Source: Taken July 12,2020

Supporting the Urban Freight Strategy

Mapping the City's Loading Facilities for On- and Off-Street Delivery Activity

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Acknowledgements

The author would like to thank the following individuals - Angie Weddell, Carol Kong, and Jessica McLennan - for their contribution, mentorship, and encouragement throughout this research.

This report was produced as part of the Greenest City Scholars (GCS) Program, a partnership between the City of Vancouver and The University of British Columbia, in support of the Greenest City Action Plan.

This GCS project was conducted under the mentorship of City staff. The opinions and recommendations in this report, and any errors, are those of the author, and do not necessarily reflect the views of the City of Vancouver or The University of British Columbia.

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Executive Summary

Introduction

The City of Vancouver currently lacks a comprehensive understanding of the existing assets that help accommodate freight delivery, which ultimately limits their ability to effectively manage it. The purpose of this work is to develop a framework for compiling an inventory of public and private loading facilities' location and features for a pilot study area to identify opportunities, challenges, and recommendations for expanding this urban freight approach.

Methodology

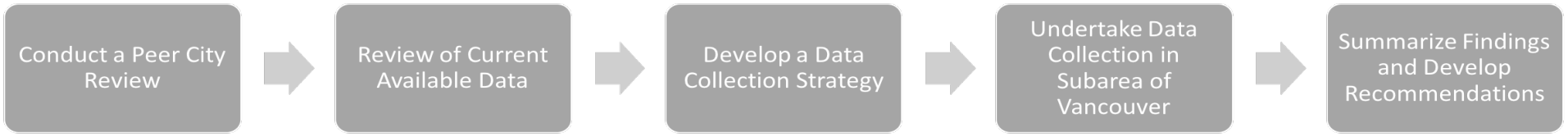


Figure 1. Research Methodology

A review of six peer cities revealed Seattle to be the only major city in North America and Europe to have undergone a comprehensive inventory of their on-street and off-street loading zones. Other cities included in the review have primarily focused their data efforts on city-managed on-street loading facilities, surveys, and traffic modeling. Likewise, the data currently available to the City of Vancouver does not include private facilities and is not consolidated into a single, organized location and consistent format. A 16-block study area along the Broadway Corridor was selected as the study parameter. Seattle's classification of various private loading typologies was adapted for the Vancouver context. Consultation with both the Transportation Planning Branch and Parking Management branch informed the development of the attributes of interest. A survey form was developed using a free GIS data collection app – Epicollect5 – and a trial run was conducted.

Data Collection Key Findings

The data collection was conducted on foot over the span of 43 hours, including a 7-hour trial run, on weekdays between 9 AM-5 PM. A total of 131 survey entries were recorded:

- 13 Public Curbside Loading Zones - 24 Vehicle Capacity
- 44 Private Infrastructure - 110 Vehicle Capacity
- 11 Undefined Infrastructure - Unknown Vehicle Capacity
- 48 Informal Loading Areas - 324 Unconfirmed Vehicle Capacity

1. The majority of loading infrastructure is accessed by laneways. Laneways are critical to the loading and unloading network.
2. For every 1 public loading area there are 3.4 private loading areas in the study area. Loading is primarily served on-site, on private property, highlighting the need for advancing the City's knowledge of off-street private loading facilities.
3. Private *Informal Loading Areas have the potential to double loading capacity when included in the total count. Further input and validation is needed from the private sector to determine the future role of these areas in serving loading/unloading needs.

Recommendations & Conclusions

Challenges: Defining and classifying the different typologies of private loading infrastructure was challenging throughout the pilot – particularly between Undefined Infrastructure, Informal Loading Areas, and Exterior Loading Areas.
Successes: Overall, the use of the laser measurement tool and Epicollect5 allowed for a seamless and efficient fieldwork workflow that minimized data entry errors and data transcription. The data collection itself proved to be highly scalable, taking about 2 hours to collect both public and private assets for one city block.

The following recommendations were developed for future expansion of the inventory:

1. **Consider a phased approach** to prioritize high-traffic commercial areas while remaining flexible to changing staff capacity, cost, and time resources.
2. **Collaborate with the Private Sector** to validate the accuracy of the data collected by the surveyor - particularly in regards to Undefined Infrastructures and Informal Loading Areas.
3. **Integrate with a coordinated Business and Goods Survey** that has inventory specific questions to gain insights into how Informal Loading Areas are being used as well as understand the diverse loading/unloading needs of a given subarea.
4. **Undertake an occupancy survey** to complement the inventory of loading/unloading facilities to determine adequate supply, demand, and accessibility.
5. **Consider using the Esri's Collector App** to better integrate with existing data stored on GIS platforms and improve overall asset management by the City.

The inventorying of public and private infrastructures is a crucial first step in bridging the information gap between the public and private sectors in order to rethink the complex management of urban freight and serves as a prerequisite for collecting valuable utilization data. To meet the needs of modern urban goods delivery, a systematic data collection method and an evidence-based approach is needed.

**Informal Loading Areas are unsigned areas in laneways and surface parking lots that may be used for loading/unloading activity.*

Introduction

Urban freight, or the movement of goods into, out of, through or within an urban area made by light or heavy vehicles, is an often-overlooked source of carbon emissions. However, the growing proportion of greenhouse gas emissions attributed to urban freight requires equal attention. Within the transportation sector, which ranks as the second-highest source of emissions in Canada, freight is the fastest-growing segment with freight emissions projected to eclipse passenger emissions by 2030.[1]

As our city continues to densify and emerging trends like e-commerce take hold, the expectations for the efficient movement of goods also increases and an equally dynamic platform for managing our finite street space is needed. Until now, the City of Vancouver has taken an ad hoc approach to planning, managing, and designing for freight delivery. The challenge of the “last mile” delivery currently results in a high number of failed delivery attempts, delivery trucks circling blocks to find loading zones, or illegally parking. Together, these negative consequences contribute to congestion, additional vehicle emissions, and increased road safety risks.

Currently, the City lacks a comprehensive understanding of the existing assets that help accommodate freight delivery, which ultimately limits their ability to effectively manage it. An inventory of each facility’s location and features is necessary in order to accurately determine whether loading and unloading facilities are well-positioned to serve the community, manage competing demands of the curbside, and provide sufficient capacity to meet current and future needs. As part of the Transportation Planning Branch’s Urban Freight Strategy, the purpose of this work is to develop the initial framework for establishing a comprehensive data inventory of our loading assets by completing a pilot inventory in a subset area. By advancing their understanding of existing loading facilities, the City can move forward with a variety of progressive urban freight solutions that will more efficiently manage the assets they have and ultimately reduce GHGs, promote livability, and support our economy.

Figure 2. A Delivery Truck Blocking an Alleyway
Source: Taken July 3, 2020

Covid-19 Context

The global COVID-19 pandemic has resulted in changes in customer and consumer behavior that has had considerable impacts on urban freight. Now more than ever, the need to manage loading infrastructure efficiently and proactively to facilitate the movement of goods is heightened.

Initially, with many non-essential stores closed, many regular freight deliveries such as produce deliveries to restaurants and inventory deliveries to retail stores were not occurring at normal volumes or frequencies. Between March 16 to May 8th, there was a significant drop in commercial transportation activity in Canada when baselined against data from February 1 to March 15.[2]

Meanwhile, the trend of “bricks to clicks” accelerated during this period, putting a considerable strain on personal freight delivery. In particular, demand for online grocery shopping soared. A survey of more than 30,000 Canadian’s revealed that almost 3 in 10 people shopped for commodities online that they normally would have brought in-store.[3,4] Predictably, food delivery services in Vancouver, such as Spud and Instacart, experienced a record influx of new customers and demand.[5]

Due to this unprecedented shift to online platforms, Canada Post reported parcel levels “only experienced during the busiest weeks of the Christmas season” with more Canadians staying home and shopping more online.[6] While delays have been inevitable, Canada Post has implemented a new “Knock, Drop and Go” approach. Where possible, signature requirements have been eliminated and employees will knock or ring before leaving the item at the door before departing for the next delivery.

This change has significantly reduced the vehicle to door times and subsequently the average duration in loading zones.[7]

In May 2020, the City of Vancouver initiated a street reallocation initiative as part of its COVID-response and recovery to address the changing curbside needs. To accommodate increased freight activity as well as the emergence of new curbside pickup activity, the Room to Load initiative temporarily converted curbside parking zones into 15-minute loading zones.

The pandemic has certainly accelerated existing trends but how these e-commerce and commercial activity trends will shape loading activity in the many months and years to come remains to be seen. One thing is certain – efficient goods movement ensures access to essential items and services and is a critical part of our COVID-19 response and recovery.

Figure 3. Curbside Reallocation Initiatives
Source: City of Vancouver

Methodology

The method used for the pilot inventory had five main components:

1) Conduct a Peer Review

- Research cities that have made progress towards or completed this type of urban freight planning work
- Review available methodology for inventorying loading infrastructure
- Identify the learnings, challenges, successes, and applicability to the Vancouver context and research scope

2) Review Current Availability of Data

- Review existing resources and sources of data available to the City on commercial loading zones
- Identify current constraints, limitations, and opportunities for strategic data collection and cataloging

3) Develop a Data Collection Strategy

- Determine the size and scope of the study area
- Group and classify the various loading infrastructure typologies
- Identify attributes of interest
- Develop a survey form for data collection
- Develop a methodology that can be scalable for other sub-areas of the City in the future

4) Undertake Data Collection in Pilot Sub-Area

- Complete fieldwork for the study area
- Convert raw data into a GIS or other easily accessible data representation software to articulate the scope of the work
- Develop the data inventory and asset map of loading facilities that includes detailed characteristics and attributes of the facility
- Identify key findings

5) Summarize the Findings and Develop Recommendations

- Detail the challenges and successes experienced with this type of work
- Develop recommendations for how the City can best manage loading facilities in order to reduce congestion
- Summarize and present notable practices and strategies used in other cities to manage urban freight

Peer City Review

A review of peer cities and their urban freight management strategies revealed – based on publicly available information - Seattle to be the only major city in North America and Europe to have undergone a comprehensive inventory of their on-street and off-street loading zones. The other cities surveyed in the review - Toronto, Washington D.C., London, San Fransisco, and New York were in various stages of managing their urban freight data and have primarily focused on city-managed on-street loading facilities.

Seattle

In 2017, the Seattle Department of Transportation (SDOT) engaged the University of Washington's Urban Freight Lab (UFL) to collect an inventory of the locations and capacity of loading/unloading private infrastructure in Seattle's urban centers. The UFL is a living laboratory made up of private industry members, academic researchers, and public transportation agencies from the Supply Chain Transportation and Logistics Center at the University of Washington that takes part in applied research projects to improve the operations of urban goods delivery. The UFL developed an efficient and systematic data collection method to build a database system of private freight infrastructure in three distinct phases. The UFL also provides a comprehensive step by step toolkit for each phase for any city to use to replicate the work done in Seattle (Appendix A-C).

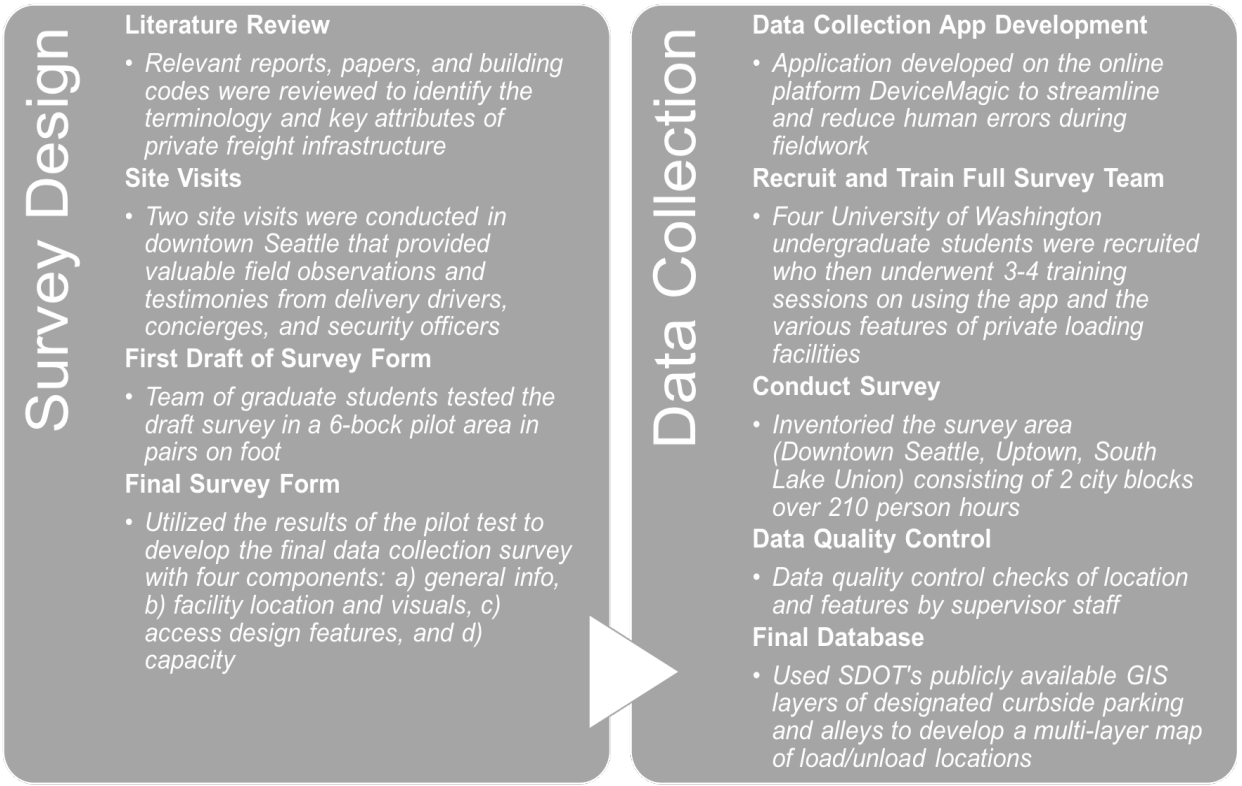


Figure 4. Urban Freight Lab's Inventory Methodology
Source: Urban Freight Lab

Phase 1 | 2017: Official Seattle's Greater Downtown Inventory of Private Loading/Unloading Infrastructure [8]
Phase 1 covered an area of 523 city blocks and took approximately 210 hours for data collection. The inventory was conducted by 4 University of Washington undergraduate students who identified 144 Loading Bays, 93 Exterior Loading Docks, 9 Exterior Loading Areas, and 17 Undefined Infrastructures.

Phase 2 | 2017: Completing Seattle's Greater Downtown Inventory of Private Loading/Unloading Infrastructure[9]
Building on the Urban Freight Lab's earlier private infrastructure inventory completed in the Downtown Seattle, Uptown, and South Lake Union area, Phase 2 completed the creation of a comprehensive Greater Downtown inventory of private loading/unloading infrastructure. Phase 2 consisted of 421 city blocks and identified 31 Loading Bays, 44 Exterior Loading Docks, 17 Loading Areas, and 4 Undefined Infrastructures.

The methodology was replicated from Phase 1 with the following four major improvements:

1) Data Structure and Survey Form
- Made the survey more efficient by only asking for information where it was relevant and refined the collection detail to be more precise.

2) Data-Collection App
- Switched to a new data-collection app that had programming that limited data-entry inaccuracies and provided better quality control.

3) Geo-location Collection Process:
- To increase precision and reliability, Phase 2 data collectors chose to collect GPS coordinates manually by dropping a pin on the map at the infrastructure location.

4) Data Quality Control:
- Phase 2 process had more data quality control checkpoints in the stages before and during data collection rather than after data collection as in Phase 1.

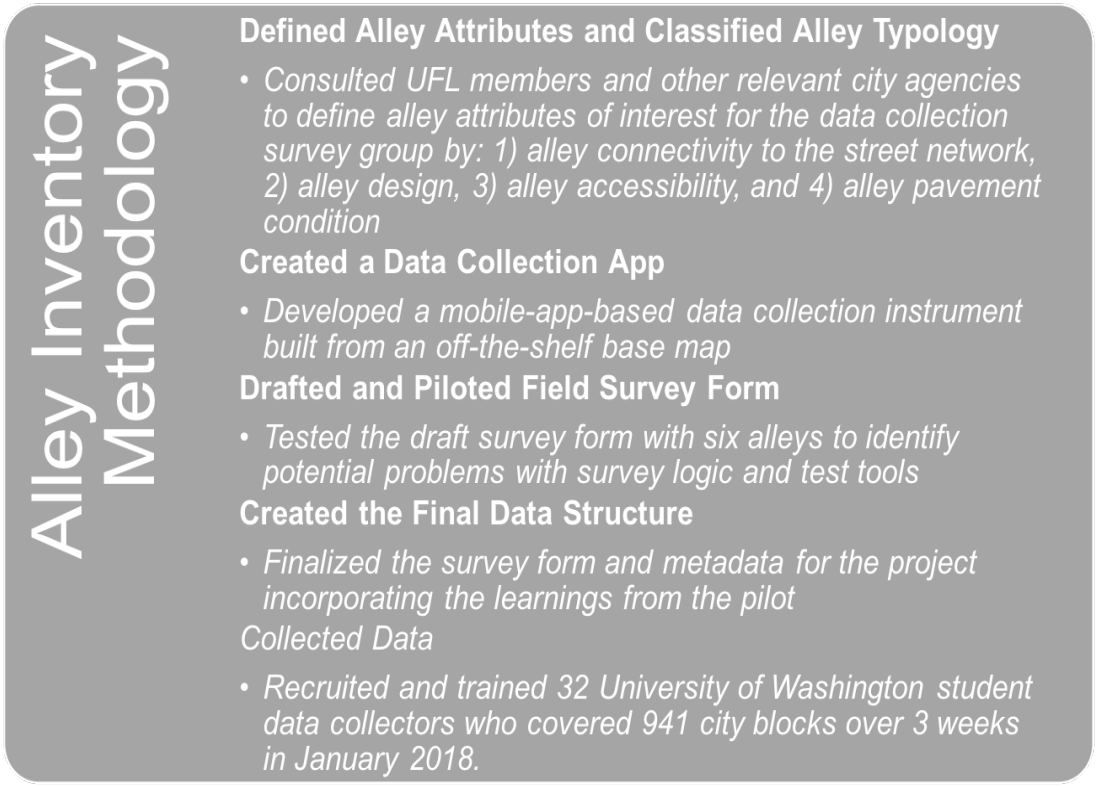


Figure 5. Urban Freight Lab's Alley Inventory Methodology
Source: Urban Freight Lab

Phase 3 | 2018: Seattle Center City Alley Infrastructure Inventory and Occupancy[10]

The alley inventory completed the final installment of Seattle's load-and-unload-space mapping effort. 32 data collectors covered 941 city blocks over three weeks to develop a complete GIS database of the 417 alleys in the Center City area. This alley inventory project recorded 70 new alleys that were not in the countywide database and provided up-to-date information leading to the removal of 26 alleys that no longer exist.

Successes

- **Collaborating with Private Sector Members Reduces Data Uncertainty:** The pilot showed difficulties in collecting complete data in instances when entrances were closed or the loading facilities could not be observed from the public right of way. Out of the 382 potential freight loading facilities surveyed, 127 cases were inaccessible with no way to confirm from the public right of way if these locations were used for freight deliveries. By collaborating with local UPS drivers, the research team was able to rule out 87% of the locations behind closed doors and subsequently reduce the uncertainty in the findings from 31% to less than 5%.
- **Development of a Data Collection App for Efficient Fieldwork:** The app allowed for the automation of data digitization and photo collection and storage. It also provided the flexibility to revise the survey form if surveyors encountered unforeseen infrastructure conditions. The fieldwork was streamlined due to the app's ability to quickly input data in the field with automated questions and drop list answers. The use of the app also decreased transcript errors and reduced data lost in transit.
- **A Phased Approach:** Allows for flexibility and improvements to the original methodology while prioritizing high conflict dense areas. The off-street loading zones, including loading bays, exterior loading docks, and exterior loading areas were inventoried first which allowed for the more challenging alley inventory to maximize the learnings from the first two phases.

Challenges

- **Security Concerns:** A member of the research team encountered a situation in which a building security guard reported them to the Seattle Police Department (SPD). This highlighted the need for data collectors to have identification to present as well as the contact of the City staff on hand. The SPD subsequently notified all building managers in the survey area through the Seattle Shield program.
- **GPS Inaccuracies:** While applying the data quality control process, several location inaccuracies were identified and required manual adjustment. GPS often has problems in alleys and urban canyons due to poor line-of-sight with satellites.
- **Difficulty Collecting Complete Data:** The team experienced difficulties in collecting complete data as some entrances were closed, and their interior could not be observed from the public right of way. Additionally, other features of interest identified in the literature review and site visits, such as turning radius, maximum truck size, and centerline distance were not possible to measure in the field due to the complexity.

Toronto

The Greater Toronto and Hamilton Area (GTHA) Urban Freight Study undertaken by Metrolinx in 2011 identified improving freight information as one of the top priorities to improve the way in which goods and services move throughout the GTHA.[11] In a status update in 2012 that highlighted key initiatives and major research undertaken, it was evident that Toronto has made significant progress in collecting urban freight data by tracking urban commercial vehicle movement and travel patterns through trip modeling and the MTO Commercial Vehicle Survey.[12] While a list of on-street loading zones including information on their location, dimensions, and time restrictions can be found publicly on the City of Toronto's website, there is currently no city-wide database or inventory of private loading/unloading infrastructure.[13]

In 2010, Justin Kwok, an undergraduate student at the University of Toronto undertook an independent parking inventory of the Toronto Central Business District area between Queen St., Simcoe St., Front St. and Victoria St (Appendix D).[14] This inventory was done as part of an undergraduate thesis titled "Data Collection on Parking and Loading Supply and Truck Driver Demand Survey". While the final report is not available publicly, the following information regarding the methodology was compiled through personal communication with Justin Kwok as well as other published articles that incorporated the data collected in 2010.

First, the research team conducted an inventory on foot from the public right of way and included both on-street and off-street formal loading/unloading facilities. The inventory included all on-street spaces, off-street surface lots, laneway loading zones, loading bays, parking garages, and private garages. Due to the time and resource limitations, data was collected manually with pen and paper. During this phase, the research team observed that a significant amount of illegal loading activity occurred on the curbside outside of the designated loading facilities.

The team then went back to each location previously identified in their inventory and conducted 200 interviews of truck drivers and observed 1940 parking events of parked commercial vehicles on weekdays between the hours of 9 AM to 3 PM. The surveyors collected information on arrival time, departure time, parking location, type of vehicle, company, the commodity delivered, and the final destination of the delivery. The full questionnaire can be found in Appendix D. Approximately 10% of trucks parking in each segment were subject to a driver interview and a broad variety of commercial vehicle types and commodity types were covered in the survey.

The on-street portion of this inventory was updated in August 2013 to include detailed information on the timing of parking restrictions for on-street parking, standing, and stopping. The data collected by Kwok's Data Collection on Parking and Loading Supply and Truck Driver Demand Survey has since been used in various trip modeling and traffic analysis research at the University of Toronto. No information could be found regarding a possible future expansion of this inventory at this time.

Washington, D.C.

In 2007, D.C.'s Downtown Business Improvement District established a pilot parking program, which helped build momentum for developing the city's Commercial Loading Zone Management Program (CLZMP).[15] The pilot program first focused on K Street NW - one of the downtown's busiest commercial thoroughfares with one lane for travel and one for passenger parking or commercial loading/unloading. For the pilot program, multi-space parking meters were installed on blocks with commercial loading zones, and parking enforcement was increased on K Street to alleviate congestion caused primarily by double-parked commercial vehicles. Assisted by the District Department of Transportation (DDOT), the Golden Triangle BID and the Downtown BID collected pre-and post-pilot data on travel times, parking occupancy, curbside uses, parking turnover, and parking violations. Results of the pilot showed travel times across all modes of travel improved measurably following the implementation, without substantial disruption of commercial activity. The success of the pilot program eventually led to the citywide implementation of the CLZMP in 2015.

With assistance from internal staff and the Metropolitan Washington Council of Governments, DDOT completed an inventory of all city-managed on-street loading zones during the 18 months leading up to implementing CLZMP in 2015[16]. The Commercial Curbside Loading Zone Program aims to improve the point of delivery through the proper use of public space by:

- Inventorying all commercial loading zones (including signage) within the city.
- Adjusting regulations to support program needs.
- Applying freight data to evaluate loading zone demand.
- Involving the freight community throughout the process.

For the inventory, characteristics including the loading zone dimensions, signage, and time restrictions were documented using the ArcGIS Collector application and resulted in a publicly available interactive map of loading zones and truck restriction zones that includes length and capacity. The DDOT's inventory is currently limited to curbside loading zones and no further publicly available information regarding their methodology or whether a database of private loading zones exists or was available at the time of this review.

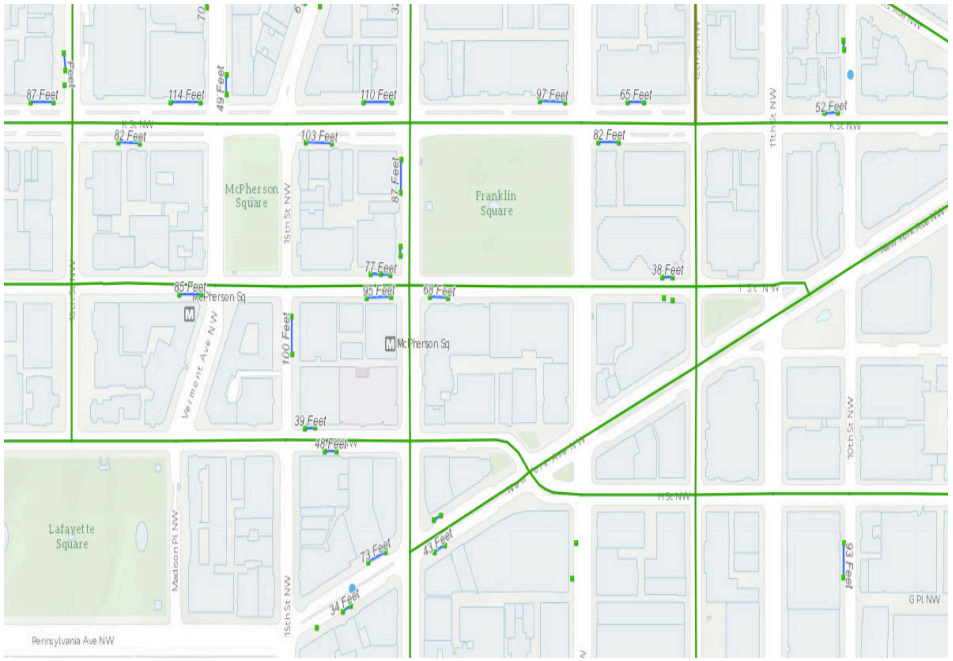


Figure 6. D.C. Truck and Bus Map
Source: goDCgo

London

London is widely regarded as a global leader in urban freight management - offering best practices and valuable lessons for other cities to consider. Specifically, they have made significant strides in their freight education and resources, the deployment of electric delivery vans, as well as the adoption of freight bicycles. CCTV cameras have also been deployed as a way to monitor compliance with delivery rules and restrictions to limit double parking, parking too long in the designated loading zone, and blocking the box.

Over the past few years, Transport for London has implemented several projects to improve the efficiency, safety, and environmental impacts of road freight transport across London including the Fleet Operator Recognition Scheme, Delivery Servicing Plans, Construction Logistics Plans, and the Low Emission Zone.[17] The London Freight Plan (2007) outlines the steps being taken in these areas with more detail, however, at the time of this review, there was no mention of an inventory or database of either on-street or off-street loading facilities.[18] No publicly available information could be found whether an inventory has been conducted.

Approximately 60 urban freight studies that have taken place in the UK since the 1960s that focuses on both goods collection and delivery vehicle activity and service vehicle activity.[19] A variety and combination of data collection techniques were in these surveys as a means of understanding the proportion of all road traffic accounted for by commercial vehicles by the time of day and day of the week:

- Establishment survey
- Commodity flow survey
- Freight operator survey
- Driver survey
- Roadside interview survey
- Vehicle observation survey
- Parking survey
- Vehicle trip diaries
- GPS survey
- Suppliers survey
- Service provider survey
- Vehicle traffic counts

These surveys provid insights into the loading and unloading process through an examination of where goods vehicles park while loading and unloading in urban areas. Data regarding off-street loading facilities is collected directly through the Stakeholder Survey (Appendix E) but does not include the exact location or dimensions of the loading facility.[20]

Figure 7. Efficient Deliveries Toolkit
Source: Transport for London

San Francisco

San Francisco Municipal Transportation Agency's (SFMTA) work on the Curb Management Strategy began in March 2018 to review existing curb management regulations and conditions, reviewing best practices, conduct interviews with staff, and conducting internal and external stakeholder workshops outreach to gather feedback. Through their work, SFMTA published a 2020 Curbside Management Strategy Report that identified six key objectives with supporting strategies designed to achieve that objective.[21] For each strategy, the level of effort – both in terms of financial and human capital - necessary to implement it is identified.

