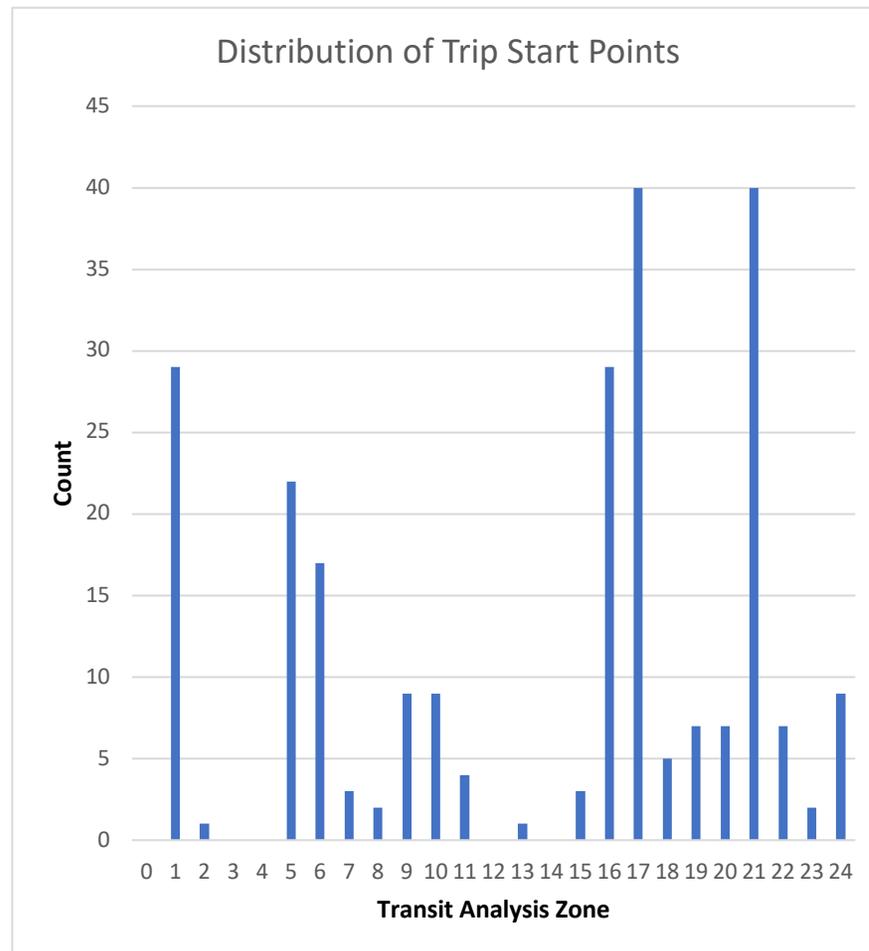
Distribution of Trip End Points



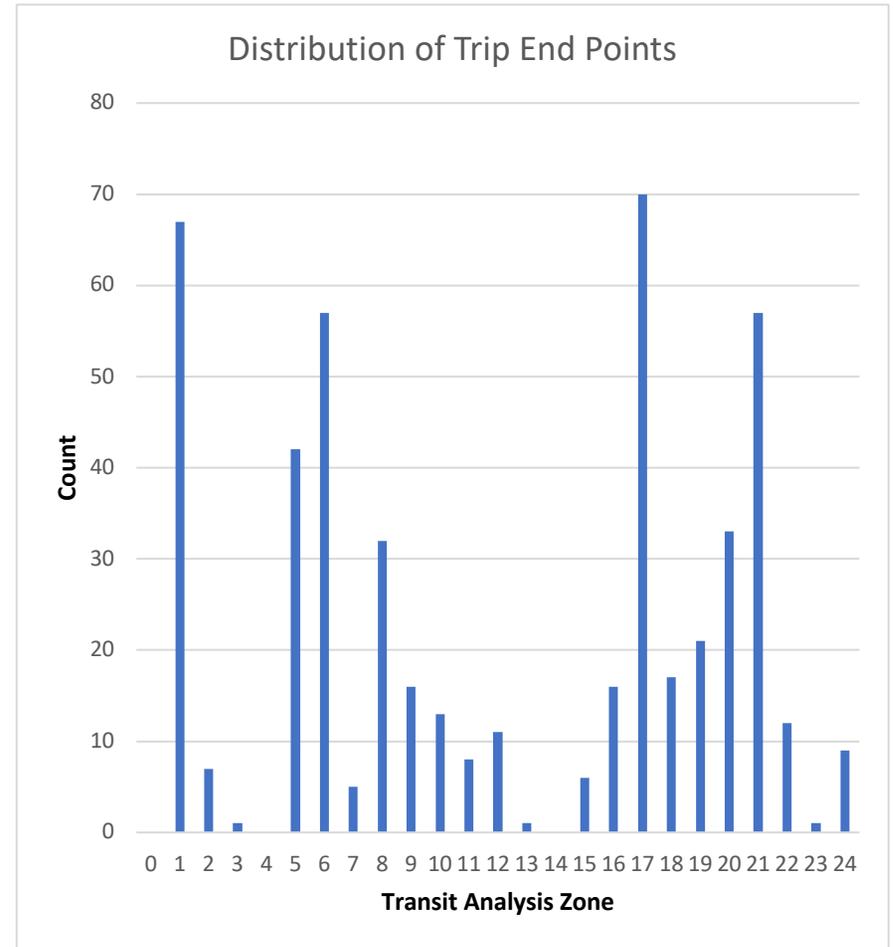