Objective 1: Advance a holistic planning approach
Objective 2: Accommodate growing loading needs
Objective 3: Increase compliance with parking and loading regulations
Objective 4: Improve access to up-to-date data
**4.1 Standardize curb data inventory*
Objective 5: Rationalize policies towards private users of curb space
Objective 6: Promote equity and accessibility

Standardizing curb data inventory was identified as a mid-term (six to eighteen months) strategy supporting the overall goal of improving access to up-to-date data. In acknowledging that their data on existing curb allocation in San Francisco is scattered and incomplete, SFMTA has recognized that they do not currently have an inventory of all existing loading/unloading assets. Like many other cities, the different types of curb uses are tracked across different formats and locations that are not aligned. Some of the data is not digitalized, while other more accurate data is stored in CAD meter drawings that are not tied to geospatial databases. This lack of reliable, comprehensive data has resulted in SFMTA's staff resorting to time-consuming field-checking of data on a case-by-case basis.

While the work is not yet underway, the SFMTA has developed three recommendations for completing this inventory:

1. **Develop and implement a linear-referencing curb data model that can interface with SharedStreets and other industry standards**
- While a linear-referencing data model is ideal, point-based data could be used as an interim step
- The curb data model should support internal needs and allow for external data sharing
- Should be connected to the SFMTA's broader effort to digitize all street data
- An API to share the data with the public should be developed in tandem

2. **Integrate all SFMTA and City processes and systems that modify curb data to enable an up-to-date single source of truth for curb locations and regulations that is integrated into the curb data model**
- Includes sources and processes such as: CAD meter drawings, Salesforce color curb records, ArcGIS spatial database, and Paint Shop work tracking systems
- Should be paired with workflow improvements to the SFMTA's existing legislation and work order tracking systems, so that curb data can be updated in real-time
- Seek funding to build out a unified system and establish workflow processes that integrate with the curb data model

3. **Create a standardized, complete inventory of curb space in San Francisco utilizing the curb data model**
- Seek funding through grants and other means for a comprehensive curb mapping effort
- Investigate opportunities for working with private industry to populate data and share development and maintenance costs

New York

In recognizing the urgent need for improvements to the truck route network in New York City, New York City Department of Transportation (NYCDOT) undertook a Truck Route Management and Community Impact Reduction Study in 2007. Through this study, the City performed an extensive analysis of the roadway network and developed a set of recommendations to improve the efficiency of goods movement through routing modifications, roadway signage improvements, enhanced enforcement, and educational initiatives.[22]

In their 2015 Urban Freight Initiatives report, NYCDOT acknowledged the lack of curb space in the City's commercial corridors. The report also noted that most retailers and grocery stores do not have off-street loading docks and, therefore, rely heavily on-street parking which is typically occupied by passenger vehicles. In focusing their efforts on curbside loading facilities, NYCDOT is currently supporting urban freight research focusing on cargo cycles for last-mile freight delivery, urban freight consolidation centers, curbside management, traffic counts, remote sensing, and off-hour deliveries to improve the efficiency of truck deliveries.[23]

In both reports, as well as an independent case study conducted for the U.S Department of Transportation of New York's urban freight initiatives, there was no mention of an inventory or database of either on-street or off-street loading facilities. At the time of this research, no publicly available information could be found whether an inventory has been conducted.

Figure 8. Smart Truck Management Plan
Source: NDOT

Review of Available Data

Like the majority of the cities surveyed in the peer city review, the City of Vancouver currently lacks a comprehensive inventory of the existing loading/unloading assets that help accommodate freight delivery. The data relevant to urban freight management currently available is not consolidated into a single, organized location and consistent format. The data available to the City is also incomplete and not inclusive of all types of loading/unloading facilities. Specifically, there is a gap in the available data and information regarding the location, quantity, and capacity of the City's private and off-street loading/unloading facilities where a significant portion of loading/unloading activity takes place. This section summarizes the currently available data related to urban freight in Vancouver and their respective limitations.

Special Zones Map

The Special Zones Map in Google Maps includes information about the location and time restrictions of city-managed on-street curbside zones in Vancouver and is an internal planning tool developed by the City. This map includes three curbside zones that are relevant to loading activity - commercial loading zones, loading zones, and passenger zones.

This map covers all the neighbourhoods within the City of Vancouver's boundary. Other layers included in this database, such as taxi and police zones, provide a holistic picture of the competing uses and needs of the curbside in a specific area. Additional layers showing curbsides dedicated to transit priority and on-street parking would improve this resource, allowing staff to determine targeted reallocation of the curb for loading as needed in the future. Currently, information relevant to urban freight management, such as the location and quantity of parking meters, is stored and managed using ArcGIS. To ensure the use of a consistent platform and format to better facilitate asset management, the Special Zones Map could be improved by transferring to ArcGIS. The ArcGIS platform would also allow for a more detailed list of attributes and better store details such as the length and vehicle capacity which are currently available but not readily accessible.

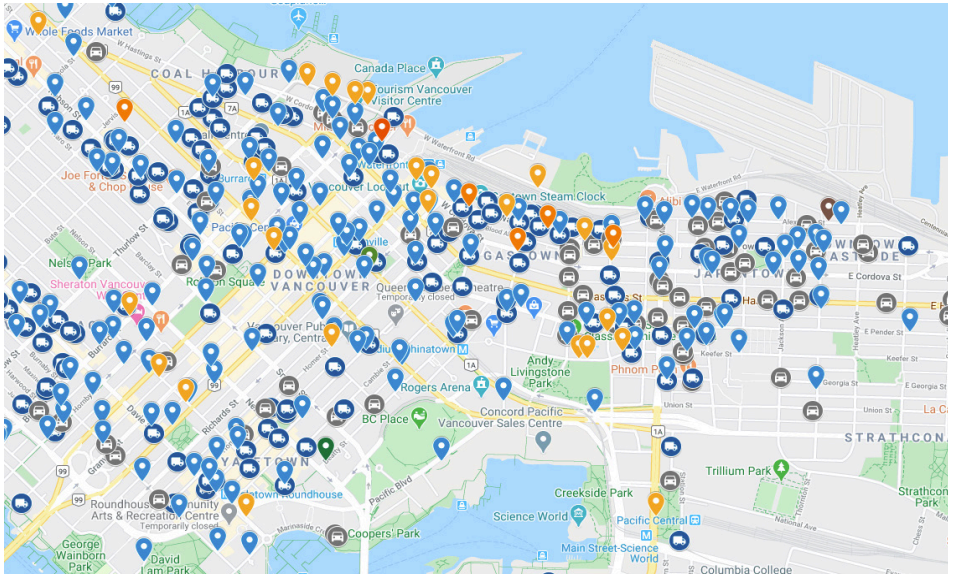


Figure 9. Special Zones Map
Source: City of Vancouver

Additionally, this resource does not include off-street commercial loading facilities or laneways and, therefore, only captures a small portion of the existing loading/unloading facilities available. Another limitation of this database is the frequency at which it is updated. After comparing the results of the fieldwork completed for this project, four additional on-street zones were discovered in the study area that were not included in the Special Zones Map.

Miovision

Miovision is a smart traffic platform that helps cities modernize traffic data collection. The City of Vancouver currently has collected Miovision video surveillance for 10 on-street and laneway commercial loading zone locations and laneways, including 2 in the Broadway area. The analysis of this footage is currently underway and the findings from reviewing the footage and conducting an occupancy and utilization study can complement an inventory of loading facilities. For example, insight and observations on loading/unloading behaviors, duration, difficulties accessing the loading space, and vehicle maneuverability would provide a comprehensive overview of the effectiveness of specific loading zones and inform future freight policy improvements.

More Miovision footage is needed to understand the seasonal fluctuations that loading activity experiences. Miovision is costly and time-consuming to use. Therefore, traffic counts and occupancy studies are completed manually, typically by an intern or co-op student. Additionally, the quality of the video footage is kept low due to privacy concerns which can make it difficult to collect data on details such as types of commercial vehicles.

By-Law Section 5 | Off-Loading Space Regulations

Section 5 of the City of Vancouver parking by-laws deals with off-street loading requirements and regulations.[24] Specifically, Section 5.2 (Appendix F) outlines the total number of required off-street loading facilities for each building classification. This provides a rough sense of the number of off-street loading facilities that exist in the city. Unsurprisingly, the limitation of this resource is that it only captures the minimum number of off-street loading facilities required by the City and, therefore, does not reflect the true number of loading assets.

Parking Infraction Data

The City of Vancouver makes parking infraction data available on their Open Data Portal.[25] This dataset includes parking ticket records data available from the Parking Operations and Enforcement branch by year and includes location information aggregated to a 100-block unit level. It is important to note that this dataset does not include parking tickets issued by the Vancouver Police Department.

Currently, there is no easy way to filter out infractions by commercial vehicles and is limited to searching by license plate number. There is an opportunity for Parking Enforcement to improve upon this dataset by collecting loading-specific infraction data in the future. Parking infraction data that captures double parking and other prohibited uses of the curbside can offer insights into high conflict areas and indicate a need for more curbside space dedicated for commercial loading. This can help determine targeted areas for further study and ideal pilot locations for the highest impact.

Development Permit Applications

The City of Vancouver requires information regarding loading facilities as part of the application process for all Commercial and Industrial Buildings obtaining a development permit.[26] As part of the Site Plan document (Appendix G), a statement of parking and loading, size and location of all off-street parking and loading, and access to parking and loading must be included in the application. Furthermore, the Parking, Loading, and Bicycle Parking Plans, document covers the specifics on how the proposed development will comply with Parking By-law and Parking and Loading Design Guidelines. Details related to loading zones include much of the attributes collected as part of this project such as vertical clearance height for underground parking area, length, and width for loading bays as well as more technical details such as grade, ingress/egress ramp and more.

The information provided on these development permits can provide a basis for conducting an inventory count of private loading facilities – particularly those that are not visible from the public right of way. While development permits are easily accessible and do not require fieldwork, there are limitations to conducting the inventory through this method. First, the database is not available in a spatial format and requires addresses in order to search for specific development permits. Additionally, information on older buildings may be archived and are not digitized. Lastly, changes that occur during the application process are not always well documented through paperwork and what ultimately gets built could be different from the original development permit. Given the opportunities and limitations of this method, likely, information gathered from development permits would require confirmation during fieldwork and serve as a complementary method to fill in data gaps.

Business and Goods Movement Survey

The City of Vancouver has conducted two Business and Goods Movement Surveys to help staff better understand the loading, delivery, parking, and access needs of local businesses in Commercial Drive (September 2016) and Gastown (October 2019). Through the public open house events and surveys, city staff gathered valuable feedback and information regarding loading needs in these specific areas that have helped inform monitoring of select commercial zones to understand occupancy and compliance with regulations (Appendix H).

This survey does not collect specific inventory information regarding the exact location of on-street or off-street loading facilities nor the quantity or capacity of them. Key findings from the surveys include loading zones that were heavily used or reported inaccessible, the types of vehicles typically used for loading, frequency and time of deliveries, and more. The mix of both quantitative and qualitative data provides a comprehensive review of the existing loading network that can inform future opportunities to improve loading for the businesses in those areas.

Commercial Vehicle Decal Applications

To access commercial loading zones and lanes in Vancouver, a City of Vancouver decal is required to be displayed on your vehicle.[27] This decal allows:

- Stopping in commercial loading zones and lanes for up to 30 minutes to load or unload materials
- Stopping in passenger zones for up to 30 minutes (before noon) while loading or unloading goods
- Use of a metered parking space for free on any day up to 10:30 AM, except in morning rush hour zones (typically 7 AM to 10 AM or per the posted signs)

Previously, commercial vehicle decals were issued under the Commercial Vehicle Licensing Program administered by the Union of BC Municipalities. As of January 1, 2020, under the city's new program, the Vancouver commercial vehicle decals are now City-issued. The number of decals issued per year can point to general quantity, trends, and changing demand for commercial loading permits.

This database is city-wide and cannot currently be broken down to a specific area or neighbourhood. There are two significant limitations to this data. First, only vehicles requiring access to on-street facilities and laneways that require the decal would be captured in this dataset. Therefore, loading activity occurring in off-street or private facilities would not be captured through the decal applications. Similarly, this data is limited to loading activity completed by commercial vehicles and does not capture the loading activity that occurs by non-commercial vehicles. Loading activity by non-commercial vehicles is rapidly increasing with services such as UberEATS and is an important subset of loading activity to consider. While there is a lack of historical data as it is a new program, there is an opportunity to build on the current application process (Appendix I) to collect important data such as the type of vehicles as well as the type of business or industry.

Figure 10. Commercial Loading Zone Sign
Source: Taken July 7, 2020

Figure 11. Commercial Lane Sign
Source: Taken July 7, 2020

Strategy for Data Collection

Step 1: Determine Study Parameters

Scope and Size of Study Area

The study area focuses on a stretch of the Broadway Corridor between Ash Street and Main Street - and encompasses one block to the north and south of Broadway to capture the laneway network around the arterial street.

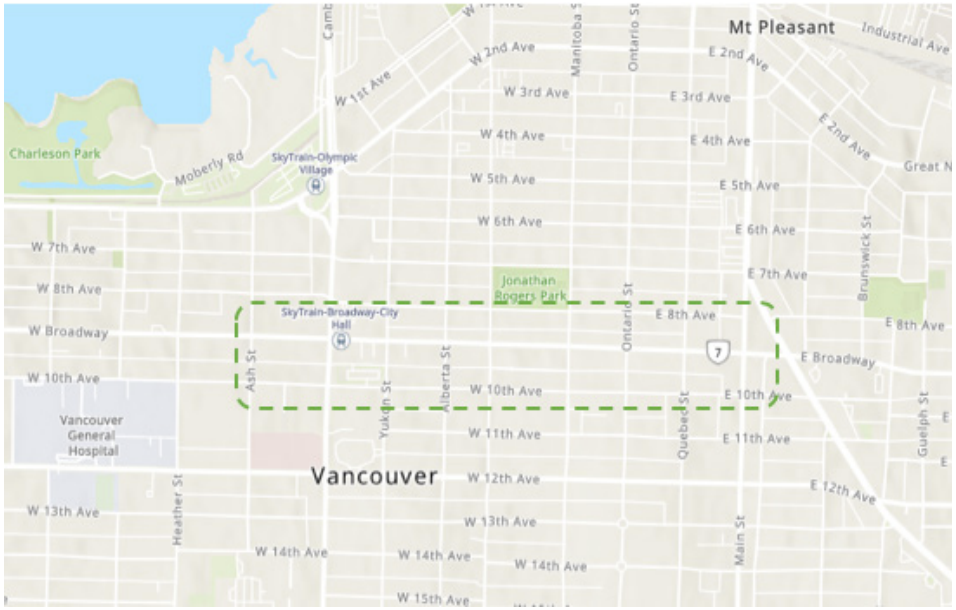


Figure 12. Study Area Boundary

Broadway Corridor Profile[28]

The study area consists of a diverse cross-section of older buildings, newer developments, and different commercial uses with high levels of loading activity. The study area crosses two distinct neighbourhoods: Fairview and Mount Pleasant. The study area's proximity to Vancouver General Hospital and Vancouver City Hall as well as its role in both the frequent transit network and the rapid transit network makes this a highly trafficked area. Notably, the highest frequency transit in the city including the busiest bus line in Canada and the United States, the 99 B-Line, runs through the study area and also encompasses two dedicated bicycle routes along 8th Ave and 10th Ave. The study area is zoned as a C-3A which allows a wide range of goods and services, maintains commercial activities and some light manufacturing, and allows residential dwelling uses that are compatible with commercial uses. The study area includes three major commercial streets: Broadway, Cambie Street, and Main Street. The majority of the buildings in the study area are between 1 to 5 stories in height and range widely in the year of construction from before 1940 to recent developments.

Data Collection Hours:

Approximately 50 hours of data collection was anticipated to complete the fieldwork for the selected study area. The data collection took place on foot during daylight hours on weekdays for safety reasons. Weekdays between 9 AM to 5 PM are also ideal for data collection to best capture when private facilities are open and in use. A security protocol was followed when conducting the data collection and the surveyor was equipped with a high-visibility vest and documents explaining the project with agency contact information should questions arise during the fieldwork.

Step 2: Define Public and Private Loading/Unloading Infrastructure Types

Unlike the Seattle methodology, the following inventory includes both public and private loading/unloading facilities as well as commercial laneways within the same phase of data collection. The typology was categorized first. This includes the three types of loading zones regulated by the City under the Street and Traffic By-law - commercial loading zones, loading zones, and passenger zones. There are several types of off-street private loading facilities. Four different types were identified as part of the Urban Freight Lab's typology literature review – loading bays, exterior loading docks, exterior loading areas, and undefined infrastructure. An additional typology, the Informal Loading Zone, was added based on observations gathered on the trial run.

Types of Commercial Loading Infrastructure Inventoried

1. City-Managed Public On-Street Zones[29]

Figure 13. Commercial Loading Zone
Source: Taken July 15, 2020

Figure 14. Loading Zone
Source: Taken July 7, 2020

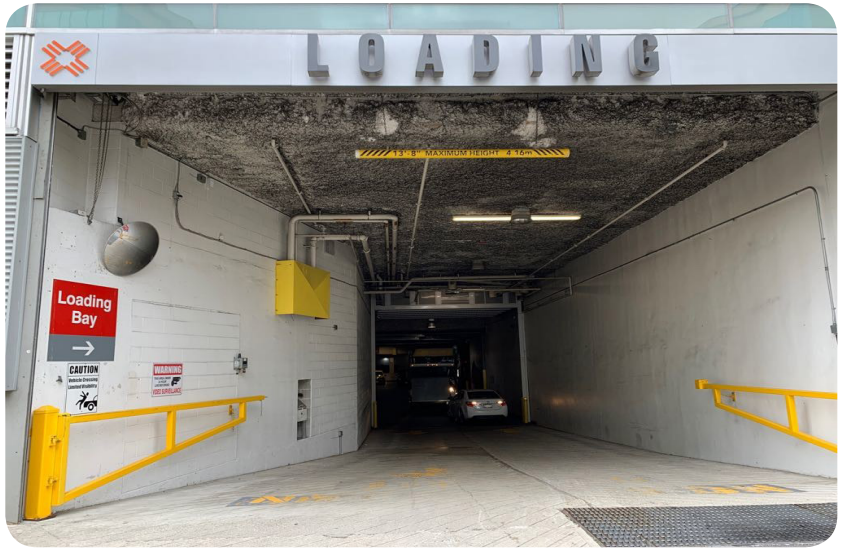
Figure 15. Passenger Zone
Source: Taken July 15, 2020

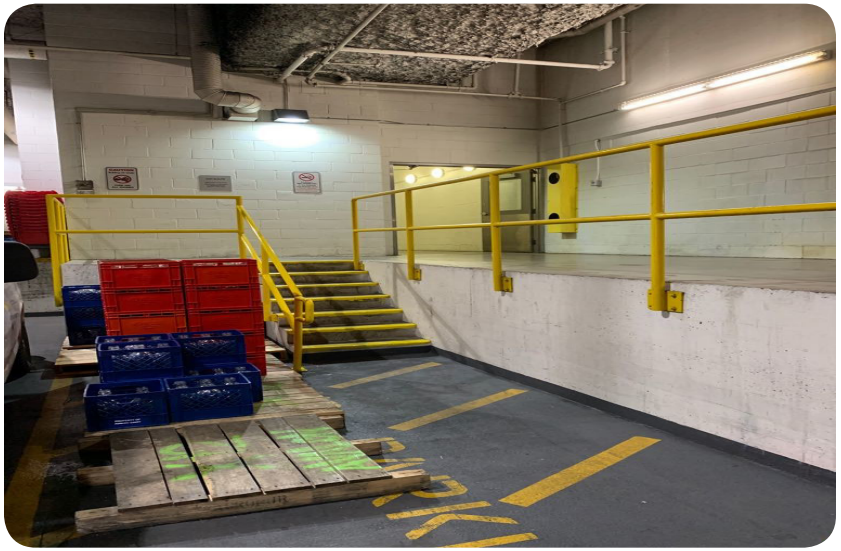
Figure 16. Commercial Lane
Source: Taken July 7, 2020

- Commercial Loading Zones:
  The area or space, defined by signage, for the loading or unloading of materials, to be used exclusively by licensed commercial vehicles. Commerical vehicles must display a valid plate or decal identifying it as being registered and licensed.
- Loading Zones:
  The area or space, defined by signage, on a roadway established for the exclusive use of people in vehicles during the loading and unloading of materials. Unlike Commercial Loading Zones, this zone does not require a valid commercial vehicle decal.
- Passenger Zones:
  The area or space, defined by signage, on a roadway established for the exclusive use of vehicles during the loading or unloading of passengers. A commercial vehicle may stop in a passenger zone, before noon on any day, for no more than 30 minutes, while loading or unloading materials.
- Commercial Lanes:
  Any lane, also referred to in this report as a laneway, that is parallel to or behind a commercial property.

2. Private Off-Street Loading Facilities[8]

- Loading Bays:
  An enclosed space inside the building partially or completely dedicated to unloading and loading activities with an entrance/ exit point (e.g. roll-up, gate, or garage).





Figures 17-18. Loading Bay Entrance and Dock
Source: Taken June 30, 2020

Figure 19. Exterior Loading Dock
Source: Taken July 8, 2020

- Exterior Loading Docks:
  An elevated platform that facilitates shipping and delivery operations, located outside a building's exterior wall, either completely open to the sky or partially or completely covered by a canopy or upper-level building feature.

Figure 20. Exterior Loading Area
Source: Taken June 30, 2020

- Exterior Loading Areas:
  A parking space dedicated to loading/unloading located outside a building's exterior wall without a loading dock. Indication of loading activity includes the presence of a truck door (8'x8' or wider) and/or a loading sign. As with exterior loading docks, exterior loading areas can be completely open to the sky, or partially or completely covered by a canopy or upper-level building feature.

Figure 21. Undefined Infrastructure
Source: Taken July 6, 2020

Figure 22. Informal Loading Zone
Source: Taken July 7, 2020

- Undefined Infrastructure:
  Locations with possible indication of loading or unloading activity that are likely private freight infrastructure. These facilities are not signed and not enough information was available in the course of the fieldwork to confirm due to access restrictions. These locations are likely to be loading bays but could also be private parking or storage.

- Informal Loading Areas:
  Private surface lots or laneway parking that are often officially used for customer or employee parking but also serve as areas for informal and sporadic loading/unloading activity. This new category was developed based on loading activity observed in the field and in acknowledging that private freight infrastructure is varied and flexibility in the classification is required to allow for new or informal facility types.

Step 3: Determine Infrastructure Attributes of Interest

Consultation with the City of Vancouver's Transportation Planning and Parking Management Branch was done to adapt and pare down the Urban Freight Lab's list of infrastructure features. Various technical attributes from the UFL's list were not included such as the apron width, apron cross slope, distance from the survey's start point to the location of the narrower point or section, and full length of the laneway. Considerations regarding the time available to dedicate to data collection, the difficulty level of collecting data, and the size of the study area played an important role in determining the final list.

The following final attributes, grouped by location, design, and capacity, will be collected over the course of the fieldwork:

Location Features:

- Latitude and longitude of the loading facility
- Type of road used to access the private infrastructure (e.g. laneway, street, arterial)
- Orientation of loading facility within the laneway
- Land use of adjacent building

Design Features:

- Dimensions of infrastructure (width, height)
- Clearance restrictions (horizontal, vertical)
- Vehicle maneuverability (back-in, pull-in)
- Security access measures (physical barriers, access code, personal interaction)
- Whether infrastructure is inside or outside the building
- Truck door
- Loading dock
- Picture of loading facility
- Level of infrastructure respective to the street
- Partially or completely covered

Capacity Features:

- Number of vehicle spaces available
- Types of commercial vehicles (vans/pickup trucks, light trucks, heavy trucks)
- Presence of a dock platform
- Time restrictions
- Usage restrictions
- Access to truck door and loading docks

**For the purpose of the fieldwork, the types of vehicles were loosely classified into three categories: vans/pickup trucks, light trucks, and heavy trucks.*

Figure 23. Vans/Pickup Trucks
Source: Full Bay

Figure 24. Light Trucks
Source: Full Bay

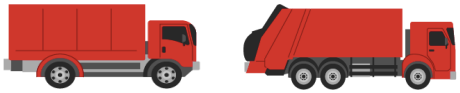
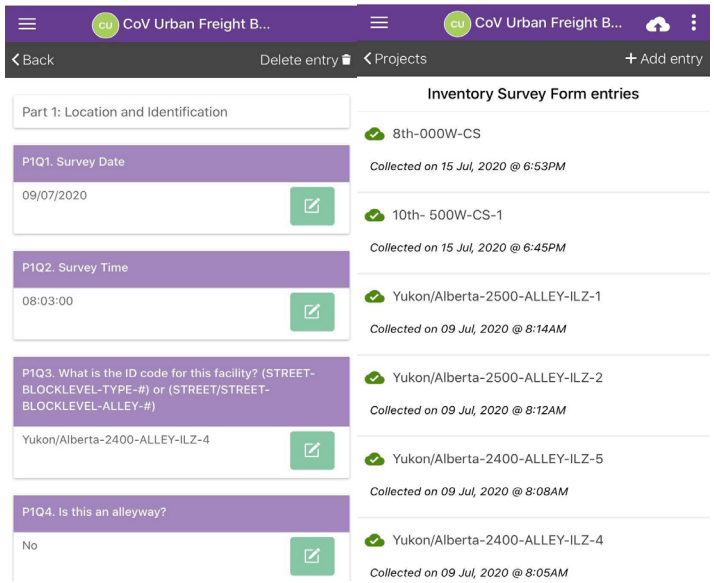


Figure 25. Heavy Trucks
Source: Full Bay

Step 4: Survey Design and Equipment

Survey Form:

After the final list of attributes of interest was finalized, they were incorporated into a survey form created on Epicollect5. The full survey form can be found in Appendix J.



Figures 26-27. Epicollect5 Interface
Source: Taken July 22, 2020

Equipment

- Measuring Device
- High-Visibility Vest
- Portable Battery Bank
- Clipboard
- Official documents explaining the project details as well as agency official contact information (in case of questions arise in the field)
- Smartphone with Epicollect5* mobile app installed

**A free and easy-to-use mobile data-gathering platform*

Step 5: Trial Run

A trial run was completed between June 24-29th for one city block in order to test out the Epicollect5 survey form and equipment. The following changes and adjustments were made to the data collection strategy based on the learnings from this trial run:

- Measurement Tool: Quickly found that both the measuring wheel and tape measure was highly inefficient for the fieldwork required. The measuring wheel was not compatible with use on concrete material whereas the tape measure was time-intensive and difficult to feed out for long measurements. A small laser measurement tool was purchased from Home Depot on the second day of the trial which significantly lowered the time spent measuring.
- New Typology: Observed loading activity occurring in areas not previously identified in the original list of types of infrastructure. As a result, a new typology called “Informal Loading Areas” was added to the scope of the project to accurately capture all the different unofficial facilities used for loading/unloading activity.
- Survey Form Edits and Naming: Fixed survey form glitches and question logic, sequence, and skips identified during the trial through practice entries. Developed a method for naming the facility’s ID codes:
  STREET-BLOCK LEVEL-TYPE OF INFRASTRUCTURE-#
  *STREET-BLOCK LEVEL-ALLEY-TYPE OF INFRASTRUCTURE-#
  **for loading facilities accessed by a commercial lane*

Data Collection Estimate:

- Observed that each city block took roughly 2 hours to survey - with the laneways taking up the majority of that time. Was better able to estimate the total number of hours necessary to complete the 16-block study area.