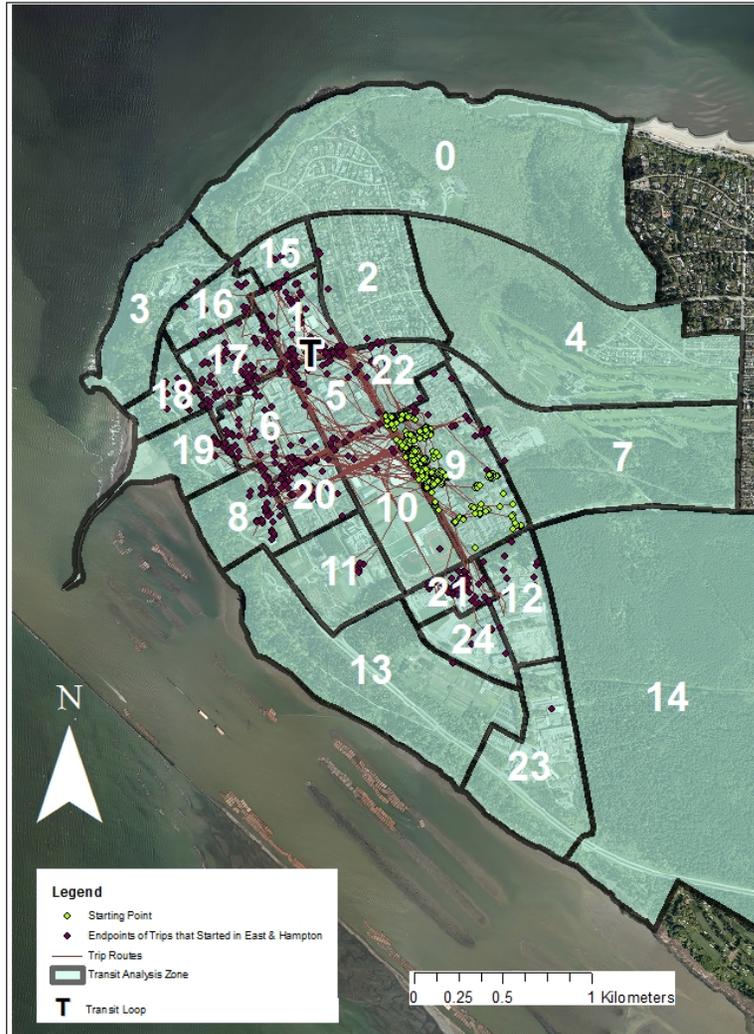
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