Undertake Data Collection

Overview

43 Hours of Data Collection
131 Survey Entries Recorded
0 Negative Encounters
7 Instances of Illegal Loading Activity Observed

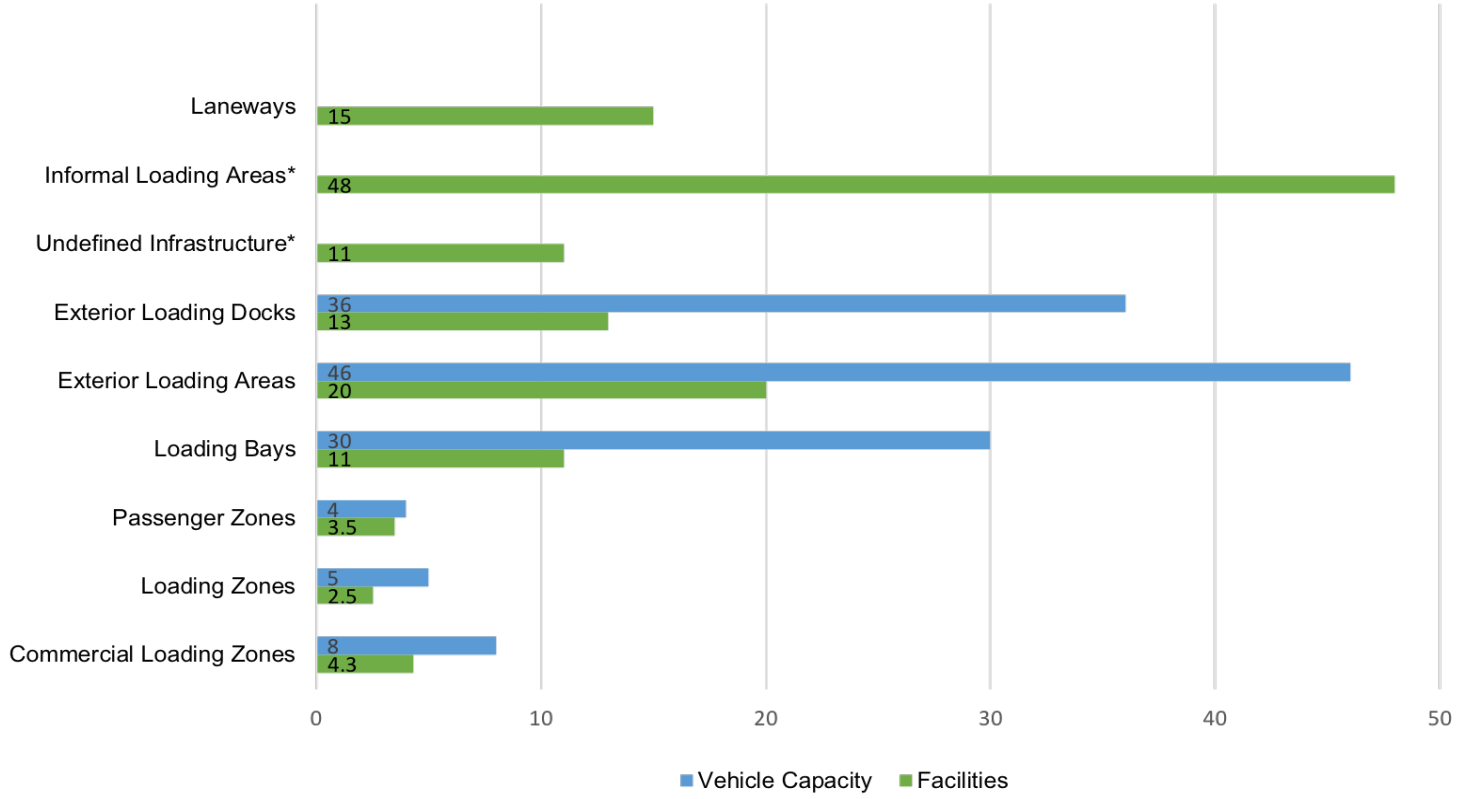


Figure 28. Breakdown of Facilities Inventoried

Vehicle Capacity

A total of vehicle capacity of 246 was recorded for all confirmed, formal assets. The “heavy trucks” category of vehicles were only able to be accommodated by the laneways themselves and private infrastructure - Loading Bays, Exterior Loading Docks, and Exterior Loading Areas.

Informal Loading Areas had a total of 324 vehicle capacity. However, as these survey entries were not validated or confirmed with the private sector, this capacity is unconfirmed. Similarly, the Undefined Infrastructures had an unknown vehicle capacity as these infrastructures were not visible from the right of way.

Undefined Infrastructures

A secondary follow up of publicly accessible rezoning and redevelopment application archives was conducted on all 11 Undefined Infrastructure facilities recorded by the surveyor. An application was found for one of the sites 8th-000W-UI-1 which confirmed the spaced behind the closed garage doors was not in fact a loading bay (Appendix K). The minimum required loading space required by the City of Vancouver’s bylaw was satisfied with an exterior loading space accessed by the laneway.

Figure 30. Data Collection Process
Source: Taken July 16, 2020

Key Findings

Figure 31. The Many Competing Uses of the Alleyway
Source: Taken July 9, 2020

1. The majority of loading/unloading infrastructure is accessed by laneways

- 36 of the 44 private loading bays, exterior loading areas, and exterior loading docks and 44 of the 47 Informal Loading Areas were accessed by laneways.
- Not only do the lanes themselves serve as loading zones, but this finding also highlights the critical role commercial laneways play in providing businesses with access to service vehicles, loading/unloading infrastructure, and parking.
- There is great potential for Miovision to be utilized for further study and monitoring of commercial lanes to better understand the loading and access issues observed in both the fieldwork and as revealed in the Business and Goods survey results.
- As well as serving business functions, laneways have emerged as an opportunity for placemaking in recent years. A deeper understanding of the laneway network and the access it provides to critical loading/unloading infrastructure will be imperative in balancing the current utilitarian role of laneways with future placemaking opportunities.

Figure 32. A Loading Bay Located Behind a Laneway
Source: Taken June 30, 2020

2. 1 public loading zone/area: 3.4 private loading zones/areas

- This finding is consistent with City policy that loading should primarily be served on-site. This finding supports the need for a deeper understanding of the private loading/unloading infrastructure as it makes up a larger portion of the goods movement network.
- High-level policy for parking, commercial laneways, and city-managed curbside zones should be informed and supported by comprehensive data of off-street private loading/unloading infrastructure. This relationship between public and private loading/unloading infrastructure is crucial for meeting the demands of modern urban freight needs. If private facilities were to decrease, this would place a higher need for off-street or curbside load zones that fall within the City's purview.
- When considering this ratio, it is important to keep in mind that public and private loading zones are cannot be viewed as equal. Not all loading zones are fit for all loading needs, and public and private infrastructures serve different vehicle sizes, docking needs, and capacity needs. Given these fundamental differences between these assets, there is no simple conversion or equivalency between these public and private infrastructure types.

Figure 33. Unconfirmed Informal Loading Area
Source: Taken July 8, 2020

3. Private Informal Loading Areas have the potential to double loading capacity when included in the total count

- It is clear that these Informal Loading Areas play a significant role in providing capacity for loading/unloading activity in laneways. Input from the private sector is needed to verify that these areas are being used for loading/unloading activity. Additionally, given the informal and private nature of this asset, more research and surveying is needed to determine their long-term role in the strategic planning for managing urban freight.
- Many of these Informal Loading Areas were located adjacent to older buildings. As re-development occurs along Broadway, there is a high likelihood that these surface lots and parking spaces will be replaced. Careful consideration of these changes is needed to ensure an adequate supply of loading zones. Additional public curbside loading zones and formal off-street loading zones may be necessary as the number of Informal Loading Areas decreases.
- Changes to the city-managed loading/unloading facilities, such as the implementation of a fee, could result in the unintended consequence of an increase in the use of these unregulated Informal Loading Areas.

Data Mapping

The raw CSV data was exported from Epicollect5 and converted into a data inventory and asset map using ArcGIS to articulate the scope of the work with detailed characteristics of the facilities included. The base of the map was pulled from open data sources including property parcels, main truck routes, and parking meters. Like the Special Zone Maps, this map is intended to be a living document. Additional close up snapshots of the map can be found in Appendix L.

Figure 34. On-Street Facilities

Legend

- Commercial Loading Zones
- Loading Zones
- Passenger Zones

1. On-Street Facilities

   Of these on-street zones, 8 were designated as Commercial Loading Zones, 3 as Loading Zones, and the remaining 2 were Passenger Zones. Seven of the thirteen on-street loading zones were located on the arterial streets. Unsurprisingly, the quieter residential area of 10th between Cambie Street and Main Street, had no on-street loading zones.

Figure 35. Private Facilities

2. Private Facilities

As illustrated by the figure below, private facilities were overwhelmingly accessed by the laneways and greatly outnumbered public facilities. There was a higher concentration of private loading facilities near commercial land uses. Most of the exterior loading docks and loading bays, as well as a few of the exterior loading areas, were able to accommodate heavy trucks. Private loading/unloading facilities along with commercial laneways play a crucial role in providing capacity for larger trucks and deliveries. This is particularly important for big-box retailers and grocery stores with a larger volume of deliveries.

Figure 36. Undefined Infrastructure and Informal Loading Areas

Legend
- Informal Loading Areas
- Undefined Infrastructure

3. Undefined Infrastructure and Informal Loading Areas

This layer illustrates the significant potential capacity added by both the Undefined Infrastructure and Informal Loading Areas. This reiterates the need to ensure flexibility in the typology of the loading/unloading facilities in order to accurately assess all loading assets within a subset area. As redevelopment occurs and surface parking lots are replaced, a decline of these private Informal Loading Areas could correlate to a decrease in loading/unloading capacity. To avoid unintended consequences, the surrounding formal loading facilities identified by this database could be re-evaluated by City staff to ensure an adequate supply of loading zones.

Figure 37. Metered Parking

4. Metered Parking

As the Commercial Drive Business and Goods survey revealed, commercial loading and deliveries often occur on-street in metered parking spaces. Additionally, un-metered parking can also serve as additional loading/unloading space in scenarios where it is more convenient for drivers. Therefore, when considering the loading/unloading ecosystem holistically, it is important to consider and include these assets. As illustrated by the City of Vancouver's Room to Load initiative, any future conversion and increase of loading facilities are likely to come from metered parking. Targeted reallocations of curbside parking zones to Commercial Loading Zones, Loading Zones, or Passenger Zones can be informed by the comprehensive inventory of all loading/unloading activity-related information.

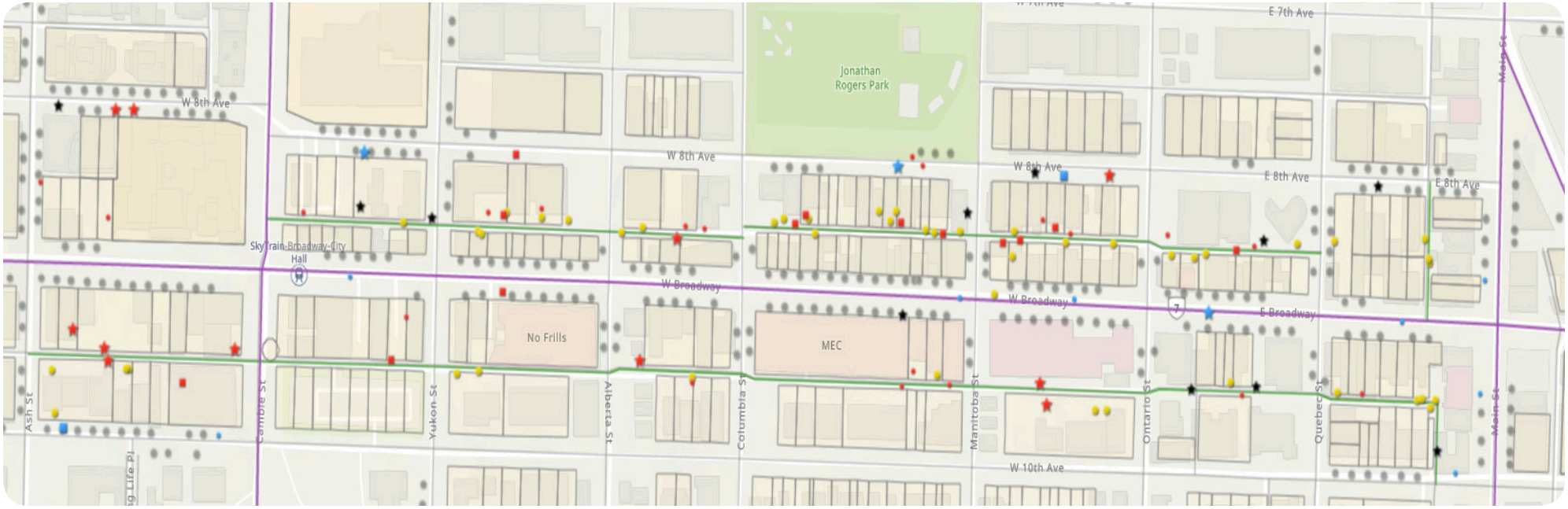


Figure 38. Comprehensive

5. Comprehensive

The figure below includes all the various typologies collected during the fieldwork as well as additional information piecing together all the different layers and loading/unloading assets. This photo illustrates the desired end results of the comprehensive inventory and database of attributes. This photo again reiterates the important role commercial laneways play in providing access to various types of loading/unloading infrastructure. Unsurprisingly, loading facilities were more densely populated near buildings with commercial land use. Given the more residential nature of 10th Ave, there were fewer loading/unloading facilities with the exception of around the arterial streets.

Legend

- Private Loading Facilities
  - Loading Bays
  - Exterior Loading Areas
  - Exterior Loading Docks
- Informal Loading Areas
- City Managed Curbside Zones
  - Commercial Loading Zones
  - Loading Zones
  - Passenger Zones
- Commercial Lanes
- Undefined Infrastructure
- Truck Routes
- Parking Meters
- Property Parcels

Conclusion

This pilot project was developed to evaluate and assess the effort required to replicate and expand to other areas in Vancouver. This section is a reflection of the challenges and opportunities experienced to inform a future expansion of the inventory.

Challenges:

1. COVID-19 Related Limitations

   First, due to the closure of both the City of Vancouver's offices and UBC's campus facilities the research was completed on a personal laptop. This presented numerous software accessibility and subscription issues due to the age and software compatibility of the available equipment (MacBook Air). While ArcGIS or QGIS would have been the preferred platform, due to these limitations, ArcGIS Online was used for the data visualization. While the features of ArcGIS limited the depth of analysis possible - an export in a File Geodatabase format was produced as part of the deliverables. Second, finding rest stops during the course of the data collection was particularly difficult during this time due to the closure of the dine-in services of many coffee shops and businesses. The lack of open public services also meant that on-site data validation checks and survey form edits had to be done on a laptop using a cellular hotspot from a public open area or vehicle.

2. Reviewing and Confirming Undefined Infrastructure

   Following up with Undefined Infrastructure to confirm whether it was a loading facility proved to be challenging. Out of the 11 Undefined Infrastructures identified in the data collection, only one site had a development permit available on record. This highlights the limitation of relying on development or rezoning permits to inventory and gather information regarding loading/unloading facilities. As found in the case with 8th-000W-UI-1, loading requirements can be met through unsigned surface area parking lots. This makes it difficult to accurately estimate the potential capacity from the development applications and further input from the private sector, either the business itself or local truck drivers would be required to confirm these closed-door locations.

3. Reviewing and Confirming Informal Loading Areas

   Ensuring consistent treatment for accounting for Informal Loading Areas throughout the course of the fieldwork was challenging. The following guiding assumptions were considered when inventorying Informal Loading Areas. First, if adequate formal loading infrastructure was provided for a site/adjacent building, areas that could potentially serve as Informal Loading Areas were not entered into Epicollect5. For example, the Raven Song Health Clinic has both a loading dock in the lane as well as one dedicated parking spot in their main parking for loading/unloading. Therefore, the adjacent staff and customer parking lots that totaled approximately 50 spots combined, were not included. Second, a judgment call was made to determine the likelihood of loading/unloading activity happening from a parking lot depending on both the type of business as well as proximity to more convenient loading zones. For example, the Scotiabank on Broadway had a large private customer parking lot in the back of its building. However, loading/unloading to and from this site is more likely to occur from the dedicated curbside loading zone which is located

closer to the business' entrance. Despite these guidelines, in recognizing the assumptions made, these facilities were intentionally added as a separate layer from the other formal and confirmed loading/unloading assets. Given the potential capacity of these Informal Loading Areas, further input from the private sector or Miovision footage would be required to confirm these areas are being utilized for loading/unloading activity.

Successes:

1. Scalable
   There is an initial investment upfront defining the various classifications and typologies of public and private infrastructure, developing a list of attributes of interest, training the surveyor, and developing the survey form. That being said, the data collection itself is highly scalable - with each city block taking approximately takes 2 hours to complete for all the public and private infrastructure typologies within the scope of the project. In the likely case that a re-evaluation of the pilot project findings results in a reduced number of fields of data, the time required for each city block would correspondingly decrease.
2. Laser Measurement Tool
   The laser measurement tool is a critical tool for measuring attributes of interest with speed and accuracy. When compared to tape measurements, the findings were highly consistent. The size, weight, discreetness, and ease of use on all materials are the main advantages of the laser measurement tool over the measuring wheel and tape measure.
3. Epicollect5
   Epicollect5 was a free, easy to use GIS-based software that was well suited to the scope and needs of the pilot project. Data collection was streamlined using Epicollect5's survey form features such as logic sequences and skip features and GPS and photos were embedded into the survey form resulting in significant time savings when compared to using Google or paper maps.

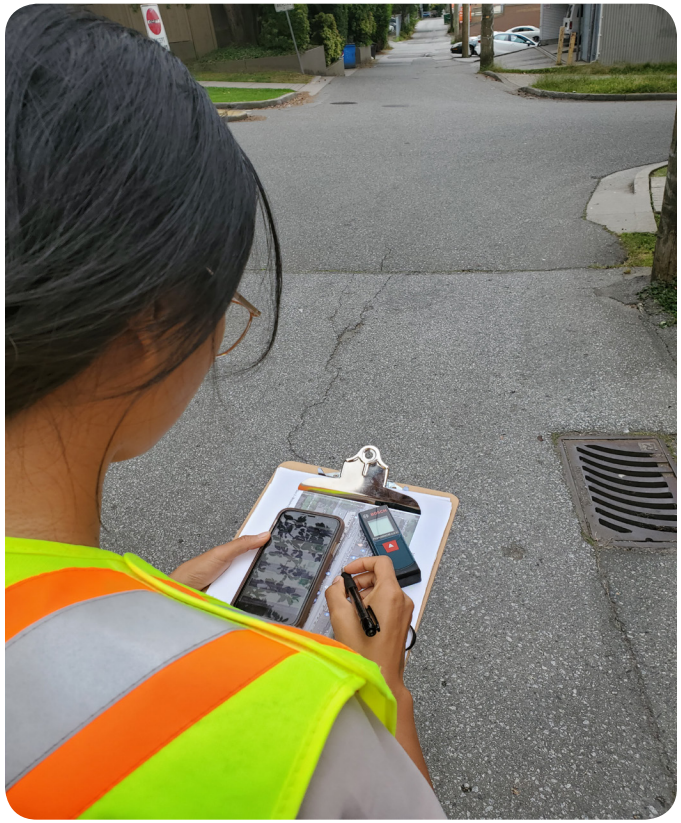


Figure 39. Data Collection Equipment Used
Source: Taken July 16, 2020

Recommendations:

1. Consider a Phased Approach
   The phased approach undertaken by UFL in Seattle allowed the research team to iterate and improve upon the survey form and methodology. This approach is flexible to changing staff, cost, and time resources and can prioritize subset areas with high levels of loading/unloading activity.
2. Collaborate with the Private Sector
   In order to validate the accuracy of the data collected by the survey form, collaboration and input is required from the private sector. This is particularly crucial for confirming Undefined Infrastructure with no public access and Informal Loading Areas that have significant loading/unloading capacity potential. Understanding how Informal Loading Areas are currently being used will inform high-level policy to ensure that the re-development of these areas does not reduce the total amount of loading space.
3. Integrate with a Coordinated Business and Goods survey
   Future iterations of the Business and Goods survey can be revised and improved upon to add inventory specific questions to narrow down and validate both Undefined Infrastructures and Informal Loading Areas. The quantitative and qualitative data gathered from these surveys, as gathered by the Commercial Drive and Gastown survey, will complement the inventory to provide a holistic and comprehensive review of the loading/unloading activities in a given neighbourhood. Specifically, the survey will provide insights on the diverse loading/unloading needs of a variety of business types that an inventory alone cannot provide.
3. Undertake an Occupancy Survey
   To complement the inventory of loading facilities in a given area, an occupancy survey can be conducted to provide insights into the utilization of these assets to determine if there is an adequate supply and demand. Key findings from this survey can inform whether additional facilities need to be provided or if changes to a current facility need to be made. For example, a loading zone to be converted into a commercial loading zone.
4. Consider Using the Esri's Collector App
   For a larger city-wide effort, the use of the Esri's Collector App is recommended to better customize the survey form and better integration with overall asset management and GIS systems used by the City.

Case Studies:

Over the course of this research, notable strategies and methods of managing loading/unloading activity surfaced that highlighted the importance of advancing the City of Vancouver's knowledge on loading/unloading assets. The following initiatives are complementary strategies that cities can implement to improve the management of urban freight and the challenges presented by the final 50 feet. The successful implementation and the strategic determination of the pilot location requires and depends upon the inventory of all the City's loading/unloading assets. The promising results of the following pilot projects, and the potential they show, underline the compelling need for a comprehensive database of the City's public and private loading/unloading facilities.

**Please refer to Appendix M for a more comprehensive list of initiatives.*

Common Carrier Locker System Pilot Test | Seattle[30]

Overview:

Common carrier lockers are secure, automated, self-service storage systems that can accommodate multiple delivery firms and a range of parcel sizes. Parcel lockers are emerging as a trend to consolidate deliveries in urban settings such as high-density mixed-use developments and high-traffic areas such as transit stations. Parcel locker systems have the potential to substantially reduce both delivery time and the number of failed first deliveries while providing additional security and convenience.

Results:

Based on the results of UFL's Phase 1 of inventorying, a ten-day pilot of a common carrier locker system was conducted in the spring of 2018 on the 62-floor Seattle Municipal Tower. The pilot results revealed a reduction in total delivery time by 78% when compared to traditional floor-to-floor, door-to-door delivery in the building with zero failed deliveries to the locker.

Vancouver Context:

This pilot is a great example of how the inventorying of public and private loading/unloading assets can inform urban freight management initiatives. While the inventory can help narrow down ideal pilot locations, the location of a common carrier locker can also inform the placement and quantity of the surrounding loading/unloading facilities. It is important that the placement of these parcel lockers correspond with the necessary public and private loading facilities to accommodate the loading activity. This would decrease the potential of unintended consequences such as an increase in illegal stopping infractions. While the common carrier locker system itself does not increase the total number of loading/unloading infrastructure available, it optimizes the assets that already exist by increasing commercial vehicle turnover and streamlining the last 50 feet of the loading/unloading process. For example, in an area that has limited available space for designated loading zones, the common carrier locker could alleviate the strain on supply by increasing the vehicle turnover rate.

Figures 40-41. Surveyors Making Observations During the Pilot
Source: UW Supply Chain Transportation and Logistics

curbFlow | City of Columbus[31]

Overview:

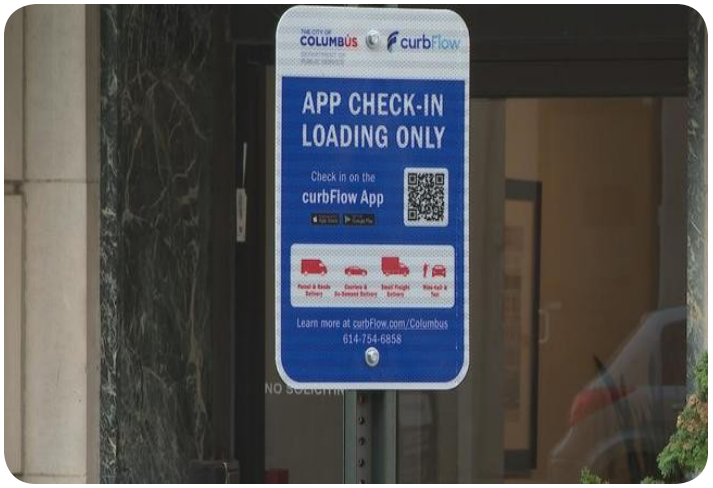
The successful implementation of innovative tech-oriented urban freight solutions depends on having an up-to-date and comprehensive inventory of existing loading/ unloading facilities. Having this database can foster collaboration with the private sector to work towards data-driven solutions for better management of the limited assets.

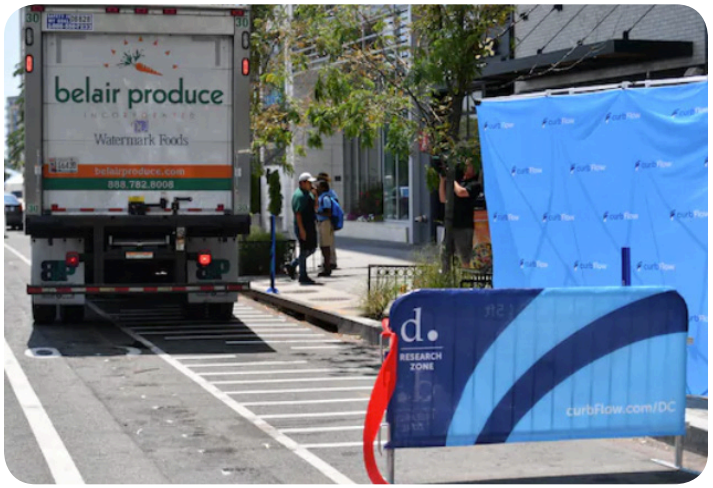
Results:

A six-month pilot, in partnership with the City of Columbus Division of Parking Services and curbFlow, a mobility solutions company, took place from November 18th, 2019 and ended on May 18th, 2020. The City converted eight high-traffic areas into Loading Management Zones (LMZs), where commercial and on-demand drivers checked in via the curbFlow App to reserve city-managed curbside loading zones in advance. The program successfully attracted over 2,150 commercial and on-demand drivers as registered users, with 18,200 legal check-ins for an average dwell time of 7 minutes in the LMZs. The pilot reduced double parking in the pilot areas by 65%.

Vancouver Context:

This case study highlights the possibility and potential of a public and private partnership in improving urban freight. Not only does the app coordinate and manage commercial loading and unloading activity in real-time, curbFlow also collects valuable data on the utilization of these facilities that will inform future policies, plans, and strategies to better manage urban freight demands. Similar to the common carrier locker implementation, the inventory could identify gaps or “deserts” within the private loading facility network to inform where the conversion of the surrounding curbside loading zones would have the highest impact. In the future, this reservation app concept could be further expanded to the commercial laneways or off-street facilities with support from the information gathered by the inventory.





Figures 42-43. curbFlow Pilot Temporary Sign and Infrastructure
Source: Washington Post

Penn Quarter/Chinatown Parking Pricing Pilot | New York[33]

Overview:

Demand-based parking pricing is a model where high-demand blocks have higher hourly prices to improve turnover and low-demand blocks have lower hourly prices to incentivize greater use. It is one strategy cities can implement to curbside loading zones to increase the efficiency of assets.

Results:

DDOT applied and extended the concept of demand-based pricing to commercial loading zones to on-street spaces in a pilot area. A partial deployment of sensors was included in the pilot to collect a range of data including transactions, historical occupancy data, and citations, to produce real-time availability information and inform pricing algorithms. As a result of the pilot, the amount of time vehicles spent cruising for a spot decreased by as much as 15%, weekday automobile congestion decreased by 5%, and travel time reliability improved by 5%.

Vancouver Context:

Applying demand-based parking pricing to on-street loading zones can improve the operations of the final 50 feet in high-density areas. Parking pricing can be an effective tool to encourage turnover of finite spaces and off-hour deliveries. By replacing unpaid commercial parking with hourly metered rates for all commercial loading zones and using an escalating pricing scale, The City of Vancouver can effectively encourage commercial parking turnover and help prioritize freight needs. The comprehensive inventory of public and private loading/unloading infrastructure would not only inform the implementation of this kind of pilot but also be used to re-evaluate the surrounding private loading facilities to prevent unintended consequences.