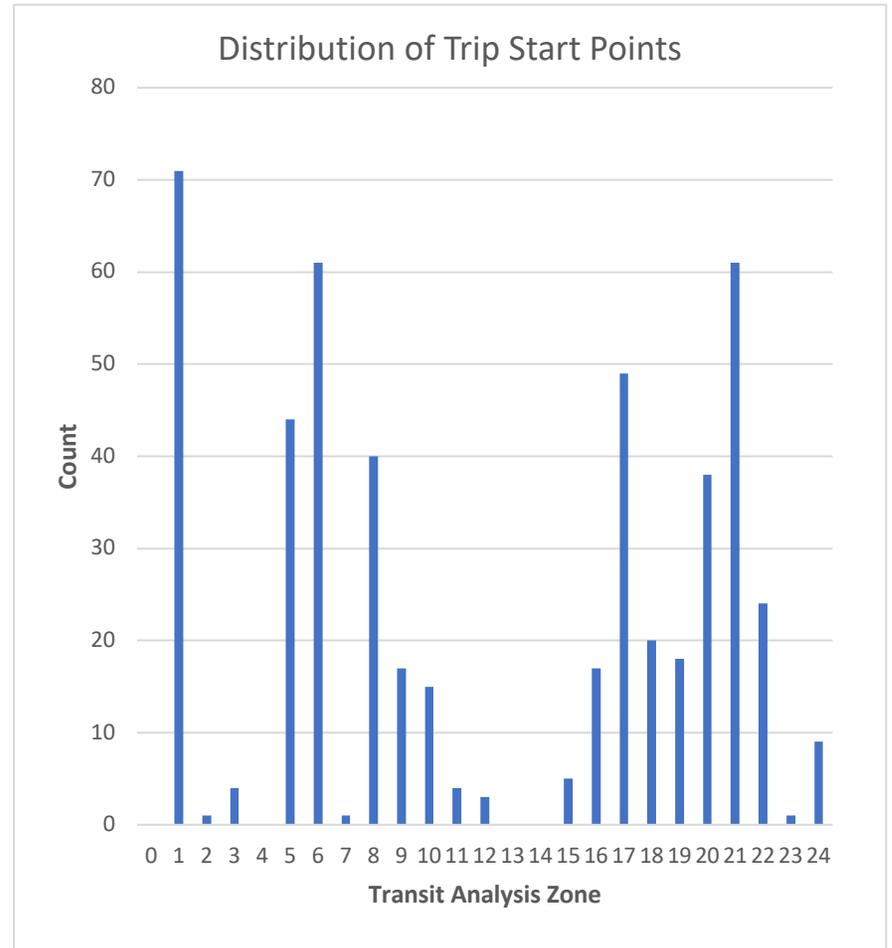
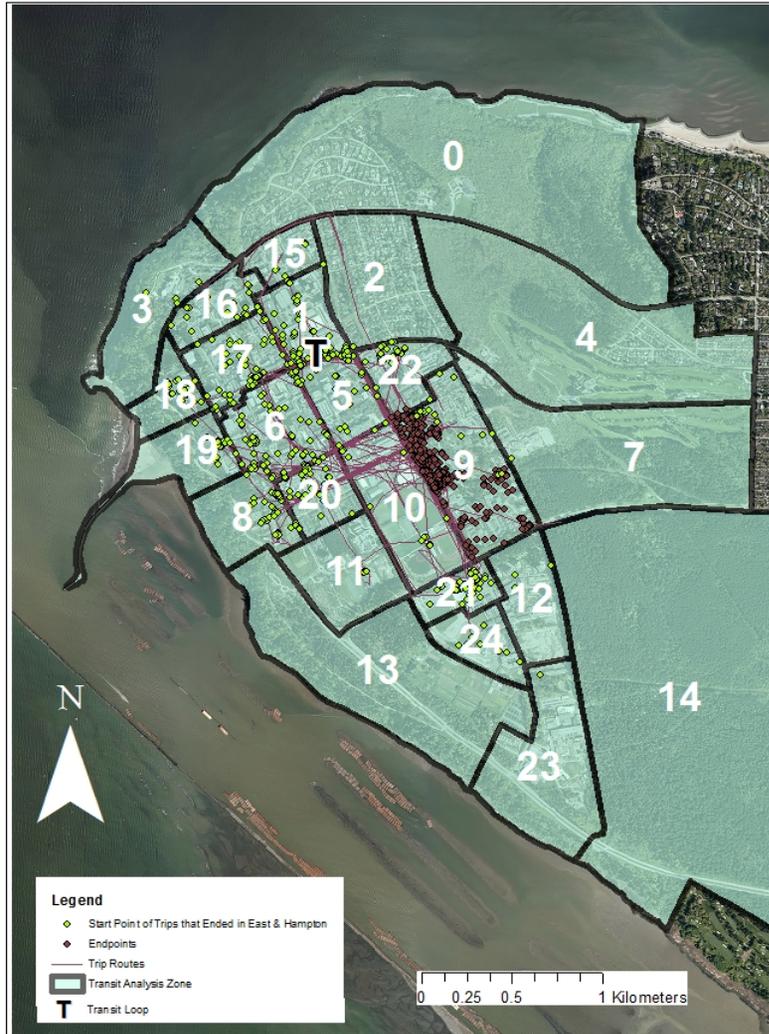
Distribution of Trip Start Points