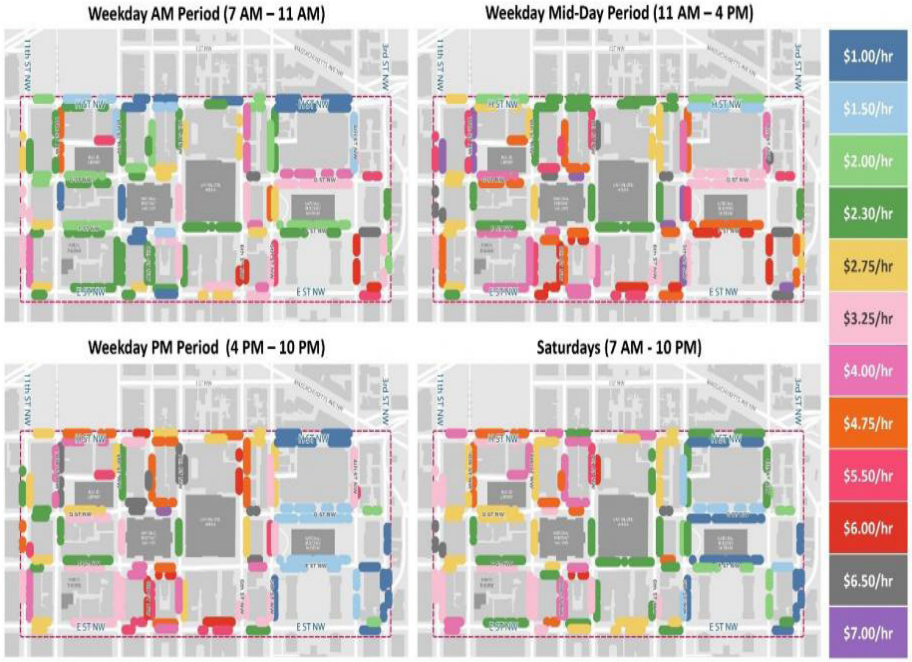


Figure 44. Various Meter Rates Depending on Location and Time
Source: DDOT

Final Thoughts

The three case studies presented above are examples of the kinds of innovative initiatives and strategies of improving the management of urban freight that are possible when there is sufficient data on public and private loading/unloading networks. Addressing the challenges of urban freight and the final 50 feet is part of meeting the City's sustainable transportation goals. An expansion of the inventory as well as further research is needed to develop innovative solutions to effectively manage the "last mile" delivery to achieve safer, clearer, more efficient roads.

While the City of Vancouver has data on city-managed assets, they lack critical data on the private loading facilities that are outside the traditional realm of urban planning. This lack of data makes it challenging to balance the conflicting needs of other curb uses and road space, and therefore, can have unintended negative consequences. This inventory of public and private infrastructures is a crucial first step in bridging the information gap between the public and private sectors in order to rethink the complex management of urban freight and serves as a prerequisite for collecting valuable utilization data. To meet the modern urban goods delivery needs, a systematic data collection method and an evidence-based approach is needed.

The findings from the inventory may also be used to provide decision support to city officials, private-sector firms managing finite road space, and inform high-level parking and loading policies. A deeper understanding of how the facilities are currently being utilized will inform a review of development bylaws and requirements for loading facilities to accurately determine if city-managed facilities such as curbside zones and commercial laneways are well-positioned to serve the community and are sufficient to meet current and future needs.

Figure 45. Illegally Parked Delivery Truck
Source: Taken June 30,2020

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Appendix

Appendix A: UFL Phase 1 - Methodology & Survey Form

MAPPING THE CITY'S PRIVATE FREIGHT INFRASTRUCTURE

In order to determine whether truck load/unload spaces are well positioned to serve the community, manage competing demands, and provide sufficient capacity to meet current and future needs, one must know each facility's location and features. While street parking is well documented in Seattle's geospatial databases, private freight infrastructure, such as loading docks and loading bays, is not. Therefore, the research team's first step was to document the current locations and features of all truck load/unload spaces in the study areas.

Step 1. Collect Existing Data

The research team used SDOT's publicly-available GIS layers of designated curbside parking , as well as King County's GIS layer of Seattle's alleys, to begin developing a multi-layer map of the truck load/unload locations in the city's urban centers.

Researchers in other large cities may find this data is readily available as well, making existing data collection a low-cost step that is easily scalable at the national level. The primary cost is staff time spent collecting the data layers, and working with agency staff to clean data points, if necessary. This could be internalized in agencies with GIS-trained staff, or purchased at a low cost from contractors if there is not a high requirement to clean the data for this purpose.

The research team reviewed the following Seattle GIS databases, further described in an attached data dictionary (Appendix K):

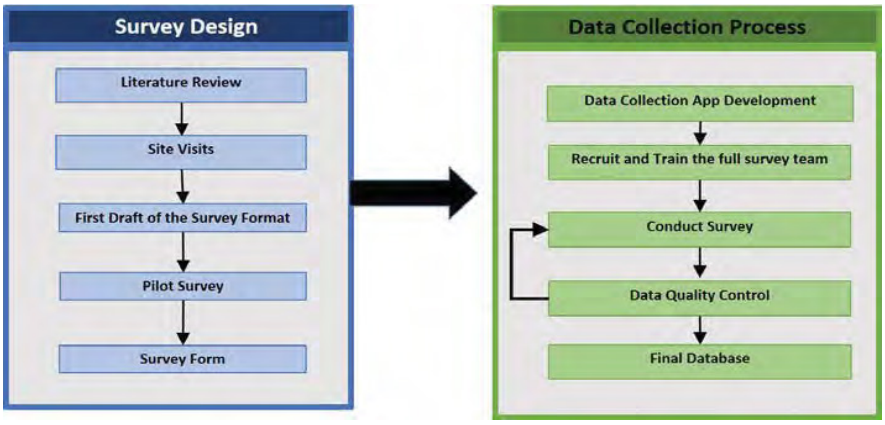
- Alleys
- Urban villages
- Arterial types
- Commercial
- Retail
- Food permit data
- Residential
- SDOT traffic lanes
- Curb space categories
- Block faces
- Year built

Step 2. Develop Survey to Collect Freight Bay and Loading Dock Data

In addition to mapping geospatial data for on-street parking, private freight infrastructure also needed to be mapped. To accomplish this, the SCTL Center developed an original data collection process to record the GIS locations and infrastructure features of all private freight infrastructure in urban centers. The intention was to create a replicable, ground-truthed method.

The proposed methodology is represented in Figure 3-1. This methodology is a result of testing and revising the initial process that provided empirical evidence of the infrastructure surveyed and proved the validity of the research method. The different steps of the process are broadly classified into Survey Design and Data Collection Process and will be further explained in the corresponding sections below.

Figure 3-1. Overview of Methodology Used to Collect Data on Private Freight Bays & Loading Docks



LITERATURE REVIEW

Previous reports, papers and building codes were reviewed to identify the terminology and key physical features of private freight infrastructure [1, 2, 3, and 4]. Additionally, two site visits in downtown Seattle provided the team with valuable field observations and testimonies from delivery drivers, concierges at residential towers and security officers.

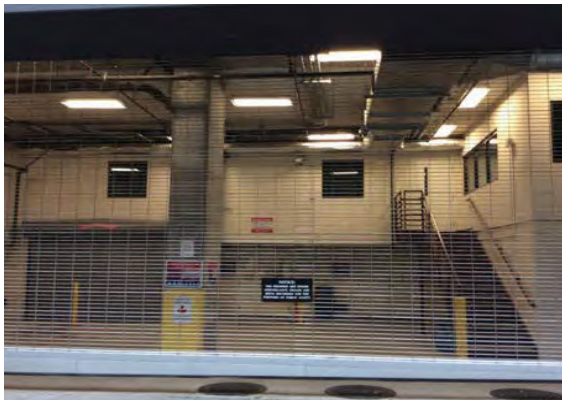
As a result of the literature review, the team defined two main categories of private freight infrastructure: loading bays (Figure 3-2) and exterior loading docks (Figure 3-3). It is worth noting that these are not the only types of infrastructure investigated in this data collection effort; the typology consists of three private freight infrastructure types that will be described further in a later section. Another finding in the literature review was an extended list of private freight infrastructure features that affect operations and can be grouped into **location, design and capacity features**.

One important **location feature** is the type of public right-of-way that provides access to the facility location. Poor layout or design of the roads or alley connecting the delivery access point to the street network may significantly affect how private freight infrastructure is used. A common example is inadequate alleyways, which delivery drivers tend to avoid if they have an alternative to make sure they are not blocked on their way out.

Design features include the dimensions of access points to the loading bay, such as vehicle doorway and dock doorway dimensions (width and height) and ground clearance restrictions (i.e. maximum vehicle height allowed). The access angle to the loading dock, which includes the access angle to the structure, the angle between the vehicle access trajectory and the traffic flow, the access grade ramp, whether the vehicle needs to back-in, maximum turning radius, maximum truck size and any additional security access measures such as physical barriers, access code and personal interaction all impact the delivery's operations.

Capacity features are the characteristics of the parking spaces and mechanical devices, such as the number of parking spaces, the apron (i.e. space for maneuvering and park), and the presence of a dock platform and dock-levelers.

Figure 3-2. Freight Loading Bay Inside a Seattle Building



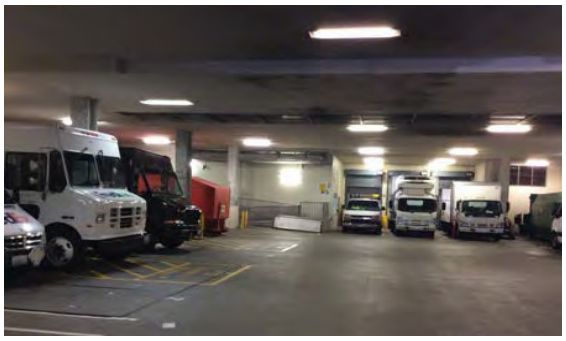
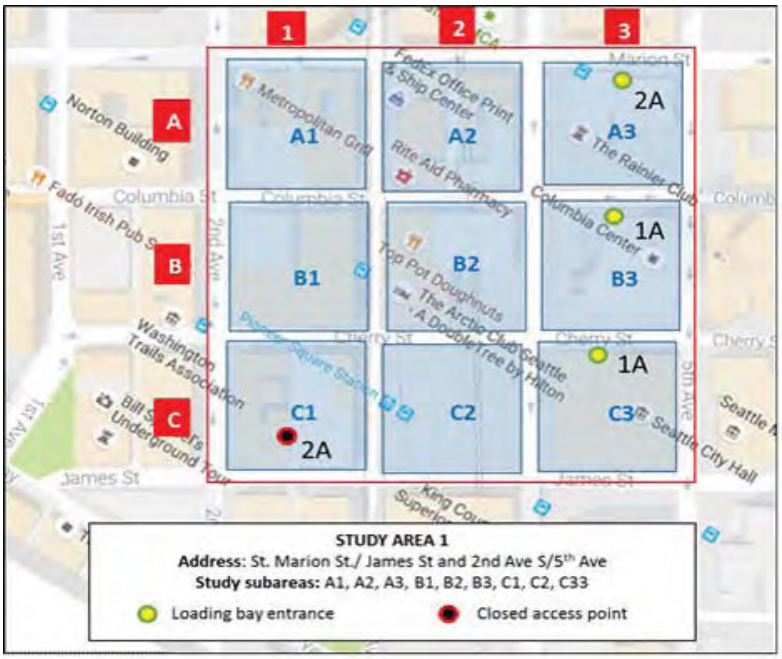


Figure 3-3. Closed Loading Dock

Survey Design and Pilot Survey

The SCTL data collection team designed and pilot tested a survey to document the key observable features of private freight infrastructure and geocode their locations. After finalizing the instrument and developing an application for data collection, teams of SCTL graduate students (operating in pairs) tested it in downtown Seattle. The six-block pilot area is shown in Figure 3-4. The data collection team used laser measurement devices bought at a local home improvement store that cost less than $150 each, and completed measurements while standing on public sidewalks and in alleys.

Figure 3-4. Pilot Survey Study Area



The pilot survey proved that the team could quickly and easily measure the entrances to open freight bays on foot. The data collected gave the project manager a clear understanding of the average time it takes to complete the survey per city block, so he could create a funding staffing plan and schedule for full implementation.

The pilot showed difficulties in collecting complete data as some entrances were closed, and their interior could not be observed from the public right of way.

Other features of interest such as turning radius, maximum truck size, and centerline distance were not possible to measure in the field due to the complexity of the geometrical features, the lack of knowledge or unavailability of the facility staff, or a lack of exterior signage.

Final Survey Form

The team utilized the results of the pilot test to develop the final data collection survey in Appendix L.

The final survey form contains four parts: a) general information, b) facility location and visuals, c) access design features and d) capacity.

DATA COLLECTION PROCESS

Development of a Data Collection App

The team developed an application using the online platform DeviceMagic. Along with cloud storage and visualization, it provides an interactive and easy-to-use tool to design mobile device survey forms compatible with both iOS and Android. The mobile data collection app instrument was chosen to make the process:

- Efficient: automation of data digitization and photo collection and storage
- Flexible: the form can be revised if surveyors encounter unforeseen infrastructure conditions that require a new data structure
- Speedy: Fast input of data in the field with automated questions and drop list answers.
- Low cost
- Accurate: decrease transcript errors and help reduce data lost in transit
- Data quality control: nearly real-time data collection monitoring and spatial visualization of completed surveys

The researchers bought two iPad mini 2s with 32 GB for the field survey for $360 each. With DeviceMagic loaded on the tablets, surveyors filled out the survey form, took and stored pictures, and used the devices' GPS capability to locate facilities. The survey form supported automatic entry of GPS locations, and allowed manual input of the same coordinates supported by offline Google maps. During the development of the data collection app, researchers also tested the questionnaire in the field to prevent logic errors.

Recruiting and Training the Data Collection Team

The research team hired four University of Washington undergraduate students and trained them to conduct the survey. Each team attended two 3-4-hour training sessions led by a supervisor. The first session instructed data collectors on freight infrastructure concepts and the second session focused on practical aspects of data collection. During the practical training, data collectors learned how to use the questionnaire app on the tablet and the laser device to measure physical features. As part of their training, the project manager also personally supervised the data collection teams' work on city streets during the first week of the full survey implementation.

Conducting the Survey

SDOT contracted with the SCTL Center to map alleys and private freight loading bays in three of the city's designated urban centers: Downtown Seattle, Uptown and South Lake Union (see Figure 3-5). **The combined area has a regular street grid of 523 blocks, which took approximately 210 person hours for data collection.**

During data collection and data quality control process, hourly staff and supervisors were responsible for the following tasks:

- **Data Collection (Hourly Staff)**
  - Commute to and from study area
  - Circulate blocks surveying any private freight infrastructure
  - Work in 2-person teams: one member filling out the survey on the tablet, and the second member taking measurements and updating a progress sheet (i.e. hard-copy map of the study area) to keep track of every new surveyed location.

Data Collection (Supervisor Staff)

- Break down the study area into subareas
- Set partial objectives of data collection on a weekly basis, depending on the number of teams working at the same time and the size of the subarea
- Develop hard copies of subarea maps and distribute them to teams progressively
- Coordinate work schedule of teams
- Make sure data collectors are always equipped with data collection materials, safety equipment, and identification.

Data Quality Control (Supervisor Staff)

- Conduct data quality control checks of location and feature information (further explained below)

Multi-Layer Communication with Stakeholders

Although the team did not experience technical difficulties while executing the full survey, they quickly ran into problems due to security concerns. On the third day of data collection, a team member was measuring a freight bay under a bank building from a nearby sidewalk. The building security guard reported them to the Seattle Police Department (SPD). A police officer arrived on the scene, reviewed the UW letter the data collectors carried explaining the project in partnership with the city, and called various city staff members to verify. The police officer could not reach the SDOT project manager, so the students had to stop their work for the day and regroup.

City police contacted the SDOT project manager the next day, as did a Federal Bureau of Investigation (FBI) agent responsible for homeland security. They were very reasonable, and suggested several changes to the security process that were implemented by the research team, including adding the SDOT manager's contact information to a letter on SDOT letterhead. SPD also notified all building

managers in the survey area through the Seattle Shield program, a pre- existing information exchange for building operators and the police. SDOT created a new webpage at http://www.seattle.gov/transportation/thefinal50feet.htm to periodically publish information on progress made during the full survey and to inform the public of where the surveyors would be in upcoming weeks. The team quickly learned that before conducting an on-street survey of private buildings, it is essential to have a multilayer communications plan in place for all parties with an interest in the survey area.

Quality Control

The quality control process included the following tasks:

- Information transfer check 1: compare completed surveys with progress sheet filled out by data collectors to keep track of the number of surveys collected and their locations.
- GPS location accuracy check 1: in field, use offline Google Maps on the tablet during data collection to support the manual input of the location with a dropped pin.
- GPS location accuracy check 2: in office, compare the GPS location of the infrastructure collected in field with the location according to Google Maps' Street View feature.
- Data entry accuracy check 1: compare infrastructure features entered with the pictures taken during the survey.
- Data entry accuracy check 2: collaborate with experienced UPS truck drivers who serve the study area to identify survey locations that were closed during the survey. This step allowed us to rule ou 110 potential locations that were not private freight infrastructure.
- GPS location and data entry accuracy check 3: The quality control process also resulted in secondary inspections at survey locations where the loading bay had not yet been surveyed or the survey could not be located based on the GPS location checks described above.

Each surveyed loading facility was inputted using the GPS (latitude and longitude) capabilities of the survey tablet, Google Maps, and paper maps distributed to survey teams. While applying the data quality control process, several location inaccuracies were identified and required manual adjustment. GPS often has problems in alleys and urban canyons due to poor line-of-sight with satellites. Google Maps can be inaccurate, particularly in alleys, and a paper map requires user interpretation. However, when the three GPS location accuracy methods were used as a crosscheck, the team could verify the accuracy of the locations that were delivered to SDOT in a latitude and longitude format.

This chapter documents an innovative and low-cost data collection procedure to map and catalog private freight infrastructure. Built from the ground up, this procedure was constantly evaluated and modified throughout the data collection process. Recommendations for improvements on geolocating private truck load/unload spaces can be found in Appendix O.

DATABASE STRUCTURE

Database Structure Diagram

Appendix M shows the data structure diagram of our database. Furthermore, this diagram is supported by our data dictionary, which describes the variables associated with each of the decisions and data features in our database.

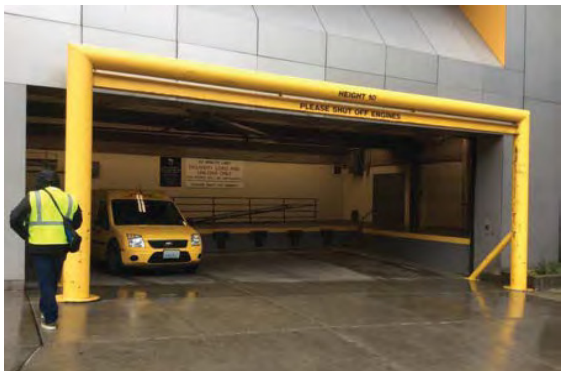
Typology of Delivery Infrastructure

One of the early findings during data collection was the variety of private freight infrastructure types. Based on the literature review and field experience, three types of infrastructure considered in the data structure were defined:

Loading bay (Figure 3-5). An enclosed space inside the building with an entrance/exit point (e.g. roll up doors, garage doors) that act as a continuation of the upper parts of the building. This space is partially or completely dedicated to unloading and loading activities. It has entrances and exits greater than 8 feet by 8 feet for commercial vehicles. Loading bays can have loading docks and truck parking spaces with or without access to a loading dock.

Figure 3-5. Examples of Loading Bays in Downtown Seattle. (A) Detail of Loading Dock Inside Loading Bay, (B) Vehicle Door of Loading Bay

(A)



(B)

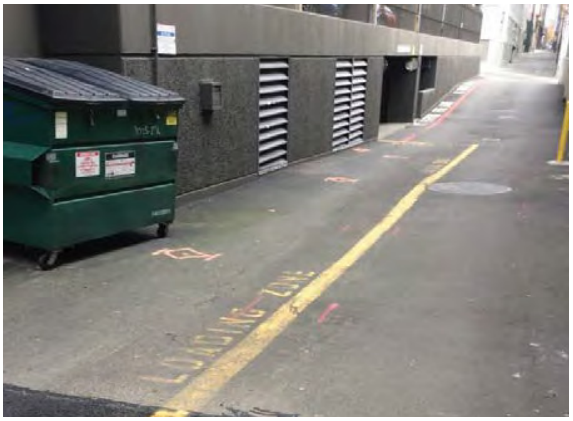
Figure 3-6. Examples of Exterior Loading Docks in Downtown Seattle. (A) Loading Dock with Platform Inside Building, (B) Loading Dock with Platform Outside the Building.

(A)

(B)

Exterior loading dock (Figure 3-6). A loading dock that is located outside of building exterior wall. Exterior loading docks can be completely open to the sky or partially or completely covered by a canopy or upper part of the building. Additionally, exterior loading docks can also include inside loading platforms, where trucks dock the cargo compartment to a dock door.

Figure 3-7. Examples of Exterior Loading Areas in Downtown Seattle. (A) Loading Area Accessed from Street, (B) Loading Area in Alleyway.



(A)

(B)

Exterior loading area (Figure 3-7). Space for loading and unloading located outside of the building exterior walls and without a loading dock. Exterior loading zones can be completely open to the sky, or partially or completely covered by a canopy or upper part of the building.

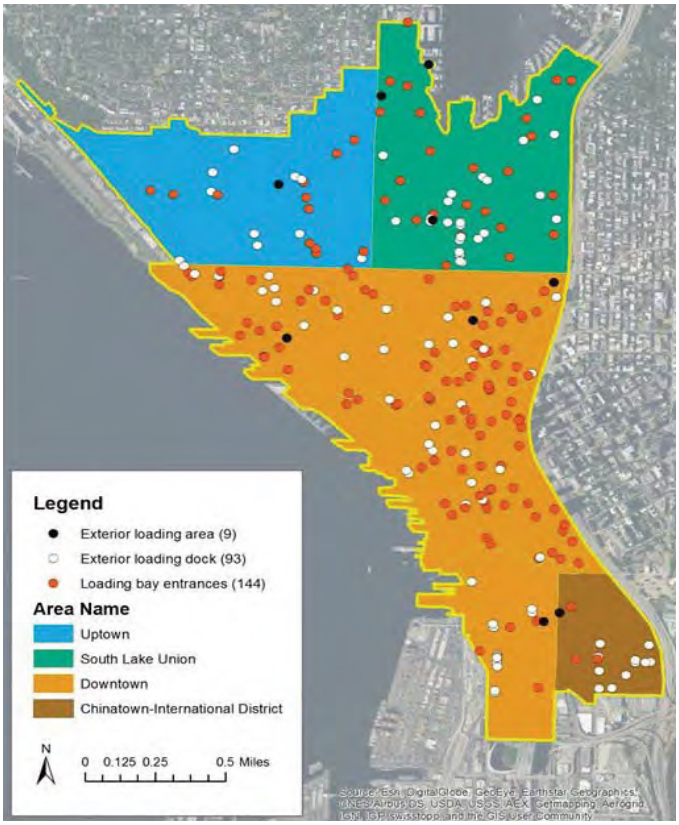
The research team's final analysis for Downtown Seattle, Uptown and South Lake Union found:

- 144 loading bays
- 93 exterior loading docks
- 9 exterior loading areas.
- 17 undefined locations that could be private freight infrastructure, but not enough information is available to confirm this.

There was considerable value in collaborating with private sector members of the Urban Freight Lab on this task. Data collectors in the field initially identified 382 potential freight loading bays and docks in the 3 urban centers. However, in 127 cases the doors were closed during the survey and there was no way to tell if those locations were actually used for freight deliveries. UPS had their local drivers, deeply knowledgeable about city routes, review the closed door locations as part of their work in the Urban Freight Lab. The Urban Freight Lab provided photos and other location information. That review allowed the Lab to rule out 87% (110) of the locations behind closed doors, reducing uncertainty in the findings from 31% to less than 5%.

This information is represented by the map in Figure 3-8.

Figure 3-8. Data Collection Results in Study Area



Data Dictionary

GENERAL DEFINITIONS

Building exterior wall. Walls of a building that separate spaces partly or completely unobstructed to the sky from spaces inside the building.

Loading dock. An elevated platform that facilitates shipping and delivery operations.

Dock leveler. An adjustable mechanized platform built into the edge of a loading dock. The platform can be moved vertically or tilted to accommodate the handling of goods or material to or from trucks.

Angled. Refers to facilities on bi-directional alleyways, where the entrance angle could be contrary or to traffic flow.

Not a loading bay. Undefined locations that were identified as not a loading bay based on responses of UPS truck drivers.

Undefined. A location that could potentially be a loading bay entrance/exit. No information is available because: a) a barrier impeded data collection, b) there was a lack of on-site signage identifying the facility as a private freight access point, and/or c) a lack of carrier drivers' survey responses identifying the facility as a private freight access point.

Additional Code definitions
Appendix N describes the data fields of our database and the code domain for each of these fields.

FINDINGS AND FUTURE RESEARCH

Due to its unique partnership with SDOT, multiple industry sectors, and academia, the Urban Freight Lab moved from a concept to a going concern in 2017. This report covers the first of a suite of Final 50′ research projects.

Research Findings

1. Geocoding the location and features of all private truck load/unload bays and loading docks in three of Seattle's urban centers: downtown, uptown, and South Lake Union, provided evidence that the vast majority of buildings in these areas depend on public truck load/unload spaces to receive goods.

   This information matters because, when combined with the city's pre-existing curb data layer, it is the basis for planning a comprehensive truck load/unload space network in the city. It is the first time that a major U.S. city has had this information.

2. This project documented detailed goods delivery system process flows and delays for 5 prototype buildings in Seattle's Center City. The Final 50′ begins where trucks stop, extends across intersections and sidewalks, and tracks goods deliveries into buildings. It is the first time that researchers have analyzed both the street network and the city's vertical space (office, hotel, retail, historic, and residential towers) as one unified goods delivery system. Although delivery companies have been well aware of challenges in the Final 50′, this is new information for the public sector. It is leading them to re-examine building codes and regulations that affect outcomes in the delivery system.

Future Research

The Urban Freight Lab transmitted the private truck load/unload space data layers to SDOT as they were completed in 2017. After viewing the data, SDOT engaged the Urban Freight Lab in a second Final 50′ project to collect similar data for two additional urban centers: the First and Capitol Hill areas. The Lab will publish its second report including these findings, along with an occupancy study of truck use in curb space, and a tool kit for cities to replicate the geocoding methodology for private truck loading bays and docks in 2018.

Based on the results of the process flow analysis of the Seattle Municipal Tower done for this report, the Lab will pilot test a Common Carrier Smart Locker System at the Municipal Tower in 2018. The pilot will document the effectiveness, lessons learned, and costs of operating a smart common carrier locker system (a new automated mini-distribution node) in the Tower. Common carrier lockers allow

multiple carriers (delivery firms) to access the lockers, which would reduce the total footprint needed (vs. providing room for many company-branded lockers) in the Tower.

In the third Final 50' research project, the Lab is developing criteria to evaluate transit stations' suitability for common carrier locker systems.

The Urban Freight Lab's fourth Final 50' project will map the locations and truck-related features of all of the alleys in Center City and complete an alley occupancy study. This research will be published in 2018.

When they have accurate data layers of the curbs, private truck load/unload spaces, and alleys, SDOT will have a complete picture of the truck load/unload network.

Final 50' project findings may be used to provide decision support to city officials and to private-sector firms managing scarce and expensive space in the City of Seattle. By applying systems engineering and evidence-based planning, we can make receiving online goods as efficient as ordering them – without clogging city streets and curb space, or losing packages.

APPENDIX L –
DATA DICTIONARY AND MAP COLLECTION

Off-Street Loading Infrastructure Survey Process

Survey ID : _____

Data Collector Name : _____ Date: _____ Time: _____

PART I. Facility Location

1. PICTURES OF THE INFRASTRUCTURE ACCESS AND PUBLIC RIGHT AWAY



2. GPS COORDINATES

3. NAME OF CLOSEST ACCESS STREET: _____

4. ACCESS ROAD TYPE

☐ Alleyway ☐ One way alleyway ☐ Street

If the answer is "One way alleyway".