Distribution of Trips that Started in East Campus and Hampton Place



Distribution of Trips that Ended in East Campus and Hampton Place



## Appendix B: Resident Survey Questions

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# Neighbourhood Resident Dropbike & Bicycle Storage Survey

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This survey is looking at the effect that Dropbike has on bicycle storage in UBC Campus Neighborhoods. Dropbike is a public bikeshare on UBC Campus. The bicycles are predominately orange and white.

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What is your affiliation with UBC? \*

- Student
  - Faculty
  - Staff
  - Neighbourhood Resident
  - Other...
- 

What is your age range? \*

- Under 18
- 18-24
- 25-34
- 35-44
- 45-54
- 55-64
- 55-65
- 65+

What building do you reside in? \*

- Nobel House
- Magnolia House or Dahlia House
- Cascara House
- Cypress House or Pine House
- Gardenia House
- Tamarack House
- Greenwood Commons
- Azalea House
- Sumac House
- Larkspur House
- Webber House

How many people live in your household? \*

- 1
- 2
- 3
- 4
- 5
- 5+

Do you own a bicycle at home? \*

- Yes
- No

Where do you store your bicycle? \*

- Storage Locker/ Bicycle Storage Room
- A bicycle rack outside your building
- Not Applicable
- Other...

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How many bicycles do you have within your household? \*

- 1
- 2
- 3
- 4
- 5
- 5+
- 0

How often do you use Dropbike? \*

- 1-3 times/semester
- 1-4 times/month
- Once per week
- 2-4 times/week
- Nearly Everyday
- Never

To what extent do you agree or disagree with the following statement:  
Dropbike has affected my use of the in-building bicycle storage.

- I Strongly Agree
- I Somewhat Agree
- Neutral
- I Somewhat Disagree
- I Strongly Disagree
- Not Applicable

How, if any, has Dropbike affected your personal bicycle use? \*

- I don't use a personal bicycle anymore
- I leave my bicycle in the bicycle storage room more
- I have to park my bicycle inside because the bicycle racks are full with Dropbikes
- Not Applicable
- Other...

To what extent do you agree or disagree with the following statement: \*  
Dropbike has affected my usage of outdoor bicycle racks around my building  
for storing my personal bicycle.

- I Strongly Agree
- I Somewhat Agree
- Neutral
- I Somewhat Disagree
- I Strongly Disagree
- Not Applicable

To what extent do you agree or disagree with the following statement: I use \*  
my personal bicycle for different purposes than I use Dropbike for. (e.g  
Personal bicycle for recreation, Dropbike to get to and from locations on  
campus)

- I Strongly Disagree
- I Somewhat Disagree
- Neutral
- I Somewhat Agree
- I Strongly Agree
- Not Applicable