4.1 Alleyway direction :

☐ North to South ☐ South to North ☐ East to West ☐ West to East

PART II. Facility Design Features

5. FACILITY TYPE

☐ Loading bay access ☐ Exterior loading area ☐ Exterior loading dock ☐ Undefined

If the answer is "Loading bay access":

5.1 Door width: _____ *ft*

5.2 Clearance: _____ *ft*

5.2 Vehicle Access Type:

☐ Exit ☐ Entrance ☐ Entrance and exit

If the answer is "Exit":

5.2.1 Access Exit Angle:

☐ *Perpendicular* ☐ *Angled to traffic flow* ☐ *Angled contrary to traffic low* ☐ *Angled*

If the answer is "Entrance" or "Entrance or exit":

5.2.3 Access Entrance Angle

☐ Perpendicular ☐ Angled to traffic flow ☐ Angled contrary to traffic low

☐ Parallel to traffic low ☐ Angled

5.2.4 Access Entrance Maneuver: ☐ *Drive-in* ☐ *Back-in*

If the answer is "Exterior loading dock":

5.3 Access Entrance Angle

☐ Perpendicular ☐ Angled to traffic flow ☐ Angled contrary to traffic low

☐ Parallel to traffic low ☐ Angled

If the answer is "Exterior loading dock" or "Exterior loading area": (if the facility is covered)

5.5 Clearance: _____ *ft*

6. SECURITY MEASURES TO ACCESS THE FACILITY *(Select all options that apply.)*

☐ Physical barrier ☐ Access code ☐ Personal Interaction ☐ No barrier

PART III. FACILITY CAPACITY

7. TOTAL OF PARKING SPACES : _____

8. IS THERE A DOCK PLATFORM? ☐ Yes ☐ No

If the answer is "Yes":

10.1 Total of parking spaces with loading dock : _____

10.2 Loading dock height: _____ *ft*

10.3 Is there a dock leveler? ☐ *Yes* ☐ *No*

9. ADDITIONAL COMMENTS :

10. PICTURES OF FACILITY ACCESS AND CAPACITY

Appendix B: UFL Phase 2 - Revised Survey Form & Toolkit

APPENDIX A:
PRIVATE LOADING/UNLOADING INFRASTRUCTURE SURVEY FORM

PART 1. Facility Access and Location

1. How is the infrastructure accessed? From a: ☐ Alleyway ☐ One-way alleyway ☐ Street

If the answer is "street":
1.1 What is the name of street? _____

If the answer is "alleyway" or "one-way alleyway":
1.2 What is the name of the street closest to where the facility access is located? _____
1.3 Take a photo of alleyway and street intersection.

If the answer is "one-way alleyway":
1.3 Traffic flow direction?

2. Is necessary to through a gate to access the infrastructure? ☐ Yes ☐ No

If the answer is "Yes":
2.1 Take picture of gate entrance.
2.2 Horizontal clearance at the gate: _____ 2.3 Vertical clearance at the gate: _____
2.3 Capture GPS coordinate of gate by dropping location pin.

3. Are there any visible security measures that limited the usage of the infrastructure by a delivery vehicle?
(Take picture if there are)
☐ Physical barrier ☐ Access Code ☐ Personal interaction ☐ None ☐ Other: _____

4. Is the infrastructure visible or partially visible? ☐ Yes ☐ No

If the answer is "No":
4.1 Is there indication of a space dedicated to loading/unloading? *(Take picture if there is)* ☐ Yes ☐ No
4.2 Proceed to "Part 2.A"

If the answer is "Yes":
4.3 Take a picture of the infrastructure.
4.4 Capture GPS coordinate of infrastructure by dropping location pin.
4.5 What is the level of infrastructure respective to street?
☐ Substructure (below street) ☐ Superstructure (above ☐ street) Level with street

4.5 Is there indication of a space dedicated to loading/unloading ?*(Take picture if there is)* ☐ Yes ☐ No

If the answer is "No":
4.5.1 Proceed to "Form 1"

If the answer is "Yes":
4.5.1 Is the infrastructure inside the building?

If the answer is "Yes": **4.51.1 Proceed to "Part 2.B"**

If the answer is "No": **4.51.2 Proceed to "Part 2.C"**

PART 2.A - Undefined infrastruc-

5. Is there a door for truck access? ?*(Take picture if there is)* ☐ Yes ☐ No

If the answer is "Yes":
5.1 Input door height _____ 5.2 Input door width _____

6. *If there is a sign of maximum vertical clearance allowed to enter the infrastructure:*
6.1 Take a picture of the clearance sign. 6.2 Input clearance measure.

7. Building address: _____ 8. Additional Observations: _____

THE FINAL 50 FEET OF THE URBAN GOODS DELIVERY SYSTEM: PHASE 2 18

PART 2.B - Loading Bay

10. Access type of the infrastructure vehicle door(s) ☐ Exit ☐ Entrance ☐ Entrance same as exit

If the answer is "Exit":
10.1 Survey ID of the entrance corresponding to this exit door: _____

If the answer is "Entrance":
10.2 Survey ID of the exit corresponding to this entrance door: _____

10.3 Vehicle entrance maneuverability: ☐ Drive-in ☐ Back-in

11. Door angle respective to traffic flow: ☐ Perpendicular ☐ Parallel ☐ Angled contrary to traffic flow ☐ Angled to traffic flow ☐ Angled (lane with bidirectional flow)

12. How many doors 8 x 8 ft. or larger act as the same vehicle door access type surveyed?
Note: *Questions from 13 to 15 repeat as many times as the total number of door.*

13. Door height : _____ **14. Door width:** _____

15. *If there is a sign of maximum vertical clearance allowed to enter the infrastructure:*
15.1 Take a picture of the clearance sign. **15.2 Clearance measure** _____

16. Total number of truck spaces: _____

17. *If there is a dock:*
17.1 Number of truck spaces with direct access to loading dock platform: _____
17.2 Dock height: _____ **17.3 Take a picture of the dock.**

PART 2.C - Exterior Loading Area or Loading Dock

18. Is the infrastructure partially or completely covered? ☐ Yes ☐ No

If the answer is "Yes":
18.1 Minimum clearance between coverture & ground of parking space: _____

19. Is there a dock? (*Take a picture if there is*) ☐ Yes ☐ No

If the answer is "No":
19.1 Total number of truck spaces: _____

If the answer is "Yes":
19.2 Dock height: _____

19.3 Dock angle respective to traffic flow: ☐ Perpendicular ☐ Parallel ☐ Angled contrary to traffic flow ☐ Angled to traffic flow ☐ Angled (lane with bidirectional flow)

19.4 Is there a dock –leveler? (*Take a picture if there is*) ☐ Yes ☐ No

19.5 Is the dock platform behind building walls? ☐ Yes ☐ No

If the answer is "No":
19.5.1 Total number of truck parking spaces : _____
19.5.2 Number of truck spaces with direct access to loading dock platform: _____

If the answer is "Yes":
19.5.3 How many dock doors are there?
Note 1: *If there are more than one dock door take a picture of group of dock doors.*
Note 2: *Questions from 19.5.4 to 19.5.7 repeat as many times as the total number of dock door(s).*

19.5.4. Take picture of dock door. **19.5.5 Door height :** _____ **19.5.Door width:** _____

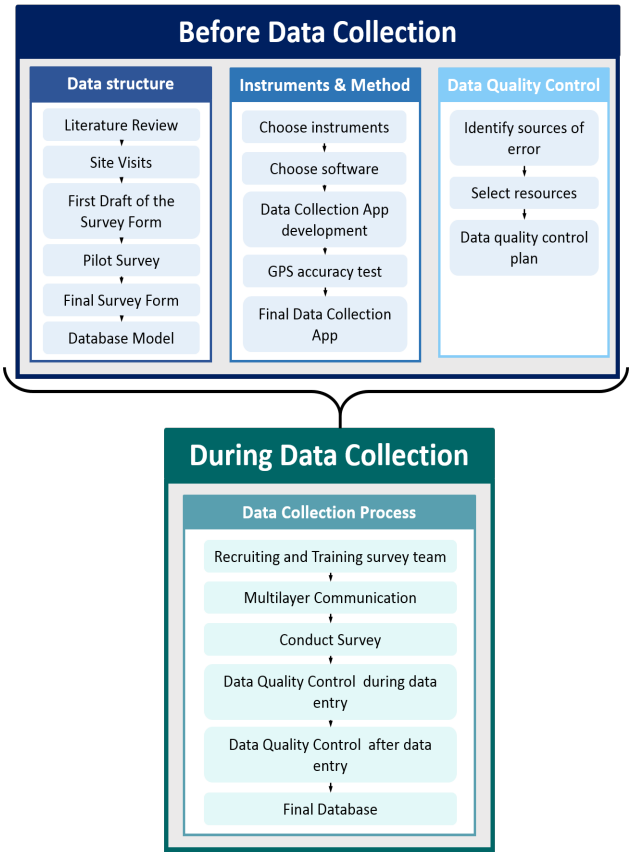
APPENDIX C:
STEP-BY-STEP TOOLKIT FOR A PRIVATE LOADING/UNLOADING INFRASTRUCTURE INVENTORY

This toolkit describes the step-by-step process that city transportation professionals can follow (or adapt as desired) to carry out a private loading/unloading inventory survey.

The data-collection and analytic methods represented here are:

- Replicable;
- Available at reasonable cost;
- Ground-truthed;
- Governed by quality-control measures in each step.

The figure below outlines the overall project data process.



STEP 1: DETERMINE STUDY PARAMETERS

The first step should define these key parameters:

- Scope/size of desired study area
- Number of city blocks in the study area: The number of city blocks could be used to assess the scope of the effort involved to complete data collection in the defined study area.
- Data-collection hours: For security reasons, it is recommended to work only during daylight hours. Because the survey includes capacity features that can only be captured when facilities are open, weekdays are recommended for data collection.

Worth noting: The research team used SDOT's publicly-available GIS layers of designated curbside parking, as well as King County's GIS layer of Seattle's alleys, to begin developing a multi-layer map of the truck load/unload locations in the city's urban centers. This UFL report adds the private infrastructure layer; an earlier UFL report updated the alley layer. Other cities also may have publicly available GIS layers that aid in any project that seeks to accurately document the load/unload network.

The research team reviewed the following Seattle GIS databases for its multi-layer map of the truck load/unload locations in the city's urban areas:

- Alleys
- Urban villages
- Arterial types
- Commercial
- Retail
- Food permit data
- Residential
- SDOT traffic lanes
- Curb space categories
- Block faces
- Year built

STEP 2: DEFINE PRIVATE LOADING/UNLOADING INFRASTRUCTURE ATTRIBUTES OF INTEREST

Section 2 in the report defines each of the three types of private infrastructure inventoried: loading bays, exterior loading docks, and exterior loading areas.

Transportation officials should also define the specific infrastructure attributes the inventory effort seeks to capture. The research team's review of design standards, city reports and research papers on recommendations regarding freight loading/unloading parking infrastructure resulted in the following extended list of infrastructure features that affect operations and that can be grouped into **location, design and capacity** features.

Important location features are the type of road at the public right of way where the access to the infrastructure is located. Poor operations of the roads connecting this infrastructure to the street network may significantly affect how private loading/unloading parking facilities are used. One example is the case of inefficient and narrow alleys, which delivery drivers tend to avoid if they have an alternative to avoid being blocked on their way out by other vehicles. The interplay between public and private freight parking infrastructure is important as well.

Design features include:

- Dimensions of access points to the infrastructure: for instance, vehicle doorway and dock doorway dimensions (width and height);
- Ground clearance: the shortest distance between vehicle tire and upper level at the infrastructure.
- The way vehicles access the infrastructure, including:
  - The access angle to the infrastructure: the angle between the vehicle access and the traffic flow
  - Access ramp's grade
  - Whether the vehicle needs to back-in
  - Maximum turning radius
  - Maximum truck size that can use the infrastructure
  - Security access measures: for instance, physical barriers, access code and any personal interaction needed to gain access.

Capacity features relate to parking spaces and mechanical devices, such as:

- Number of parking spaces;
- Apron: space for parking and maneuverability, and;
- Presence of a dock platform and dock-levelers.

Ultimately, not all features listed here were ultimately able to be captured in field, as explained in Step 3.

STEP 3: DESIGN SURVEY AND PILOT TEST

A pilot test of the initial survey gave the research team critical information about what features data collectors could capture in the field from the public right of way (e.g. sidewalks and alleys.) For this project, researchers selected a six-block area to pilot-test the draft survey. Features noted in Step 2 including turning radius, maximum truck size, and centerline distance were not possible to measure in the field due to the complexity of the geometrical features, the private infrastructure personnel's lack of knowledge or unavailability, or a lack of exterior signage. The research team used the pilot-test results to develop the final data-collection survey in Appendix A and the data structure metadata in Appendix B.

The final survey encompassed all key attributes identified in Step 2 that data collectors were able to capture from positions on sidewalks and in alleys. The specific scope of work for each project may require adaptation of the survey form used in this report. If changes are needed, the recommended process is to pilot-test the draft survey form. This pilot test enables cities to:

- Estimate the time needed to survey each infrastructure, including walking time between survey locations;
- Identify potential problems with the survey logic, and;
- Test data-collection methods and instruments.

Regarding survey logic, data collectors created a record for each loading bay entrance/exit. They recorded individual features of each loading bay.

STEP 4: SELECT DATA-COLLECTION TOOLS

It is recommended that the chosen tools of the data-collection method be:

- Able to measure metrics with sufficient accuracy
- Easy to transport
- Reasonably priced
- Available as off-the-shelf technology

Below is the list of tools used in the UFL project and their unit price:

Instrument	Unit price ($)
Laser measuring device	80
iPad mini 2 with 32 GB and Wi-Fi and cellular option*	300
Portable power bank	11
iPad Case	90
Security Vest	17.9
Clipboard	2

*This instrument may not be required if the survey instrument is paper-based.

STEP 5: CHOOSE SOFTWARE AND PROGRAM DATA-COLLECTION APP

This step requires choosing database management software that allows for:

- Controlled submission or input of data;
- Data storage in different formats, including databases with relationships;
- Geodatabases and cloud storage;
- Multiuser data editing;
- Set data rules and relationships;
- Secure data, and;
- Use of data-collection app.

These functionalities enable effective data management, data-quality control and scale-up of data collection across multiple staff members. Use of a data-collection app in field is recommended to reduce transcript time and errors. The Urban Freight Lab developed a private loading/unloading infrastructure inventory app, thought to be the first of its kind. That said, a paper-based questionnaire may be a viable alternative if a mobile data-collection app is not available or practical.

The research team conducted the data-collection process on tablets using ESRI GIS software Survey123, ArcView and ArcGIS Online. These ESRI products offer a seamless data-collection tool that allows for both visualization and editing of the collected data. Additionally, Survey123 allows selection of the most appropriate basemap to assist the geolocation input: the World Street from ArcGis.com viewer last updated in July 2017.

Additionally, the mobile data-collection app allows manual input of the infrastructure location, supported by offline basemaps. This allowed the research team to avoid the cost of having a wireless Internet plan for the tablets to support data collection. (Once collected, data could be uploaded using the Wi-Fi option.)

For precision and reliability, the research team for this inventory chose to collect GPS coordinates (geopoints) manually by dropping a pin on the map at the infrastructure location. The team then used Survey123 to average multiple GPS readings to reduce error and uncertainty in the coordinates. This process performed better in field testing than automatic geopoint collection alone.

While data quality-control checks to identify readings taken more than five-to-ten feet away from the infrastructure are effective, they are time consuming. Given the state of current technology (e.g. low accuracy of the devices), collecting the GPS coordinates of the infrastructure manually by dropping a pin at its location on the map may be the best approach. It is the approach followed in this project.

STEP 6: CREATE DATA QUALITY-CONTROL PLAN

A data quality-control plan must consider the possible sources of error in the data and the resources available to mitigate these errors at different stages of the data-collection process. This helps ensure the quality of the data before it is collected, entered or analyzed. It also helps with monitoring and maintaining the data once collected. The UFL research team identified the types and possible sources of error specific to this type of project to define the quality-control measures needed:

- **Positional error** refers to inaccuracies of GPS coordinate readings due to device issues (e.g. low satellite signal in urban canyons) and mistakes by humans manually collecting this data with tablets.
- **Attribute error** is associated with the remaining non-spatial infrastructure data collected with the survey. Some examples are incorrect data entry due to wrong measurements or mistyped data. Lack of access to the information due to obstructions or safety issues may also result in inaccurate data.
- **Conceptual error** refers to errors around identification and classification of relevant infrastructure attributes or related information. Concepts wrongly used can result in information misclassified and information not captured.

Table 1 shows the UFL project data quality-control design to address the three types of errors above. The table illustrates the measures implemented in three stages: before data collection, during data entry, and after data entry.

The Seattle project used four types of resources to carry out quality-control procedures throughout the project stages:

- **Supervisor(s):** are responsible for defining and enforcing the data collection standards and methodology; training the collectors; and monitoring and maintaining the database. The supervisor handled the data-control measures implemented before data collection and after data entry.
- **Collectors:** are responsible for data entry in field and carrying out same-day data quality-control checks after data entry.
- **Survey app:** refers to the digital and online tool that helps create entry constraints, estimates accuracy of the GPS device readings, eases the digitization of the data as it is collected and ends the need for manual information digitalization. The survey app plays an important quality-control role because it is programmed to limit inaccuracies in the data-entry stage by considering the data structure rules, attributes and relationships.
- **Carrier:** refers to the private company (UPS, a UFL member) that collaborated with the research team to review survey locations when it was unclear if the locations were used for freight operations, such as when locations had a closed door during the survey. The carrier-check happens after the collectors finish their same-day checks.

Table 1. UFL Data Quality-Control Process

	STAGE 1. BEFORE COLLECTION		STAGE 2. DURING DATA ENTRY		STAGE 3. AFTER DATA ENTRY		
	In office	In field	In field		In office		
	Supervisor(s)		Collector(s)	Survey App	Collector(s)	Carrier	Supervisor(s)
Positional	- Establish physical reference - Develop questionnaire logic to capture GPS device reading errors -Train data collectors to clean geolocation data in office following data collection	- Deliver training session to collectors about GPS location collection with survey app	- Follow instructions to always remain aware of their location - Keep track of surveyed infrastructure location with hard copies of maps	- Includes manual collection of GPS reading by dropping location pin - Includes updated base map with city blocks and building outlines	- Conduct same-day check of surveyed infrastructure location by comparing ArcGIS Online map with hard copy of map	NA = Not applicable	- Review collectors' positional check. - Identify outliers by finding geopoints out of their corresponding city block - Correctly geocode outliers based on Google Maps
Attributes *(Infrastructure features)*	- Build questionnaire's data-entry constrains in survey app - Deliver theoretical training session to data collectors - Train data collectors to clean attributes data in office following data collection.	- Deliver training on data collection with survey app and measurement devices for infrastructure features	- Take clear photos to aid data entries	- Includes visual and written aid for data fields	- Conduct same-day check of data collected in field with survey pictures using ArcGIS Online platform	NA = Not applicable	- Check numeric fields for outliers - Conduct second inspections in surveys
Conceptual *(Infrastructure concepts)*	- Establish metadata and vocabulary related to the surveyed infrastructure - Deliver theoretical training to data collectors	- Train collectors in field on how to identify infrastructure relevant to the survey	- Write open-ended comments, take additional pictures and use "Other" categories for "undefined" cases	NA = Not applicable	NA = Not applicable	- Resolve "undefined" cases due to lack of access to information	- Resolve collectors' observations and "Other" cases - Classify surveyed infrastructure - Check typology of private freight infrastructure with pictures collected

STEP 7: RECRUITING AND TRAINING OF DATA COLLECTORS

Recruiting

The workforce requirements (number of data collectors and supervisors needed) are determined by the project budget, timeline and survey length. Security concerns and survey complexity may also result in different workforce needs. For instance, data collectors may work better in teams of two to improve security conditions and enable efficient operation of the multiple data-collection instruments (e.g. laser measurement device, iPad, etc.).

In addition to data collection in field, data-collection staff may spend time commuting to and from the study area and within the study area, as well as conducting data quality-control tasks in office. These tasks will take a varying amount of time depending on the nature, size and location of the study area, and are important to consider when estimating workforce needs in relation to the desired project duration. For this project, data collectors were compensated for their time in transit to get to the study area.

Training

Three different training sessions are suggested for data collectors:

The first session instructs data collectors in concepts and attributes regarding the private loading/ unloading infrastructure.

This training session can be done in a classroom-type setting, with a slide presentation introducing the audience to private loading/unloading infrastructure and the various features and concepts that surround them. The research project should be explained, providing everyone with the goal, process, timeline, and information on shifts. Security in field is also addressed.

The second session focuses on practical aspects of data collection, such as how to use the questionnaire in the tablet app and the measurement tools. This training session should be done in-field to give the collectors real-world practice with the materials and process.

This training session should lead collectors through the actual process of collecting data. Attention should be paid to teaching how to take accurate measurements with the laser, how to use the hard-copy maps, and how to effectively divide collection work between the pair. One person may become very familiar with the measurement tools and always take measurements; the other may become adept at navigating and filling in the survey tool and always take responsibility for this task. Security in field is also addressed.

The third session centers on how to implement data quality-control measures.

After every shift in-field, one of the data collectors in each pair must clean the data he or she just collected. The third training session should be dedicated to this data-cleaning process: how to access the survey data results and how to properly clean the data, noting common errors to look for and needed changes to make.

STEP 8: DATA COLLECTION

The actual data-collection step depends on the size of the study area and, subsequently, the size of the workforce required. For the First Hill/Capitol Hill inventory, a total of 230 person-hours was required to survey 96 private freight loading/unloading infrastructures across 421 city blocks. It is recommended that data collectors work in two-person teams: one member normally inputs information on the tablet and the second takes measurements, updates the hard-copy inventory sheet, and maps each location surveyed. Depending on collectors' schedules, works shifts can be formed around a geographic area, with more city blocks included if the shift is longer. A check-out and check-in process can be developed for collectors to pick up and drop off the required materials needed for each shift. Supervisors must make sure territory assignments are formed and hard-copy maps are printed for each team and shift. Data collectors use hard-copy maps to know what area they are assigned, to help with quality control for positional errors, and to update progress on data collection.

Security in field

Safety of data collectors visiting the city blocks and surveying the infrastructure is paramount. It is essential to have a multilayer communications plan in place for all parties with an interest in the study area and the survey. It is also essential to have a comprehensive security protocol to avoid unsafe situations in field.

Data collectors should carry official documents from the sponsoring agency explaining the project and granting data-collection authorization. The documents should include agency official contact information should questions arise in field. Police and other relevant agencies should be informed and recruited to help communicate with all building managers in the survey area. Relevant agencies can also disseminate information on the survey and its progress to communicate with the public and relevant stakeholders. This communication can indicate where surveyors will be working and when. In Seattle, for example, the Seattle Police Department notified all building managers in the survey area in real time through the Seattle Shield program, a pre-existing information exchange for building operators and the police. SDOT also set up a new webpage at http://www.seattle.gov/transportation/thefinal50feet.htm to communicate with the public and relevant stakeholders.

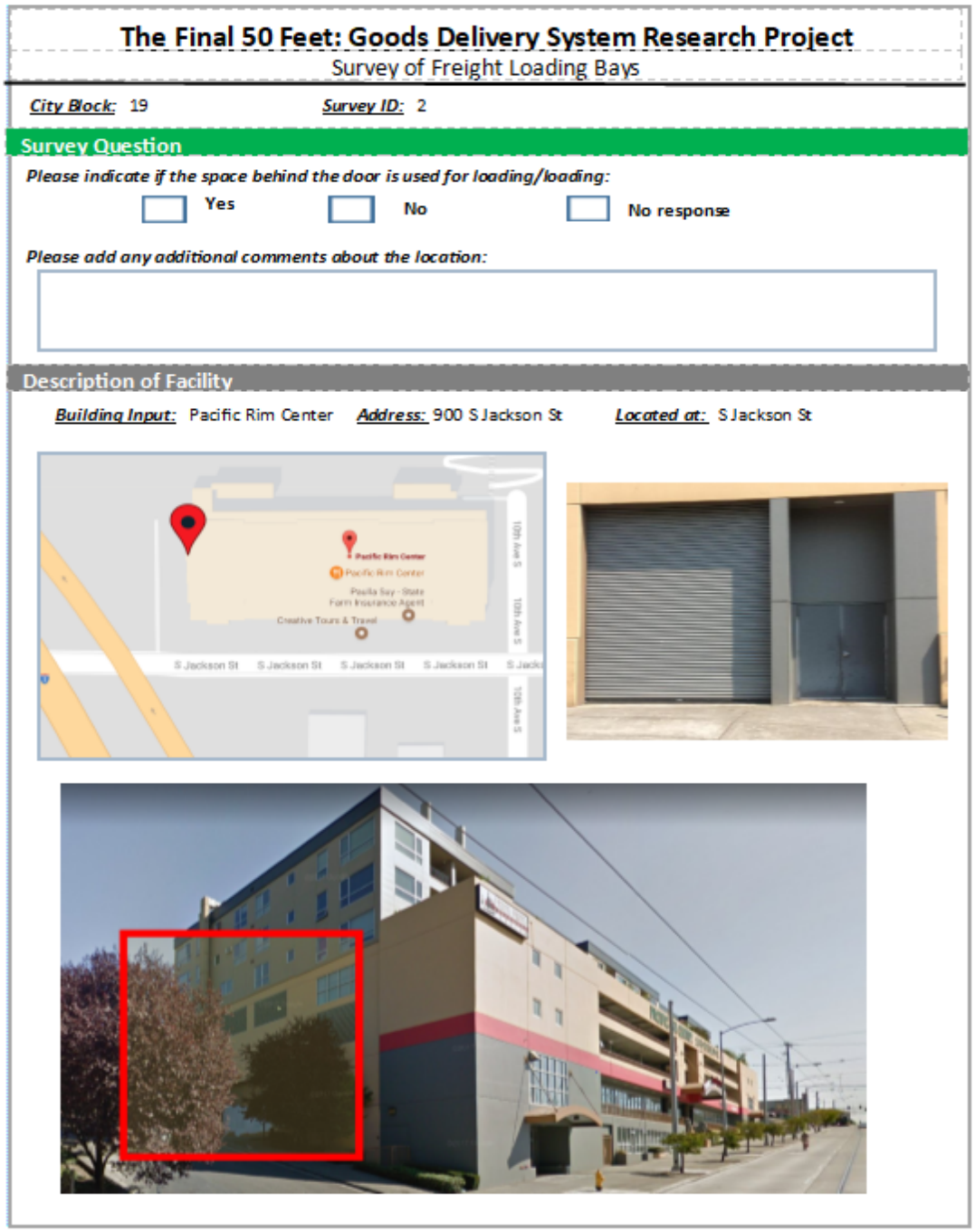
STEP 9: DATA CLEANING

After data collection, data must be cleaned. Both the data collectors and the supervisors play a role in this effort, which is detailed further in Table C-1, Stage 3. The data collector must conduct a check of the surveyed infrastructure locations after having completed in-field data collection. This step makes the final cleaning of the complete dataset easier and more efficient. The supervisor(s) can conduct their data-cleaning steps during the collection process, but must perform a comprehensive clean after all the data has been collected.

The research team collaborated with experienced UPS drivers who regularly serve the study area to identify survey locations that were closed during the survey. This step allowed the team to rule out 186 of the closed-door locations across this and the earlier 2017 data collection, reducing uncertainty in the total inventory from 33% to less than 1%. This survey of UPS drivers proved integral to accurately documenting and understanding the private inventory.

As shown in the driver survey form (Figure 1), for any facility in question, drivers were given detailed location information (including photos that gave context for the door in question) and were asked whether the space was used for loading/unloading.

Figure 1. Form UPS Drivers Used for Closed-Door Locations to Determine if Used for Freight



STEP 10: PUT TOGETHER AND SUMMARIZE THE DATA

Varying city needs may require different final formats. The final format can be a database made of spreadsheets with relationship between them. In the Seattle project, each private loading/unloading infrastructure was considered a point feature layer on a GIS map. Most information about this infrastructure was stored in a corresponding attribute table. Pictures of private loading/unloading infrastructure features were also collected and stored as JPEG files with a naming convention that allowed them to relate to the corresponding infrastructure.

In Seattle, the final format is an up-to-date geodatabase with detailed features of private loading/unloading infrastructure represented as a point feature on the GIS map.

APPENDIX A:
STEP-BY-STEP TOOLKIT FOR AN ALLEY INVENTORY

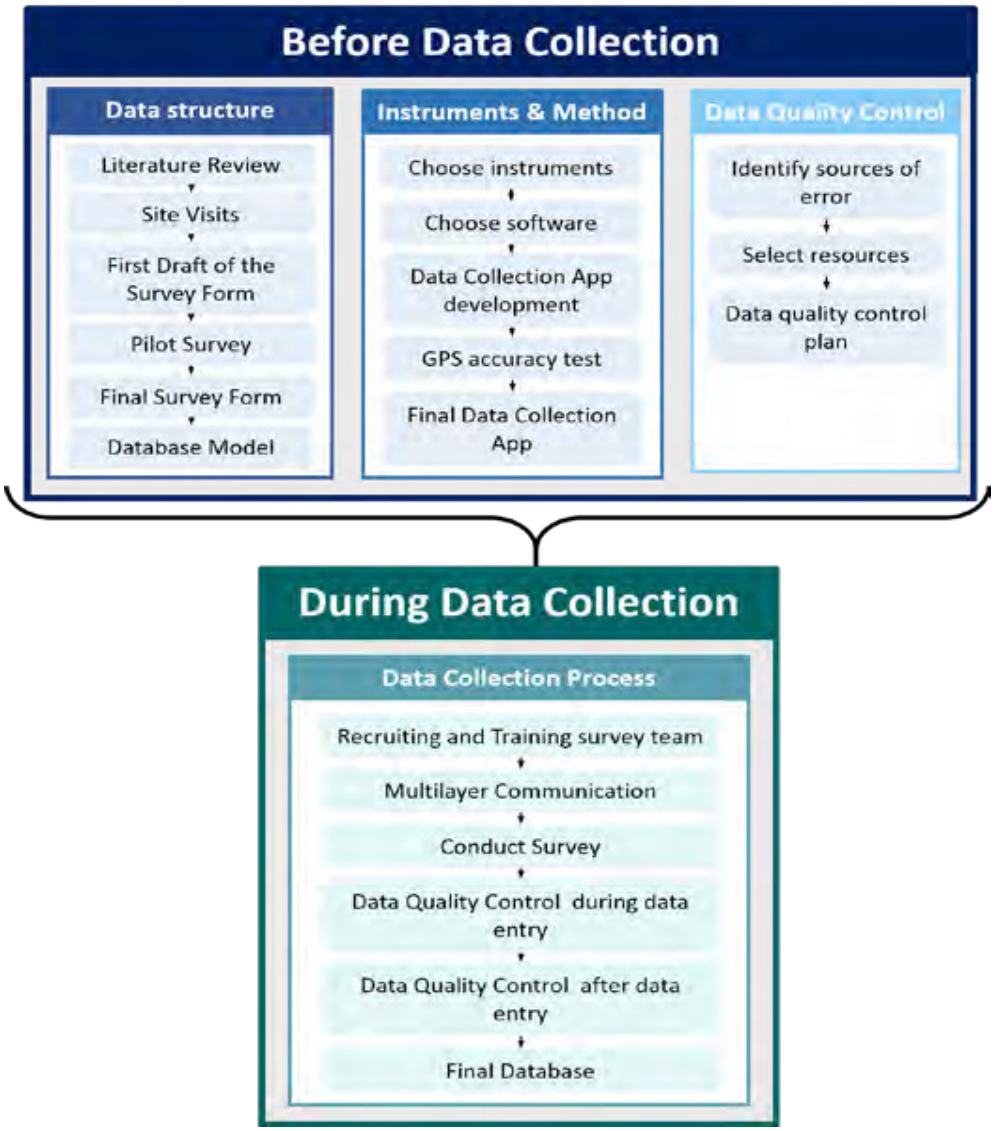
This toolkit describes the step-by-step process that city transportation professionals can follow to carry out an alley inventory survey.

The data-collection and analytic methods represented here are:

- Replicable;
- Available at reasonable cost;
- Ground-truthed;
- Governed by quality-control measures in each step.

The figure A1 below outlines the overall project data process.

Figure A1. Data Process.



STEP 1: DETERMINE STUDY PARAMETERS

The first step should define these key parameters:

Scope/size of desired study area

Number of alleys to inventory: Pre-existing GIS databases such as transportation network may be a valuable resource as these databases might include alleys. If there is a GIS database of the transportation network but it does not include alleys, the number of city blocks could also be used to assess the scope of the effort involved to complete data collection in the defined study area.

Data-collection hours: For security reasons, it is recommended to work only during daylight hours. As this is not an occupancy study, periods of low activity, such as weekend days, are also candidate times to collect alley data.

STEP 2: DEFINE ALLEY ATTRIBUTES OF INTEREST

Transportation officials should define the specific alley attributes the inventory effort seeks to capture. Cities should decide what agencies, beyond transportation, to include in the definition of attributes as the inventory can have broad applications beyond urban freight. As outlined in the Inventory Method Design, Seattle involved police, public utilities, and fire agencies, as well as firms involved in urban freight. Cities can use (and adapt as desired) the detailed alley typology in the Inventory Method Design to categorize significant alley features. Broadly, Seattle's effort sought to map and inventory various attributes related to 1) Alley connectivity to street network; 2) Alley design; 3) Alley accessibility; 4) Alley pavement condition. Details are available in the Inventory Method Design.

STEP 3: SELECT DATA-COLLECTION TOOLS

The UFL research team decided that a **mobile-app-based data-collection instrument** built from an off-the-shelf basemap was a better option than a paper-based instrument, as detailed in the Inventory Method Design. That said, a paper-based questionnaire may be a viable alternative if a mobile data-collection app is not available or practical.

It is recommended that the chosen tools of the data-collection method be:

- Able to measure metrics with sufficient accuracy
- Easy to transport
- Reasonably priced
- Available as off-the-shelf technology

Below is the list of tools used in the UFL project and their unit price.

INSTRUMENT NAME	UNIT PRICE ($)
Laser measuring device	80
Measuring wheel	50
iPad mini 2 with 32 GB and Wi-Fi and cellular option*	300
Portable power bank	11
iPad Case	90
Security Vest	17.9
Clipboard	2

*This instrument may not be required if the survey instrument is paper-based

STEP 4: CHOOSE SOFTWARE AND PROGRAM DATA-COLLECTION APP

This step requires choosing a database management software that allows for the following functionalities:

- Controlled submission or input of data
- Data storage in different formats, including databases with relationships, geodatabases and cloud storage
- Multiuser data editing
- Set data rules and relationships
- Secure data
- Data-collection app

These functionalities allow effective data management, data quality control and the scaling up of data collection with multiple staff members. It is also recommended to include a data-collection app for the collection of data in field to reduce transcript time and errors. The Urban Freight Lab effort included development of an alley inventory app, thought to be the first of its kind.

The research team implemented the survey form and data-collection process on tablets using ESRI GIS software Survey123, ArcView and ArcGIS Online. These ESRI products offer a seamless data-collection tool that not only allows for visualization of the collected data but its editing.

Additionally, Survey123 allows selection of the most appropriate basemap to assist the geolocation input.

The mobile data-collection app allows manual input of the infrastructure location supported by offline basemaps. This allowed the UFL research team to avoid the cost of having a wireless Internet plan for the tablets to support data collection. During development of the data-collection app, researchers tested the questionnaire in field and in office to prevent logic and other errors in using the survey form.

Based on the UFL research team experience, the collection of geolocation with off-the-shelf GPS devices in urban areas requires:

- Selection of a basemap to support the data collection
- Manual GPS coordinate reading by dropping a pin with a map-based app
- Definition of the data quality control regarding geolocation measures.

UFL researchers selected as a basemap the World Street from ArcGis.com viewer that was last updated on July of 2017 (3). An appropriate basemap can be created incorporating various elements as needed/ available in a given city. In Seattle's case, UFL researchers first selected the World Street Map basemap preloaded within ArcGIS software and available from arcgis.com. This worldwide street map presents highway-level data for the world. To supplement this resource and make the basemap more specific within Seattle, researchers added existing GIS data of the location and key names of alleys and loading bays in Seattle's Center City area. The former was from King County's Metro Transportation Network (TNET) database, and the latter was from the SDOT-UW Final 50 Feet Loading Bays and Docks database.

STEP 5: PREPARE ALLEY INVENTORY SURVEY FORM

The survey should encompass all key attributes identified in Step 2. The specific scope of work for each project may require adaptation of the survey form used in this report. If changes are needed, the recommended process is to pilot-test the draft survey form as discussed in the Inventory Method Design section. This pilot test enables cities to:

- Estimate the time needed to survey each alley, including walking time between alleys
- Identify potential problems with the survey logic
- Test data-collection methods and instruments

This step should result in a survey form and metadata document that describe survey data structure.

STEP 6: CREATE DATA QUALITY-CONTROL PLAN

A data quality-control plan must consider the possible sources of error in the data and the resources available to mitigate these errors at different stages of the data-collection process. This helps ensure the quality of the data before it is collected, entered or analyzed. It also helps with monitoring and maintaining the data once collected. The UFL research team identified the types and possible sources of error specific to this type of project to define the quality-control measures needed:

Positional error refers to inaccuracies of GPS coordinate readings due to device issues (e.g. low satellite signal in urban canyons) and mistakes by humans manually collecting this data with tablets.

Attribute error is associated with the remaining non-spatial alley data collected with the survey. Some examples are incorrect data entry due to wrong measurements or mistyped data. Lack of access to the information due to obstructions or safety issues may also result in inaccurate data.

Conceptual error refers to errors around identification and classification of relevant alley attributes or related information. Concepts wrongly used can result in information misclassified and information not captured.

Figure A-2 below shows the UFL project data quality-control design to address the three types of errors above. Figure A-2 illustrates the measures implemented in three stages: before data collection, during data entry, and after data entry.

The Seattle project used three types of resources to carry out quality-control procedures throughout the three project stages:

Supervisor(s) are responsible for defining and enforcing data-collection standards and methodology; training the data collectors; and monitoring and maintaining the database. The supervisor handled the data-control measures implemented before data collection and after data entry.

Collectors are responsible for data entry in field and carrying out same-day data quality-control checks after data entry.

Survey app refers to the digital and online tool that helps create entry constraints, eases the digitization of the data as it is collected and ends the need for manual information digitalization. The survey app plays an important quality-control role because it is programmed to limit inaccuracies in the data-entry stage by considering the data structure rules, attributes and relationships.

Figure A-2. UFL Data Quality-Control Process

	STAGE 1. BEFORE COLLECTION		STAGE 2. DURING DATA ENTRY		STAGE 3. AFTER DATA ENTRY	
	In office	**In field**	**In field**		**In office**	
	Supervisor(s)		Collector(s)	Survey App	Collector(s)	Supervisor(s)
Positional	Establish physical reference of geopoints	Deliver training session to collectors about GPS location collection with survey app	Instructed to be always aware of their location Keep track of surveyed alley locations with hard copies of maps	Includes manual collection of GPS reading by dropping location pin Includes updated base map with city blocks, building outlines, King County TNET alleys and loading bays in alleys.	Conduct same-day check of surveyed alley locations by reviewing alley end points in ArcGIS Online Check street names of alley end points Check alley TNET id the alley exist in King County's TNET database	Check alleys in TNET database to identify alleys not visited (i.e. missed)
Attributes (Infrastructure features)	Build questionaries' data entry constrains in survey app Deliver theoretical training session to data collector	Deliver training session on data collection with survey app and measurement devices regarding infrastructure features	Take clear photos to aid data entries	Includes visual and written aid for data fields	Conduct same-day check of data collected in field using ArcGIS Online platform	Check numeric fields for outliers Conduct revisits to missing alley locations
Conceptual (Infrastructure concepts)	Establish metadata and vocabulary related to the surveyed infrastructure Deliver theoretical training session to data collector	Train collectors in field on how to identify infrastructure relevant to the survey	Write open-ended comments, take additional pictures and use "Other" categories for "undefined" cases	NA = Not applicable	NA = Not applicable	Resolve collectors' observations Check classification of alley end point types with pictures collected and basemap in ArcGIS Online

STEP 7: RECRUITING AND TRAINING OF DATA COLLECTORS

Recruiting

The workforce requirements (number of data collectors and supervisors needed) are determined by the project budget, timeline and survey length. Security concerns and survey complexity may also result in different workforce needs. For instance, data collectors may work better in teams of two to improve security conditions and enable efficient operation of the multiple data-collection instruments (e.g. laser measurement device, measuring wheel, iPad, etc.).

Beyond the time required for data collection in-field, project organizers should also account for the time needed for data-collection staff to commute to/from the study area and conduct data quality-control tasks in office. These tasks will take a varying amount of time depending on the nature, size and location of the study area, and are important to consider when estimating workforce needs in relation to the desired project duration.

Training

Three different data-collector training sessions are suggested:

The first session instructs data collectors in alley concepts and attributes. This training session can be done in a classroom-type setting, with a slide presentation introducing the audience to alleys and the various features and concepts that surround them. The research project should be explained, providing everyone with the goal, process, timeline, and information on shifts. This is also where data collector security and safety protocols can be covered. (See Step 8.)

The second session focuses on practical aspects of data collection, such as how to use the questionnaire in the tablet app and the measurement tools. This training session can be done in-field to give the collectors real-world practice with the materials and process.

The materials needed for alley inventory data collection are detailed in Appendix B. These materials should be acquired before the second training session. Enough should be purchased so every collector and collector pair has what they need. Maps should be prepared that divide up the study area into sectors, allowing data collectors to always have a hard copy map to reference in-field.

This training session should lead the collectors through the actual process of collecting data. Attention should be paid to teaching how to take accurate measurements with the laser and wheel devices and how to effectively divide the collection work between the pair. One person may become very familiar with the measurement tools and always take measurements; the other may become adept at navigating and filling in the survey tool and always take responsibility for this task. Data collectors also had a chance to practice security and safety protocol in field, such as pausing to look down the alley length and determining whether they felt safe before entering. (See Step 8.)

The third session centers on how to implement data quality-control measures. After every shift in-field, one of the data collectors in each pair must clean the data he or she just collected. The third training session should be dedicated to this data-cleaning process: how to access the survey data results and how to properly clean the data, noting common errors to look for and needed changes to make.

STEP 8: DATA COLLECTION

The actual data-collection step depends on the size of the study area and, subsequently, the size of the workforce required. It is recommended that collectors work in pairs on each alley. Depending on collectors' schedules, works shifts can be formed around a geographic area, with more city blocks and alleys included if the shift is longer. A check-out and check-in process can be developed for collectors to pick up and drop off the required materials needed for each shift. Supervisors must make sure territory assignments are formed and hard-copy maps are printed for each team and shift. Data collectors were instructed to inspect every city block searching for alleys, whether the county basemap showed an alley or not.

Security in field

Safety of data collectors visiting and surveying alleys is paramount. It is essential to have a multilayer communications plan in place for all parties with an interest in the study area and the survey. It is also essential to have a comprehensive security protocol to avoid unsafe situations in field.

Data collectors should carry official documents from the sponsoring agency explaining the project and granting data-collection authorization. The documents should include agency official contact information should questions arise in field. Police and other relevant agencies should be informed and recruited to help communicate with all building managers in the survey area.

Relevant agencies can also publish and disseminate information on the survey and its progress to communicate with the public and relevant stakeholders. This communication can indicate where surveyors will be working and when. In Seattle, for example, the Seattle Police Department notified all building managers in the survey area in real time through the Seattle Shield program, a pre-existing information exchange for building operators and the police. SDOT also set up a new webpage at http://www.seattle.gov/transportation/thefinal50feet.htm to communicate with the public and relevant stakeholders.

It is recommended that data collectors follow a security protocol before entering the alley and once they are working inside the alley. In Seattle, data collectors were instructed to not enter in the alley if any staff felt uncomfortable. The presence of obstructions, such as garbage trucks, that made the alley access difficult was sufficient reason to avoid entering the alley. Once inside the alley, data collection teams were directed to exit the alley if any staff felt uncomfortable at any point while collecting features. In some cases, data collectors were able to go around the block to the second alley end point to finish the data collection. The survey logic considered possible interruptions, such as those due to security issues, so that valuable alley information was not lost and data collectors could at a minimum collect data from either end of an alley.

STEP 9: DATA CLEANING

After data collection, data must be cleaned. Both the data collectors and the supervisors play a role in this effort, which is detailed further in Figure A-2, Stage 3. The data collector must conduct a check of the surveyed alley locations after having completed in-field data collection. This step makes the final cleaning of the complete dataset easier and more efficient. The supervisor(s) can conduct their data-cleaning steps during the collection process, but must perform a comprehensive clean *after* all the data has been collected.

STEP 10: PUT TOGETHER AND SUMMARIZE THE DATA

Varying city needs may require different final formats. The final format can be a database made of spreadsheets with relationship between them. In the Seattle project, alleys were considered a point feature layer of alley reference end points, which could be displayed and mapped in GIS software. Most information about the alley was stored in a corresponding attribute table. Information about passenger parking, driveways, buildings' main entrances, and narrowest points along the alley were stored in table attachments that had a relationship one-to-many with the alley reference end points layer. Pictures of alley features were also collected and stored as JPEG files with a naming convention that allowed relating them to the corresponding alleys.

APPENDIX D:
ALLEY INVENTORY SURVEY FORM

Note: Data collectors will do a walk around the city block before starting any survey of a new city block. During the round, they will indicate the following information on the hard copy map:

- Access point(s) width
- Access point(s) location

Part A - Existence of the alleyway

1. **Survey date**
2. **Survey time**
3. **What is the survey ID on the hard copy map?**
4. **Is the alleyway shown on the base map?**

   ☐ Yes ☐ No

   If the answer is No:

   4.1 Proceed to Form1

   If the answer is Yes:

   4.2 What is the TNET_ID?

   4.3 Does the alleyway exist?

   ☐ Yes ☐ No

   If the answer is Yes:

   4.3.1 Proceed to Form1

   If the answer is No:

   4.3.2 Take a picture of what there is instead of the alleyway.

   4.3.3 Gather additional observations.

   4.3.4 Submit the survey.

Part B - For existing alleys

Note 1: *If the alleyway has two access points start with the narrowest one.*

FORM 1 - ALLEYWAY'S "EXTREME POINT" – Survey Start Point

5. What type of extreme point is being surveyed? (EXTR_TYPE)

☐ Access Point (in the public right away with access to street – most common)

☐ Intersection with street (inside the city block)

☐ Intersection with another alleyway (inside the city block)

☐ Dead end, ending at a building outline

☐ Dead end, ending at a driveway with access to street

☐ Dead end, ending at open private property

If it is an access point:

5.1. What is the name of the street closest to the alley's access point?

5.2. What type of street is it?

☐ One-way street ☐ Two-way street

5.3. Where is the access point located?

☐ South or West face of the city block ☐ North or East face of the city block

5.4 . Capture GPS coordinate of access point by dropping location pin at the curb

5.5. Input the apron width.

5.6. Input the apron cross slope. (*The apron slope is the slope measured perpendicular to the direction of travel. To measure the slope, the laser should be placed from* ***South to North***, ***East to West,*** ***Southwest to Northeast,*** *or* ***Southeast to Northwest****. Refer to the Map North Arrow)*

5.7. Input the length from the curb to the alley's access point

If it is an intersection with street:

5.8. What is the name of the street?

5.9. What type of street is it?

☐ One-way street ☐ Two-way street

5.10. Where is the access point located?

☐ South or West face of the city block ☐ North or East face of the city block

5.11. Capture GPS coordinate of access point by dropping location pin at the curb

5.12 Input the apron width.

5.13. Input the apron cross slope. *(The apron slope is the slope measured perpendicular to the direction of travel. To measure the slope, the laser should be placed from* ***South to North****,* ***East to West****,* ***Southwest to Northeast****, or* ***Southeast to Northwest****. Refer to the Map North Arrow)*

5.14. Input the length from the curb to the alley's access point

If it is an intersection with alley:

What is the name of the street closest to the intersection?

Capture GPS coordinate of the alley's extreme point by dropping location pin at the middle of the intersection

If it is a dead end:

Capture GPS coordinate of the alley's extreme point by dropping location pin at the middle of the intersection

6. Take a photo of alleyway extreme point

7. Input the alley's extreme point width (Note: Capture the narrowest within 30ft of the alley)

FORM 2 - ALLEYWAY ACCESS TO THE SURVEY

8. Is there an indication that it is a one-way alley?

☐ Yes ☐ No

If it is a one-way alleyway:

Take a picture of the indication.

What is the direction of traffic in the alleyway?

☐ North	☐ Northeast
☐ South	☐ Northwest
☐ East	☐ Southeast
☐ West	☐ Southwest

9. Is there any sign indicating a restriction on alley usage?

☐ Yes ☐ No

If There is restriction sign:

9.1. Take a picture of the alley usage sign(s).

9.2. Take a picture of the alley usage sign(s).

10. Do you feel safe entering the alley?

☐ Yes ☐ No

If the answer is No:

10.1. Explain why you don't feel safe.

10.2. Take pictures of the area within the alley. *(Skip this question if you don't feel safe taking a picture)*

Note: *Don't enter the alley if any of the team members feel uncomfortable! Go around and survey the alley's second access point (i.e. the end point of the survey); unless the alley ends in a dead end.*

10.3. Can you access the other extreme point from the street?

☐ **Yes** ☐ **No** ☐ **Not sure**

If the answer is yes:

10.3.1 Proceed to "FORM 4"

If the answer is no:

10.3.2 Submit the survey.

If the answer is not sure:

Close the survey for now.

If the answer is Yes:

10.4. Is there any obstruction that impedes measuring inside the alley?

☐ Yes ☐ No

If the answer is Yes:

10.4.1 What is the obstruction?

☐ Construction

☐ Gate

☐ Blocked by a vehicle

☐ Other:

10.4.2. Take pictures of the area within the alley.

10.4.3. Proceed to "FORM 4"

If the answer is No:

10.4.4. Proceed to "FORM 3"

FORM 3 - FEATURES WITHIN THE ALLEYWAY (From where the survey starts)

11. Sub form - Narrowest Points / Sections

11.1 Input the distance from the survey's start point to the location of the narrower point or section.

11.2. What type of restriction is it? (multiple selection)

- ☐ Bollards
- ☐ Building outline
- ☐ Camera
- ☐ Fire escapes
- ☐ Electric Panels
- ☐ Mirrors
- ☐ Parking / Commercial ventilation intakes or exhaust
- ☐ Projecting lights
- ☐ Signs
- ☐ Standpipes
- ☐ Transformer equipment
- ☐ Trash chutes
- ☐ Other: _____

11.3. Input the width

11.4. What type of dimension restriction is it?

- ☐ Point restricting width *(an obstruction in the floor or close to the floor)*
- ☐ Point restricting height and width
- ☐ Section restricting width (such as a building face)
- ☐ Section restricting height and width

If the answer is height and width

11.4.1. Input the effective height of the alley

If the answer is width in a distance

11.4.2. Input the distance from the survey's start point where the narrowest section ends.

11.4.3. Input the width where the narrowest section ends

If the answer is width in a distance

11.4.4. Input the distance from the start point where the narrowest section ends.

11.4.5. Input the width where the narrowest section ends

11.4.6. Input the effective height of the alley

11.5. Take a picture of the narrower point or section

11.6. Gather additional information.

12. **Sub form -** Main Private Entrances *(i.e. the primary entrance to a private business or establishment)*

12.1. Input the distance from the start point where the main private entrance is located.

12.2. As you stand in the alley and face the main private entrance, what is the block face on the other side of the building?

- ☐ South or West face of the city block
- ☐ North or East face of the city block

12.3. What is the building address?

12.4. What type of building?

- ☐ Residential
- ☐ Commercial
- ☐ Historic
- ☐ Office
- ☐ Other

12.5. Take a picture of the main private entrance.

12.6. Gather additional information.

13. **Sub form** - Parking facility access

Note: *Only capture parking facilities that can be accessed only via the alley.*

13.1 Input the distance from the start point where the parking facility access is located.

13.2 Is the parking facility access already in the base map as a loading bay?

☐ Yes ☐ No

If the answer is Yes:

12.2.1 Input the Loading Bay ID

13.3 If you stand in the alley and face the parking facility entrance, what is the block face on the other side of the parking facility?

- ☐ South or West face of the city bloc
- ☐ North or East face of the city block

13.4 Capture GPS coordinate of parking facility access by dropping location pin at the parking facility entrance

13.5 Take a picture of the parking facility access

13.6 Gather additional information.

14. **Sub form** - Driveways

14.1. Input the distance from the start point where the driveway is located.

14.2 As you stand in the alley and face the driveway, what is the block face on the other side of the driveway?

☐ South or West face of the city block

☐ North or East face of the city block

14.3 Does the driveway provide access to a parking lot?

14.4 Does the driveway connect with a street?

If the answer is Yes:

14.4.1 What is the name of the street?

14.5. Take a picture of the driveway

14.6. Gather additional information.

15. **Sub form** - Security Protocol inside the alley

Note: *If any of the team members feel uncomfortable at ANY point while collecting the features within the alley,get out of the alley! If able, go to the second access point (i.e. the end point of the survey) to finish your data collection (unless the alley ends in a dead end).*

15.1. Do you want to close Form 3 because of safety reasons?

☐ Yes ☐ No

If the answer is Yes:

15.1.1. Explain why you don't feel safe.

16. **Input the length of the alleyway** *(from extreme point to extreme point)*

Note: *Measure length between the two access points of the alley, or between one access point and a dead end or intersection.*

17. **How many dumpsters, garbage cans or bins are in the alley?**
Note: *Do not count garbage cans or bins located in private property.*

18. **How many garbage cans or bins for oil are in the alley?**
Note: *Do not count garbage cans or bins located in private property.*

19. **How many fire escapes are in the alley?**

20. **What is the pavement surface type?**

☐ Asphalt ☐ Cobblestones

☐ Concrete ☐ Other: _____

21. What is the condition of the pavement?

☐ Good

☐ Poor

Note: *pavements in poor condition show height differences that include uplifts, non-flush utility vault lids, and settling alleyways (SEE PICTURE).*

22. Take a picture of the pavement surface

23. Are debris in the alleyway?

☐ Yes ☐ No

24. Is there street furniture in the alleyway?

☐ Yes ☐ No

If the answer is Yes:

24.1 Take additional observations about street furniture.

25. Is there any mechanical equipment in the alleyway?

☐ Yes ☐ No

If the answer is Yes:

25.1. Take picture of mechanical equipment.

25.2. Additional observations about equipment

26. Additional observations

27. Proceed to "Form 4"

FORM 4 - ALLEYWAY'S EXTREME POINT – Survey end point *(The point where the survey ends)*

28. Input the alley's extreme point width (Note: Capture the narrowest within 30ft of the alley)

29. What type of extreme point is being surveyed?

- ☐ Access Point (in the public right away with access to street)
- ☐ Intersection with street
- ☐ Intersection to alleyway (inside the city block)
- ☐ Dead end to building outline
- ☐ Dead end to driveway with access to street
- ☐ Dead end to open private property

If the answer is dead end:

29.1. Take a photo of the dead end.

29.2. Submit the survey.

If the answer is an access point or intersection with street:

29.3 Input the length from the curb to the alley's access point

29.4 What is the name of the street closest to the alley's access point?

29.5 What type of street is it?

- ☐ One-way street
- ☐ Two-way street

29.6 Where is the access point located?

- ☐ South or West end of the city block
- ☐ North or East end of the city block

29.7 Capture GPS coordinate of access point by dropping location pin at the curb

29.8 Input the apron width.

29.9 Input the apron cross slope. *(The apron slope is the slope measured perpendicular to the direction of travel. To measure the slope, the laser should be placed from **South to North**, **East to West**, **Southwest to Northeast**, or **Southeast to Northwest**. Refer to the Map North Arrow)*

29.10. Take a photo of alleyway access point and street intersection

If UNSAFE = Yes:

29.10.1. Do you feel safe entering the alley?

☐ Yes ☐ No

If the answer is yes:

29.10.1.1. Proceed to "Form 3"

If the answer is No:

29.10.1.2. Submit the survey.

Note: *"Form 3" remains empty.*

If the alley exists from Part A:

29.10.2. Is there any obstruction that impedes measuring inside the alley?

☐ Yes ☐ No

If the answer is No:

29.10.2.1.1. Proceed to "Form 3"

If the answer is Yes:

29.10.2.1.2. What is the obstruction?

☐ Construction

☐ Gate

☐ Block by a vehicle

☐ Other: _____

29.10.2.1.3. Take pictures of the area within the alley.

29.10.2.1.4. Submit the survey.

Note: *"Form 3" remains empty.*

Richmond Adelaide Centre (12-storey office complex) and several other 12–20 storey office towers. Retail and dining establishments are present at street level and office space is generally located above street level.

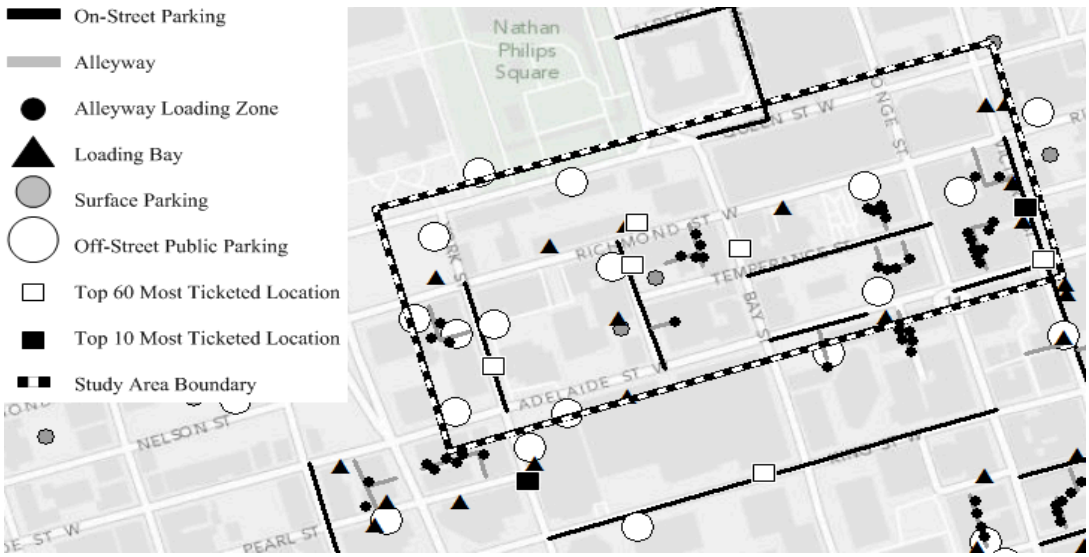


Fig. 1. Study area in the Toronto CBD

The modelling methods developed in this paper include a parking choice model and a parking simulation model. These models are described in the following sections.

Parking choice model

The parking choice model is an econometric discrete choice model of parking type (on-street, off-street, illegal) and location choice. A binary logit model is developed to determine the probability of parking at a parking location for every simulated vehicle in the study area network. This model can be written as (Ben-Akiva and Lerman, 1985):

$$P_i = \frac{e^{\beta x_i}}{1 + e^{\beta x_i}}$$

where β is a vector of estimated parameters and x_i is a vector of characteristics of the current parking location i. The binary logit

APPENDIX A: Parking Survey Questionnaire

1.1 – Type of freight carrier
1.2 - TL, LTL or Package
1.3 - Type of freight carried
1.4 – Type of truck driven

2.1 – How long have you been driving for this company?

2.2 – How long have you been driving in downtown Toronto?

2.3 – How familiar are you with parking available in downtown Toronto?

3.1 – What type of fuel does your vehicle use?

4.1 – Currently, where are you parked relative to your destination?

4.2 – List the location(s) of the pickup/delivery or other activity accessed from this parking spot

4.3 – What is the approximate total weight of deliveries from this parking spot?

4.4 – What is the approximate total weight of pickup from this parking spot?

4.5 – What is the approximate total number of boxes/packages/ items delivered and picked-up?

4.6 – Was any special handling equipment used? If so, please describe

4.7 – Did you have difficulty finding a legal parking spot? If so, how long did you spend searching for a spot to parking?

4.8 – Did you have to wait to use a loading zone at this stop? If so, how long did you wait?

4.9 – Do you idle or turn your engine off when making deliveries/pickups? If you do idle, for how long do you do so?

4.10 - Do you understand what the no stopping, standing, parking sign mean?

5.1 – What was the location of your previous stop?

5.2 – What will be the location of your next stop?

5.3 – How many pickups/deliveries/other purpose stops do you expect to have made by the end of today? How many of these are in downtown TO?

5.4 – What are your driving hours for today?

5.5 – What is the location of your depot?

6.1 – What times of the day are the easiest to park legally? The hardest?

6.2 – What makes it hard to park legally at the hardest time of the day? (Select three)

6.3 – Where are the majority of your parked locations at?

6.4 – How many parking tickets do you typically receive daily?

6.5 – Do you agree parking authorities are biased towards commercial vehicles in issuing tickets?

6.6 - Does your company have a parking policy? If so, what is it?

6.7 – What are major barriers for using loading and parking zones?

6.8 – Which area in the downtown is the most frustrating for you to park/load and why?

Appendix E: London - Freight Stakeholder Survey Questionnaire

South London Freight Quality Partnership
Legal Loading Initiative
Stakeholder Survey

Retailer Questions

GOODS IN

What is the nature of your business?

Restaurants / Retail / Services (bank, estate agency, etc.) / Supermarkets /

Others

What vehicles are used to make deliveries to you?

Van up to 3.5t gvw / 2 axles rigid up to 7.5T gvw / 2 axles rigid over to 7.5T gvw /

3/4 axle rigid / artic / drawbar trailer / don't know

How often are goods delivered?

Throughout everyday / Once every day / 2 - 4times per week / Once per week / Less often

Is any particular day especially busy for receiving deliveries?

Monday / Tuesday / Wednesday / Thursday / Friday / Saturday

Not really

At what times of day are goods delivered to you?

Before 7am / 7am - 9.30am / 9.30am - 4.30pm / 4.30pm - 7pm / After 7pm / All through the day

How are the shops serviced?

Using their own vehicles

By a freight operator(s)

Various Suppliers

Prompt: (If they have answered "By a freight operator", ask how many suppliers deliver their goods)

How long do your deliveries normally take?
Prompt for further information: ('Delivery Time' could include time spent in the stock / store room, moving boxes around in the van, unloading, reloading and moving between the vehicle and the store. Also check that the driver is stopping to service just the one store you are surveying.)

Less than 5 minutes / 5 – 15 minutes / 15 – 30 minutes / More than 30 minutes / Variable

How close can your delivery vehicles park to service the shop?

Less than 50m / 50m - 100m / 100m - 200m / More than 200m / Unknown

Which access point do delivery drivers use? (Roadway, side-road, etc.)?

Do delivery drivers meet some problems/conflicts when goods are delivered? Explain?

ACCESS & DELIVERY FACILITIES

Does your business have an adequate off-street collection / delivery area?

Yes No

Can heavy goods vehicles access the delivery area easily?

Yes No

Are you restricted to kerbside access for collections / deliveries?

Yes No

Do you have problems with access restrictions or (un)loading restrictions? What kind?

Would you be interested in co-operative management of delivery bays with neighbouring retailers? Other solutions?

Delivery Driver Questions

PARKING ENFORCEMENT AND RESTRICTIONS

What are your views towards the loading / unloading restrictions for delivery vehicles?

Do you have a particular problem with Penalty Charge Notices (PCNs or parking fines)? How many have you been issued with for parking in this site in the last 12 months?

How, if at all, would you like to see parking restrictions altered in this area for loading / unloading?
(Prompt: Specifically for loading / unloading restrictions (otherwise they may provide a general answer about restrictions for customer parking)).

Do you consider the level of parking enforcement in this area to be adequate for delivery vehicle parking?
(Prompt: Ensure that you are targeting a question about enforcement for delivery vehicles).

Parking Attendant Questions

PARKING ENFORCEMENT AND RESTRICTIONS

Do you focus more on private parking (residents or shoppers) or on commercial vehicles that are loading or unloading?

Do you have different priorities for different times of the day with respect to the type of vehicles enforced?

Section 5

Off-Street Loading Space Regulations

5.1 Number of Loading Spaces

5.1.1 General Requirements

Unless otherwise provided in Schedule C or a CD-1 By-law, in all districts except FCCDD and BCPED the number of spaces for the off-street loading and unloading of motor vehicles required for any development shall be calculated according to section 5.2.

5.1.2 HA District and Sub-area C2 Loading Requirements

In HA Districts and sub-area C2, the Director of Planning may permit or require fewer spaces than in section 5.1.1, where, after considering the recommendations of any advisory group, policies or guidelines approved by Council for the area, he is satisfied that literal enforcement would result in a development that is out of character with the architectural, historical, or cultural nature of the area.

5.1.3 BCPED and FCCDD District Requirements

Unless otherwise provided in an Official Development Plan, the number of spaces for the off-street loading and unloading of motor vehicles required for any development in the BCPED and FCCDD District shall be calculated according to section 5.2.

5.1.4 Uses Not Listed

If a use is not listed in the tables, the number of loading spaces shall be calculated on the basis of a similar use as determined by the Director of Planning.

5.1.5 Multi-Use Developments

For the purposes of this section, uses with the same formula for determining required loading spaces shall be considered to be of the same class. If a development contains more than one use as defined in section 5.2, the total number of loading spaces shall be the sum of the loading spaces required for the various classes of uses calculated separately and, unless otherwise permitted by the Director of Planning, in consultation with the City Engineer, taking into account the time-varying demand of uses, a loading space required for one use shall be deemed not to meet the requirement for any other use in that development.

5.1.6 Floor Area Calculations

Where gross floor area is used to calculate the number of required loading spaces, it shall be calculated in the same manner as the floor space ratio of the applicable district schedule or official development plan.

5.1.7 Rounding of Fractional Numbers

Where the calculation of total required loading spaces results in a fractional number, the nearest whole number above zero shall be taken. Subject to section 5.2.1 or to any other specific requirement of this By-law, a fraction of one-half shall be rounded up to the next whole number.

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Where the calculation of total required loading spaces results in a fractional number, the nearest whole number above zero shall be taken. Subject to section 5.2.1 or to any other specific requirement of this By-law, a fraction of one-half shall be rounded up to the next whole number.

5.1.8 Loading Space Requirement Exemptions

The required number of off-street loading spaces need not be provided where, subsequent to original construction of a building, any additions, alterations or change in use would, in total, result in an increase of less than 10 percent of the number of parking spaces required for the originally constructed building before any addition, alteration or change in use.

5.1.9 Farmers' Market Exemption

A farmers' market is exempt from off-street loading space requirements.

5.2 Table of Number of Required Off Street Loading Spaces

Loading spaces for any building classified in Column 1 must meet the corresponding standard listed in Column 2, except for Fitness Centre - Class 1 that does not include racquet and ball courts, School-arts or self-improvement, Restaurant, Health Enhancement Centre, Health Care Office or Animal Clinic, that consists of less than 200 m², that is commencing business in an existing building in the C-2, C-3A, C-5, C-5A or C-6 zone, and that constitutes a change of use from the previous use in the same premises, in which case the loading standard is at least one Class A space for each 100-200 sq metres of gross floor area.

	Column 1 Building Classification	Column 2 Required Loading Spaces		
		Class A		
5.2.1	Dwelling Use (For the purpose of calculating loading spaces in the Southeast False Creek area illustrated in Map 4.5A, the number of dwelling units is to include the number of live-work units under section 4.5A.5 and social housing units under sections 4.5A.6, 4.5A.7, and 4.5A.8.); .	No Requirement.	No requirement for less than 100 dwelling units. At least one space for 100 to 299 dwelling units; a minimum of one additional space for 300 to 499 dwelling units; and at least one additional space for any portion of each additional 200 dwelling units, except that where one or more parcels of land include multiple buildings that share a parking area or parking garage, the Director of Planning, in consultation with the City Engineer, may allow the loading requirement to be based on the total number of dwelling units in all the buildings.	No requirement.
	Dwelling use in RM-10 and RM-10N	A minimum of one space at grade for sites located on Joyce Street		

	Column 1 Building Classification	Column 2 Required Loading Spaces		
		Class A		
5.2.2	Hotel	A minimum of one space for a hotel with a minimum of 150 sleeping, housekeeping or dwelling units up to a maximum of 249 units, a minimum of two spaces for a hotel with 250 units up to a maximum of 499 units, a minimum of three spaces for a hotel with 500 units up to a maximum of 699 units, and one additional space for any portion of each additional 200 units.	A minimum of one space for a hotel with less than 75 sleeping, housekeeping or dwelling units, a minimum of two spaces for a hotel with 75 units up to a maximum of 399 units, a minimum of three spaces for a hotel with 400 units up to a maximum of 599 units, and one additional space for any portion of each additional 200 units.	No requirement.
5.2.3	Community Care Facility - Class B; Group Residence; School Business; Animal Clinic; Detoxification Centre; Hospital or other similar use; Church, chapel, wedding chapel, funeral home, place of worship, or similar place of assembly; School - Elementary or Secondary; School University or College; Community centre, activity centre, or similar place of assembly; Library, gallery, museum, or aquarium; Theatre, auditorium, Casino - Class 1, hall, club or bingo hall; Stadium, arena, exhibition hall, rink, ring, pool, or similar place with spectator facilities; Fitness Centre, except as provided for in section 5.2.4; School - Vocational or Trade; School - Arts or Self - Improvement.	No Requirement.	No requirement for less than 100 square metres of gross floor area. A minimum of one space for each 2 800 square metres of gross floor area.	No requirement for less than 2 000 square metres of gross floor area. At least one space for each 2 000 square metres to 5 000 square metres of gross floor area for a hospital or other similar use; and at least two spaces for more than 5 000 square metres of gross floor area for such use.

	Column 1 Building Classification	Column 2 Required Loading Spaces		
		Class A	**Class B**	**Class C**
5.2.4	Billiard Hall or Arcade; Bowling Alley or Curling Rink; Racket or Ball Court; Golf Driving Range; Artist Studio; Marina, Sailing School or Boat facilities.	No Requirement.	No requirement for less than 100 square metres of gross floor area. A minimum of one space for the first 4 650 square metres of gross floor area plus one space for any portion of the next 1 860 square metres and one additional space for each additional 2 325 square metres.	No requirement.
5.2.5	Laboratory; Motor Vehicle Repair Shop; Photofinishing or Photography Laboratory; Repair Shop - Class A; Repair Shop - Class B; Retail Uses, except for Neighbourhood Grocery Store; Restaurant or Drive-in Restaurant; Premises, or portions thereof, licensed pursuant to Provincial legislation for the regular sale of liquor; Production or Rehearsal Studio; Manufacturing Uses; Transportation and Storage Uses; Utility and Communication Uses; Wholesale Uses; Work Shop.	No Requirement.	No requirement for less than 100 square metres of gross floor area. A minimum of one space for the first 465 square metres of gross floor area plus one space for any portion of the next 1 860 square metres and one additional space for each additional 2 325 square metres.	No requirement for less than 2 000 square metres of gross floor area. At least one space for 2 000 square metres to 5 000 square metres of gross floor area for a manufacturing use, retail use except for a neighbourhood grocery store, storage warehouse, or wholesale use, separately or in combination; and at least two spaces for more than 5 000 square metres of gross floor area for any such use or combination of uses.
5.2.6	Seniors Supportive or Assisted Housing	No requirement.	A minimum of one space for a facility with less than 200 residential units, and one additional space for any portion of each additional 200 residential units.	No requirement.

	Column 1 Building Classification	Column 2 Required Loading Spaces		
		Class A	Class B	Class C
5.2.7	Office Uses	No requirement for less than 1 000 square metres of gross floor area At least one space for 1 000 to 7 500 square metres of gross floor area; at least two spaces for more than 7 500 to 15 000 square metres of gross floor area; at least three spaces for more than 15 000 to 20 000 square metres of gross floor area; at least four spaces for more than 20 000 to 28 000 square metres of gross floor area; and at least one additional space for any portion of each additional 7 500 square metres of gross floor area.	No requirement for less than 500 square metres of gross floor area. At least one space for 500 to 5 000 square metres of gross floor area; at least two spaces for more than 5 000 to 10 000 square metres of gross floor area; at least three spaces for more than 10 000 to 28 000 square metres of gross floor area; and at least one additional space for any portion of each additional 15 000 square metres of gross floor area.	
5.2.8	Mini-storage Warehouse	A minimum of one space for each 620 m² of gross floor area	A minimum of one space for each 1 860 m² of gross floor area.	No requirement.
5.2.9	Live-Work Use, except in the Southeast False Creek area illustrated in Map 4.5A	No requirement for less than 7 500 square metres of gross floor area. At least one space for 7 500 to 20 000 square metres of gross floor area; at least two spaces for more than 20 000 to 35 000 square metres of gross floor area; and at least one additional space for any portion of each additional 15 000 square metres of gross floor area.	No requirement for less than 5 000 square metres of gross floor area. At least one space for 5 000 to 10 000 square metres of gross floor area; at least 2 spaces for more than 10 000 to 28 000 square metres of gross floor area; and at least one additional space for any portion of each additional 30 000 square metres of gross floor area.	No requirement.

5.3 Location of Loading Spaces

All off-street loading spaces shall be located on the same site as the development or building they are intended to serve.

5.4 Access to Loading Spaces

5.4.1 Access to Loading Spaces

Except as otherwise provided for in section 5.4.2, adequate provision shall be made for unobstructed access by vehicles to all off-street loading spaces by means of a minimum 6.1 metre wide manoeuvring aisle and a loading throat or throats where required if required, and from any lane abutting the site, or from a street where either no lane is present or the Director of Planning, in consultation with the City Engineer, is satisfied that lane access is not possible because of site or development peculiarities.

5.4.2 The design of the ingress and egress route or routes to each Class C off-street loading space must satisfy the Director of Planning, in consultation with the City Engineer.

5.4.3 Loading Access Restrictions - Central Area

Access to loading shall be restricted on those streets and in the same manner as set forth in section 4.6.4.

5.5 Design Standards for Loading Spaces

5.5.1 Size of Loading Spaces

5.5.1.1 Each Class A off-street loading space must be at least 5.5 metres long, 2.7 metres wide, and 2.3 metres high.

5.5.1.2 Each Class B off-street loading space must be at least 8.5 metres long, 3.0 metres wide, and 3.8 metres high, unless the requirement is for only one Class B space and access to loading is from a lane or local street that does not have a directional dividing line in which case the minimum height is 3.5 metres, except that the Director of Planning, in consultation with the City Engineer, may allow a decrease in the length, width, or height of no more than 30 centimetres so long as such dimensions remain adequate to accommodate the largest vehicles intended to occupy the space while loading.

5.5.1.3 Each Class C off-street loading space must be at least 17.0 metres long, 3.5 metres wide, and 4.3 metres high, except that the Director of Planning, in consultation with the City Engineer, may allow a decrease in the width or height of no more than 30 centimetres and in the length of no more than 3.0 metres so long as such dimensions remain adequate to accommodate the largest vehicles intended to occupy the space while loading.

5.5.1.4 The manouevring aisle for each Class C off-street loading space must be at least 14.0 metres wide, except that, for other than right angle loading or if the Director of Planning has decreased the length of the space under section 5.5.1.3, the Director of Planning, in consultation with the City Engineer, may allow a decrease in the width of the manoeuvring aisle.

5.5.1.5 The design of the access and egress route to and from each Class C off-street loading space must satisfy the Director of Planning, in consultation with the General Manager of Engineering Services.

5.5.2 Internal Access to Loading Spaces

Loading spaces shall be located so that each individual occupancy use requiring loading has access within a development to a space and sufficient space to conduct loading and unloading activities within the site.

5.5.3 Setback from Site Boundaries

Except for points of access, all loading spaces and associated manoeuvring aisles not located within a structure shall be uniformly set back from the site boundaries as follows:

(a) from the front boundary of the site, a distance equal to the required front yard for the district in which it is located;
(b) from a flanking street a distance equal to the required side yard on such flanking street for the district in which it is located; and
(c) from a flanking lane or an adjacent property that is in an R district, a distance of 1.25 metres.

5.5.4 Setback from Residential Accommodation

Notwithstanding the conditions of section 5.5.3, all off-street loading spaces shall be located a minimum of 4.6 metres from any window, vent or wall opening providing access to residential accommodation in any building.

5.5.5 Landscaping of Setbacks

Where a loading area is required to be set back from any site boundary or building, the setback area, except for points of access, shall be landscaped and maintained to the satisfaction of the Director of Planning.

5.5.6 Specialized Vehicles

If the operation of any use requires access to loading by specialized vehicles, the Director of Planning, in consultation with the City Engineer, may set height clearances at points of access and loading space sizes appropriate to such vehicles.

Appendix G: City of Vancouver - Development Permit Application

CITY OF VANCOUVER

DE Checklist – Commercial and Industrial Buildings
Updated September 2018

DEVELOPMENT, BUILDINGS & LICENSING

This checklist **MUST** be completed and submitted with your Development Permit Application. If you have any questions regarding the information requested on this form, please call the Services Centre at 604.873.7611.

Project Address:	**Development Application:**

Drawings Required - Required scale 1/4" = 1'0" (1:50) unless otherwise specified in Notes, or if plans exceed standard A2 paper (2'x3') at the above-noted scale, then plans at 1/8" = 1'0' (1:100) scale may be acceptable.				Staff Use Only	
Document	**Copies Required**	**Details**	**Notes**	**Copies Attached**	**Accepted**
Reduced Drawings	1	▪ A complete set of reduced drawings on minimum of 8 ½" x 11" paper, maximum 11" x 17"	Not required in Industrial zones (M or I).		
Site Plan	8	▪ Address ▪ Legal description (found on tax notice) ▪ Street name(s) ▪ North arrow ▪ Dimensions of site ▪ Location and dimensions of all buildings ▪ Required yards, setbacks and building lines ▪ Size and location of all off street parking and loading ▪ Access to parking and loading ▪ Statement of parking and loading ▪ Size of manoeuvring aisles ▪ Existing and finished grade levels ▪ Treatment of open areas, courtyards, pedestrian areas, etc. ▪ Subdivision plan ▪ Location of garbage facilities ▪ Location of fire hydrants and their distance from the subject site ▪ Fire access routes or lanes ▪ Location of Sewer, water and gas lines (new buildings)	This includes principal and accessory building(s). Including paving material. Note: For proposed driveways from a street, contact the Enquiry Centre for Zoning and Development By-law requirements. (A streetscape plan may be required). Required and proposed. Where applicable. Including curbs and paving materials.		
Building Grades Plan	1	▪ Building grades at all four corners of the site will be required. Submission for Development Application will not be accepted without Building Grades Plan.	Contact City Engineering Services at 604-873-7316 for application. http://vancouver.ca/home-property-development/building-grades-for-sidewalk-and-street-elevation.aspx Note: it will take several weeks for building grades to be available and a fee will be required.		

DE Checklist – Commercial and Industrial Buildings cont'd.

Drawings Required – Required scale 1/4" = 1'0" (1:50) unless otherwise specified in Notes, or if plans exceed standard A2 paper (2'x3') at the above-noted scale, then plans at 1/8" = 1'0' (1:100) scale may be acceptable.				Staff Use Only	
Document	**Copies Required**	**Details**	**Notes**	**Copies Attached**	**Accepted**
Survey Plan [Scale NOT less than 1/16" = 1' 0" (1:200)]	8	▪ The PID (The Property Identifier Number) ▪ Legal description (found on tax notice) ▪ Street address, street name(s) and location, as well as location and width of any lane(s) ▪ Dimensions of site and site area, including north arrow ▪ Location and dimensions of all existing buildings on the site ▪ Front and rear yard depth at each corner of the proposed building ▪ Setbacks must be taken from the established building line (where applicable) ▪ Location and elevations at the top and bottom of any existing retaining walls at regular intervals of approximately every 3 metres (10' 0") ▪ Ultimate property line ▪ Lane dedications, registered easements, encroachments and right-of-ways must be indicated on the surveys ▪ Location of existing street crossings ▪ Existing grades at each of the four corners of the site ▪ Existing grades at each corner of the existing and/or proposed principle building envelope (based on Zoning and Development By-law requirements) ▪ Existing grade levels at the four corners of the proposed accessory building envelope ▪ Elevations along the centre line of the lane opposite to the centre line of the accessory building envelope (if lane paved, elevations must also be shown along the centre-line of the gutter) ▪ Location, height & diameter of all stumps 20 cm (8") caliper or greater ▪ Location of all existing trees (including adjacent property trees within 2 m (6.5') of the property line and trees on any City street or lane allowance adjacent to the site) that are 20 cm (8") in diameter or greater (and all multi-branching trees where the combined diameters of the three largest stems equal 20 cm (8") caliper or greater) when measured 1.4 metres (4.5') above the ground ▪ Tree grades (existing tree base elevations) for those trees exceeding 20 cm (8") in diameter that are affected by development ▪ The drip line (crown of trees or extent of tree branches) and species or type of trees, exceeding 20 cm (8")in diameter measured 1.4 m (4.5') above the ground	2 original surveys and 6 copies are acceptable. Especially important where the site dimensions are irregular. Where lane dedications are required, setbacks must be measured from dedication line.		

DE Checklist – Commercial and Industrial Buildings cont'd.

Drawings Required – Required scale 1/4" = 1'0" (1:50) unless otherwise specified in Notes, or if plans exceed standard A2 paper (2'x3') at the above-noted scale, then plans at 1/8" = 1'0' (1:100) scale may be acceptable.				Staff Use Only	
Document	**Copies Required**	**Details**	**Notes**	**Copies Attached**	**Accepted**
Floor Plans	8	▪ All storeys including all levels of underground parking with all outside dimensions of each floor ▪ Indicate all room uses/dimensions, including finished/unfinished areas ▪ Proposed changes or alterations to existing buildings (areas fully dimensioned and outlined or highlighted in red pen) ▪ All door, window and skylight locations ▪ For floors that have sloped ceiling, see notes under cross section ▪ Location of vents, bay or box windows, air conditioning units and/or condensing units ▪ Floor space ratio permitted and proposed for new buildings and additions ▪ Number of dwelling units - existing and/or proposed ▪ Compliance with horizontal angle of daylight regulations for the particular zone in which the building site is located			
F.S.R. Compliance	1	▪ Proof of compliance with F.S.R. May be submitted directly to the Project Coordinator, when assigned. Not required at time of application submission.	Proof of compliance can take the form of colour-coded floor plans cross-referenced to data sheets. Verification using computer generated illustrations or other means acceptable to the Project Coordinator. Refer to bulletin at: http://former.vancouver.ca/commsvcs/BYLAWS/bulletin/a008.pdf		
F.S.R. Exclusion	1	▪ Floor Space Exclusion for additional wall thickness to control Building Envelope Leaks	In order to assist staff in the processing of this exclusion, this information will be required for the review of the development application. Refer to bulletin at: http://former.vancouver.ca/commsvcs/bylaws/BULLETIN/F009.pdf		
Elevations	8	▪ Four elevations, front rear and two sides ▪ Floor levels and height above and below finished grades ▪ Finish details and materials of exterior ▪ Elevation on each floor level, peak of pitched roof or parapet wall of flat roof ▪ Chimney details ▪ Door and window details and sizes ▪ Weather protection ▪ Fencing and accessory building details ▪ Layout of heating, ventilation, air conditioning, mechanical structures or equipment ▪ Detailed elevations of screening	Elevations of all sides of the building if new building or if adding to an existing building, sufficient elevations to clearly represent the proposal. Cellar and basement heights. Existing and proposed.		

DE Checklist – Commercial and Industrial Buildings cont'd.

Drawings Required – Required scale 1/4" = 1'0" (1:50) unless otherwise specified in Notes, or if plans exceed standard A2 paper (2'x3') at the above-noted scale, then plans at 1/8" = 1'0' (1:100) scale may be acceptable.				Staff Use Only	
Document	**Copies Required**	**Details**	**Notes**	**Copies Attached**	**Accepted**
Sections	8	Longitudinal and cross sections should include: ▪ Details of vaulted areas and adjacent attic spaces ▪ Envelope or height protrusions ▪ Bay window, window seats and window well details			
Landscape Drawings	8	▪ Provide a full Landscape Plan illustrating both common and botanical names, sizes and quantity of all proposed plant material ▪ Proposed plant material, paved surfaces, other landscape elements and existing trees must be clearly shown on the Landscape Plan ▪ Existing site contours, landscaping and material to be removed, include size, common name and placement ▪ All landscape elements and details, including new/existing surfaces to be retained, enclosures, site furniture and structures ▪ Location of Sewer, water and gas lines (new buildings)	Refer to Section 7 and 8 of the applicable zoning guidelines: http://vancouver.ca/home-property-development/land-use-and-development-policies-and-guidelines.aspx All landscaping details shown on the survey are to be transferred to the Landscape Plan. The applicant is responsible for the confirmation of all Landscape information.		
Arborist Report	1	▪ Report to include details of existing site trees and adjacent trees (as noted on the survey) and relevant comments as noted in the Protection of Trees By-law Section 7.2	Prepared by an ISA Certified Arborist Not required for applications without site or adjacent trees, or for applications that meet Section 7.3 of the Protection of Trees By-law.		
Streetscape Drawings	8	▪ Graphic and written analysis of the streetscape noting the existing architectural and landscape design patterns and elements	Not required in Industrial zones (M or I).		
Context Plan	8	▪ Drawings showing the relationship of the proposed buildings to surrounding development at front, rear and sides (in plan and elevation) ▪ Windows, uses and private open space in adjacent buildings, including secondary buildings and significant features must be indicated ▪ Room uses of adjacent residential /mixed use buildings (not required in M or I zones)	Not required in Industrial zones (M or I). To ensure that residential privacy issues are dealt with.		

DE Checklist – Commercial and Industrial Buildings cont'd.

Drawings Required – Required scale 1/4" = 1'0" (1:50) unless otherwise specified in Notes, or if plans exceed standard A2 paper (2'x3') at the above-noted scale, then plans at 1/8" = 1'0' (1:100) scale may be acceptable.				Staff Use Only	
Document	**Copies Required**	**Details**	**Notes**	**Copies Attached**	**Accepted**
Parking, Loading and Bicycle Parking Plans	8	Proposed development to comply with Parking By-law and Parking and Loading Design Guidelines for the following: ■ Access to parking and loading (including elevations to verify) ■ Ingress/egress ramp(s), width(s) (including elevations to verify) ■ Ingress/egress ramp(s) grade(s), i.e., not more than 10% slope for the first 20' and 12.5% subsequently ■ Interior ramp(s) grade(s) and width(s) ■ The crossfall and slopes of parking areas and loading bays not to exceed 5% maximum ■ Vertical clearance height for underground parking area (minimum 2 m) and for loading bays (minimum 3.5m) ■ Length and width of parking stalls ■ Length, width and throat width (where applicable) for loading bays ■ Width of manoeuvring aisles for parking stalls ■ Handicapped stall to be clearly designated ■ Curbs having cross-sectional dimensions above the pavement of at least 15 cm (6"), located at least 60 cm (23.6") distant from interior or exterior fences, walls, landscaped areas and buildings ■ Bicycle parking requirements to be complied with ion accordance with section 6 of the Parking Bylaw parking	Off-street passenger spaces are required to be provided in accordance with the Off-Street Passenger Space Regulations for: ■ Special Needs Residential Facility - Community Care - Class B ■ Health Care Office		
Coloured Rendering	1	■ Colour rendering of the front elevation indicating the details of finished materials must be included in at least one set of drawings	Not required in Industrial zones (M or I).		
Design Rationale	8	■ A written statement, with illustrations as needed, conveying the proposal's urban design and architectural concept and its response to the by-law and relevant sections of the applicable guidelines, including justification of request for any discretionary zoning provisions (relaxations, increases, etc.)	Not required in Industrial zones (M or I).		
Charge Summary	1	■ A complete Charge Summary prepared by a solicitor, summarizing "all" the charges listed on title for the subject property	**MUST** be submitted at the time of application for ALL NEW buildings, except new one and two family dwellings.		
Model	1	■ A model of the development and the surrounding buildings	Not required in Industrial zones (M or I).		
Context Photographs and Photos of Existing Buildings	1	■ A set of photos is required ■ Photos showing relationship of the proposed building/s to surrounding development at front rear and sides ■ Four sides of the building ■ Typical views of the property and running streetscape ■ Adjacent streetscape and buildings	Photomontage. Not required in Industrial zones (M or I).		

DE Checklist – Commercial and Industrial Buildings cont'd.

Drawings Required – Required scale 1/4" = 1'0" (1:50) unless otherwise specified in Notes, or if plans exceed standard A2 paper (2'x3') at the above-noted scale, then plans at 1/8" = 1'0' (1:100) scale may be acceptable.				Staff Use Only	
Document	**Copies Required**	**Details**	**Notes**	**Copies Attached**	**Accepted**
View Analysis	8	▪ An analysis of the impact of the development on any existing view corridors or any view impacts on adjacent properties or nearby public open spaces and an analysis of any skyline impacts as seen from afar as they impact sea or mountain views or the crest of any hill	Not required in Industrial zones (M or I).		
Shadow Analysis	1	▪ An analysis of sun and shadow patterns on adjoining properties and the street as well as on usable outside open spaces on the subject site (equinox March 21 and September 21 at 10:00 am, 12 noon and 2:00 pm)	May be required.		
Acoustical Reports	1	▪ An acoustical report must be submitted where required by the Zoning and Development By-law	Not required in Industrial zones (M or I).		
Material and Colour Sample Board	1	▪ All material must be submitted with the Development Application, except the model which must be submitted one week before the scheduled review	Not required in Industrial zones (M or I).		
Site Profile	1	▪ Site Profile must be completed for all demolitions where any Schedule 2 activities have taken place in the past. See the link to the right for more information.	http://vancouver.ca/home-property-development/demolition-deconstruction-permit.aspx		
Written Information	8	▪ FSR statement including accessory uses and amenities ▪ Parking, loading and bicycle parking statement ▪ Statement of dwelling uses (units/types where applicable) ▪ Statement of balconies (where applicable) ▪ Statement of industrial uses to determine accessory use implications (where applicable)	Can be included in technical data statement as shown below.		
Rainwater Management Plan & Supporting Geotechnical Report	3	▪ Finalized Rainwater Management Plan. ▪ Finalized Geotechnical Report.	▪ Each report must be signed & sealed by a qualified engineer. ▪ Not required for applications proceeding from a rezoning that submitted a final Plan at the time of enactment. ▪ For direct DP, applies only to applications within the Cambie Corridor planning boundary. ▪ Refer to the Rainwater Management Bulletin for more information.		

DE Checklist – Commercial and Industrial Buildings cont'd.

Drawings Required – Required scale 1/4" = 1'0" (1:50) unless otherwise specified in Notes, or if plans exceed standard A2 paper (2'x3') at the above-noted scale, then plans at 1/8" = 1'0' (1:100) scale may be acceptable.				Staff Use Only	
Document	**Copies Required**	**Details**	**Notes**	**Copies Attached**	**Accepted**
Hydrogeological Study (Groundwater Study)	3	▪ Finalized Hydrogeological Study that includes: ▪ Finalized Groundwater Management Plan ▪ Finalized Impact Assessment	▪ Must be signed & sealed by a registered professional with experience in hydrogeology. ▪ For projects in select areas only. ▪ Not required for applications proceeding from a rezoning that submitted a final Plan/Study at the time of enactment. ▪ For direct DP, applies only to applications within the Cambie Corridor planning boundary. ▪ Refer to the Groundwater Management Bulletin for more information.		

Technical Data – A technical statement is required on all cover sheets (sample below)

Total Site Area				
Total Floor Space	Permitted		Proposed	
Site Coverage	Permitted		Proposed	
Height	Permitted		Proposed	
Front Yard	Permitted		Proposed	
Rear Yard	Permitted		Proposed	
Side Yard	Permitted		Proposed	

Appendix H: Commercial Drive Business and Goods Movement Survey

CITY OF VANCOUVER

Commercial Drive

Results: Business and Goods Movement Survey

In September, the City of Vancouver conducted a Business and Goods Movement Survey, as part of the Commercial Drive Complete Street Project. The survey results will help us better understand the loading, delivery, parking, and access needs of local businesses.

Notification about the Business and Goods Movement Survey was hand delivered by City staff and mailed to over 400 businesses along Commercial Drive between Venables Street and E 14th Avenue.

Thank you to everyone who took time to respond. This letter provides a summary of what we heard.

83 surveys completed

69 partially completed surveys

Purpose:

To understand the commercial loading, delivery, parking, and access needs of Commercial Drive businesses.

WHAT WE HEARD

- Diverse range of businesses have different commercial loading and delivery access needs.
- Loading zones are heavily used and are reported as inaccessible by some businesses.
- Loading and deliveries often occur on-street in metered parking spaces.
- Many businesses report wanting more loading zones.
- Some businesses do not want to trade customer parking (i.e. on-street metered parking) for additional commercial loading zones.
- Discontinuous lanes or alleys mean not all businesses have rear or side access.
- Some businesses reported that lanes function poorly for loading.
- Some businesses are concerned that a protected bike lane will lead to loss of parking and loading space.

HOW WE ARE SHARING THE RESULTS

This newsletter is being distributed to over 400 businesses along Commercial Drive:

- In the **mail**,
- Via **email**,
- At a business owner/manager **drop-in event** on December 12, 2016. (See last page for event details).

BUSINESS OWNER/MANAGER DROP-IN EVENT

Come discuss loading, laneways, parking, and transportation improvements along Commercial Drive with City staff. **Monday December 12, 2016** at the **Canuck Family Education Centre at Britannia, 1655 William Street** from **8:30am-4:00pm and 6:30pm-8:00pm**

CITY OF VANCOUVER

Commercial Drive

Results: Business and Goods Movement Survey

COMPLETE STREET PROJECT GOALS:

- Increase the safety and comfort for people of all ages and abilities using all types of transportation
- Allow people convenient access to shops and services
- Maintain and enhance the vitality of the street
- Ensure local businesses continue to thrive

3 THINGS TO KNOW ABOUT THE COMMERCIAL DRIVE COMPLETE STREET PROJECT

- The Complete Street Project is looking at transportation improvements for people walking, cycling, and taking transit, with a focus on improving safety and enhancing public spaces.
- The Complete Street Project will try to minimize the loss of parking to allow access to shops and services, and create an environment where businesses will thrive.
- Key stakeholders involved in the project include: local businesses, residents, the general public, the Commercial Drive Business Society, TransLink, and the newly formed Grandview-Woodland Transportation and Neighbourhood Parking Stakeholder Advisory Group.

WHAT'S NEXT

The City will take feedback from the business surveys and public open house events, and online feedback forms to draft Complete Street design concepts. We expect to bring the draft design concepts back to the community and stakeholder groups in early 2017.

To view information on the Commercial Drive Complete Street Project, visit:
vancouver.ca/commercial-complete-street
Questions or comments?
Contact us by phone at **3-1-1** or
e-mail **commercialdrive@vancouver.ca**

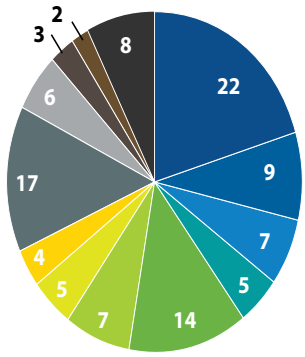
CITY OF VANCOUVER

Commercial Drive

Results: Business and Goods Movement Survey

Business and Goods Movement Survey Summary
Completed September 6 - 30, 2016.

1. Please choose the one category below that best describes your business:



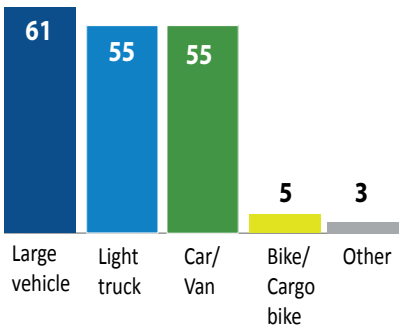
Total responses = 99

Other:

- Tattoo and body piercing
- Cannabis dispensary and wellness centre
- Business Improvement Area – offices
- Retail musical instrument store
- Auto shop / motorcycle sales service , parts and riding gear
- Liquor store/ wine boutique
- Importer and distributor
- Storage

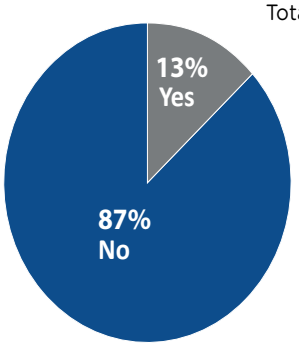
2. At your business, how are your commercial supplies or goods delivered or picked up?

Total responses = 98



3. Do you have a dedicated loading zone available off-street?

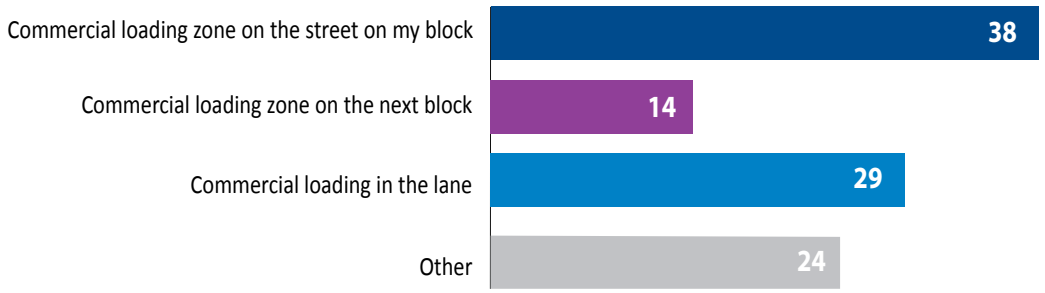
Total responses = 98



3

4. What types of loading zones does your business have available to use?

Total responses = 92

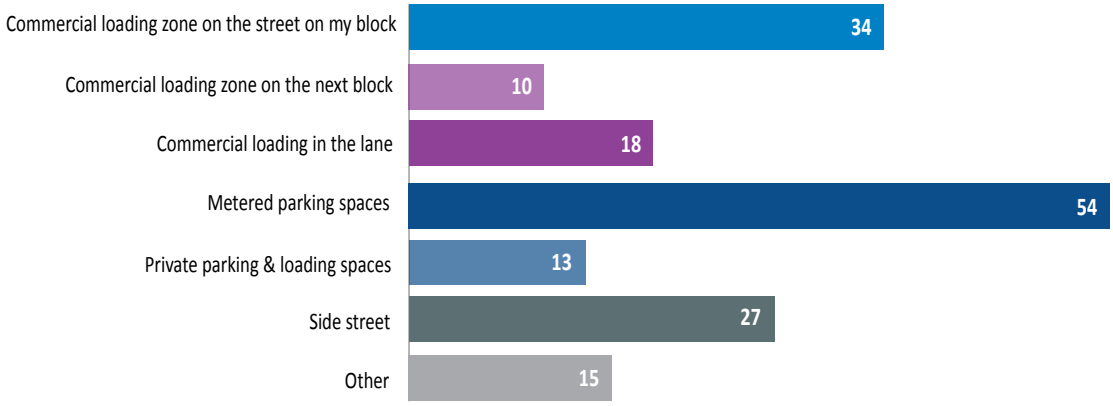


Other:

- No commercial loading available
- Metered parking in front of business
- Bus stop in front of business
- Parking lot
- N/A

5. When vehicles are delivering or picking up supplies or goods from your business, what type of parking do they use most often?

Total responses = 92



Other:

- Illegal stopping in lane/double parking
- Semi truck fills up the alley
- In front of 24hr “no stopping zone”
- Metered parking in front of business
- Bus stop in front of business

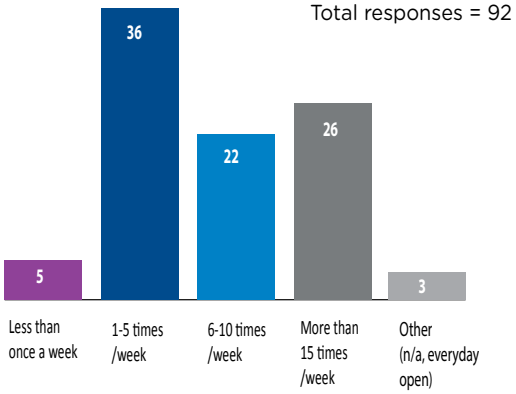
CITY OF VANCOUVER

Commercial Drive

Results: Business and Goods Movement Survey

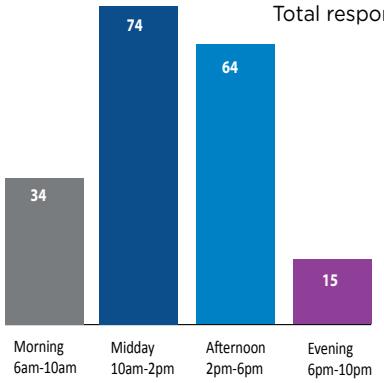
6. In a typical week, how often are commercial supplies or goods delivered or picked up from your business?

Total responses = 92



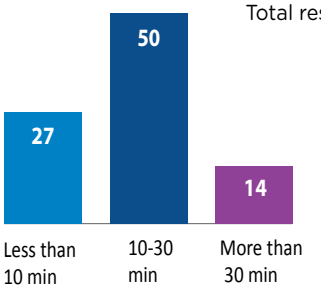
7. What time of day are commercial supplies or goods most frequently delivered or picked up from your business?

Total responses = 92



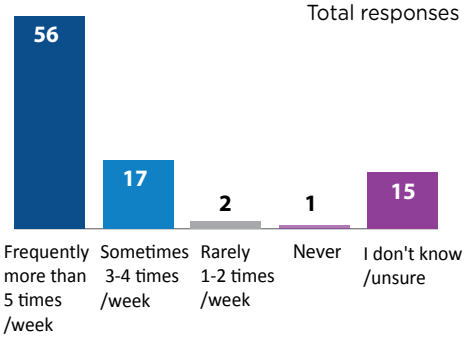
8. Generally, how long does it take to have supplies or goods delivered and picked up from your business?

Total responses = 91



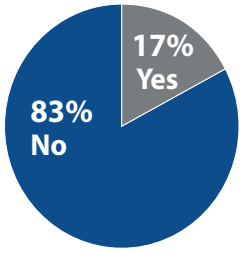
9. How often are the loading zones used by your business occupied by other users or customers?

Total responses = 91



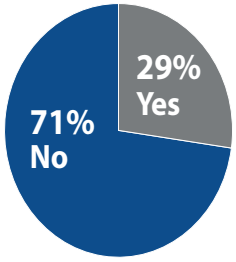
10. Do you have dedicated customer parking spots available off-street?

Total responses = 91

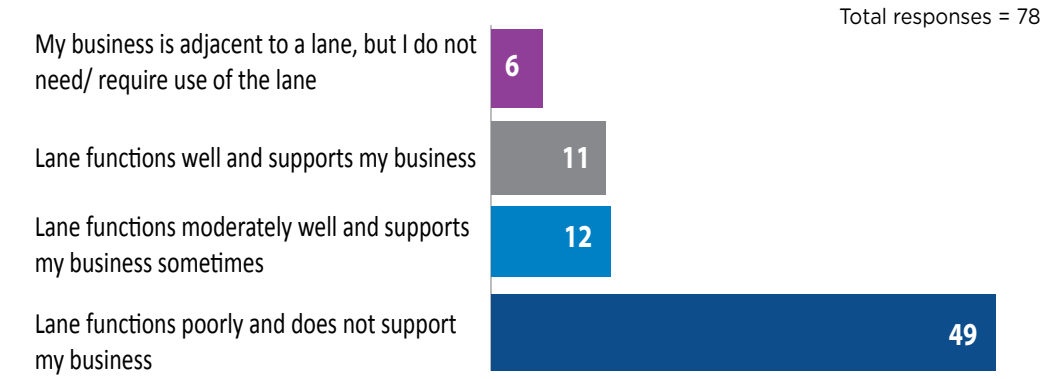


11. Do you have dedicated employee parking spots available off-street?

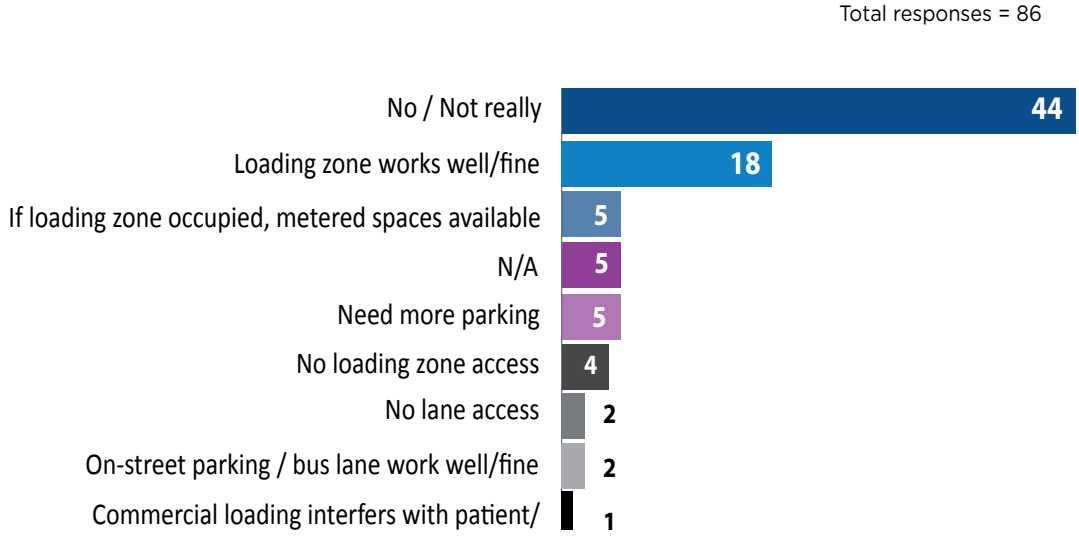
Total responses = 91



12. If your business has direct access to a laneway, what statement best describes the function of the lane?



13. Are there other aspects of your current commercial loading **that work well** for your business?



14. Are there aspects of your current commercial loading that **could be improved** for your business?

15. Do you have other comments you would like to add?

Total responses = 84

- "We would be willing to lose a metered parking spot in exchange for a loading spot on the street, as there is no back lane, and nowhere for delivery vehicles to park. Many of our delivery drivers get parking tickets while trying to deliver to us."
- "We already have extremely limited parking available... a commercial loading zone that further limits available customer parking will be detrimental."
- "As a business owner, I should be granted a parking permit and leave my space open for a visitor shopping in the neighbourhood. I sense that a lot of spaces are taken by staff and owners without parking."
- "It's not so much commercial loading that affects us but 'human loading and unloading' we have a lot of people in wheelchairs and with walkers and there is often no space for their caregivers to park either on Commercial Drive or 14th."
- "Our recycling and garbage removal trucks often cannot access the alley due to high traffic, resulting in 'blocked access' charges for us and there is not much we can do except hope for more available free parking spaces so people wont have to block our space to try to get free parking. We cannot monitor and control who is blocking the laneway 24/7."
- "My business would not exist on the street without parking."

15. Continued ...

- "We receive deliveries from multiple suppliers throughout the week (M-F) that are critical to the efficiency of our business and ultimately to our customer. It can already be a challenge to receive deliveries effectively and for customers to find parking easily on The Drive close to our location. We hope that access for our deliveries and customers not be impacted negatively by any development or redesign of the street including bike lanes that are already within easy access and close proximity."
- "We need as much customer parking and commercial loading zones as possible to function efficiently."
- "Receiving our goods is always very difficult and we are subject to many delays because of other delivery trucks, customers trying to find parking and pedestrians."
- "There is no 'loading/unloading' availability or lane behind our building. If our Commercial Loading zone was taken from us it would be devastating to our business and ability to operate."
- "Not enough street parking availability."
- "There is nowhere near enough customer parking as it is. There are all kinds of customers who come from outside the area who will NOT bike to Commercial Dr. There are local residents who also depend of parking as they are buying goods that cannot be transported on a bike."

BUSINESS OWNER/MANAGER DROP-IN EVENT

Come discuss loading, laneways, parking, and transportation improvements along Commercial Drive.

City staff will be available to go over the survey results, discuss the Complete Street Project, and help identify improvements for your block.

Monday December 12th, 2016
Canuck Family Education Centre at Britannia
1655 William Street (Eastside Family Place on Grandview Park)
8:30am-4:00pm and 6:30pm–8:00pm

CONTACT
To view information on the Commercial Drive Complete Street Project, visit:
vancouver.ca/commercial-complete-street
Questions or comments? Contact us by phone at **3-1-1**
or e-mail **commercialdrive@vancouver.ca**

Appendix I: City of Vancouver - Commercial Loading Decal Application

CITY OF VANCOUVER

Company Name: _____

Name of contact: _____

Phone number: _____

MULTIPLE VEHICLE DECAL APPLICATION

*Copy of valid ICBC insurance for all vehicles must be submitted along with this form

	Applicant to Complete						Office Use Only		
	A	B	C	D	E	F			
	ICBC Registration #	Gross Vehicle Weight (GVW)	Provincial Licence Plate #	Signage on vehicle Y/N	If no signage, existing Commercial Plate #	New Comm Plate req'd Y/N	Municipal Decal	Commercial Permit Decal	New Plate Number
1									
2									
3									
4									
5									
6									
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453 West 12th Avenue Vancouver BC V5Y 1V4
Tel:3-1-1, Outside Vancouver: 604.873.7000 Fax: 604.873.7142
Email: commercial.decal@vancouver.ca Website: vancouver.ca

MULTIPLE VEHICLE DECAL APPLICATION INSTRUCTIONS

Column	Description	Instructions
A	ICBC Registration number	Write the full ICBC Registration number. Include any zeros.
B	Gross Vehicle Weight (GVW)	From ICBC paperwork, write the Gross Vehicle Weight. If there is no GVW, write the Net Vehicle Weight (NVW) instead.
C	Provincial Licence plate number	From ICBC paperwork, write the full Provincial Licence plate number.
D	Signage* on vehicle (Y/N)	Write "Y" for yes, "N" for no. An unsigned vehicle requires a Commercial Permit plate
E	Existing Commercial plate number	If the vehicle has previously been issued a Commercial Permit plate, record the plate number, otherwise leave blank.
F	New Commercial Plate required? (Y/N)	Write "Y" for yes, "N" for no. Yes if vehicle needs a new Commercial Permit plate or if existing plate has been damaged and needs to be replaced.

* Signage affixed to the vehicle is considered Permanent Signage and valid if:
- includes business name and address
- is on both sides of vehicle
- is no less than 5 cm (2 in) high
- is affixed to the vehicle with:
    - High-performance pressure sensitive vinyl
    - Reflective sheeting
    - Painted enamel

!magnetic signs are not permanent and are unsuitable under this bylaw!

Submit completed form with photocopies of current ICBC registration and insurance documents for all vehicles:

- by email to commercial.decal@vancouver.ca
- by fax to 604.873.7142 (provide contact name & phone number on the cover sheet)
- or in person to Revenue Services

Please allow up to seven days for processing.
We will contact you when your decals (and plates) are ready for pick up.

CoV Urban Freight Broadway Pilot

Inventory Survey Form

Part 1: Location and Identification

P1Q1. Survey Date

P1Q2. Survey Time

P1Q3. What is the ID code for this facility? (STREET-BLOCKLEVEL-TYPE-#) or (STREET/STREET-BLOCKLEVEL-ALLEY-#)

P1Q4. Is this an alleyway?

- ○ Yes
- ○ No

P1Q5. How is the infrastructure accessed?

- ○ Alleyway
- ○ One-way Alleyway
- ○ Street
- ○ Street - Arterial
- ○ Parking Lot

P1Q6. If the answer is Alleyway, One-way Alleyway, or Parking lot, what is the name of the closest cross-street to access the loading facility?

P1Q7. What side of the alleyway is the infrastructure on?

- ○ North
- ○ East
- ○ South
- ○ West

P1Q8. If the answer is Street or Street - Arterial, what is the name of the street?

P1Q9. Capture GPS coordinates of the infrastructure from the Northeast corner

P1Q10. Is this an informal loading space?

- ○ Yes
- ○ No

P1Q11. Is the loading infrastructure public or private?

- ○ Public
- ○ Private

Part 2: Public Loading Infrastructure

Part 2.1 Curbside

P2.1Q1. Capture GPS coordinates of the loading zone by dropping location pin at the front of the curb

P2.1Q2. Capture GPS coordinates of the loading zone by dropping location pin at the end of the curb

P2.1Q3. How many vehicles does this zone accommodate?

P2.1Q4. What is the total length of the loading zone?

P2.1Q5. Are there time restrictions? (format eg. 7am-6pm, MON-SAT)

- ○ Yes
- ○ No

P2.1Q5. If "yes", what are the time restrictions?

P2.1Q6. If "yes", take a picture of the time restriction

P2.1Q7. Take a photo of the curbside loading zone

Part 2.2 Alleyways

P2.2Q1. Is the alleyway shown on the base map?

- ○ Yes
- ○ No

P2.2Q2. What is the name of the street that intersects with the alleyway's first access point?

P2.2Q3. Capture GPS coordinates of alleyway first access point by dropping location pin at the curb

P2.2Q4 Take a photo from the alleyway's first access point

P2.2Q5. Is there an indication that it is a one-way alleyway?

- ○ Yes
- ○ No

P2.2Q6. If "yes", take a photo of the indication

P2.2Q7. What is the name of the street that intersects with the alleyway's second access point?

P2.2Q8. Capture GPS coordinates of alleyway's second access point

P2.2Q9. Take a photo from the alleyway's second access point

P2.2Q9. Is this lane a signed commercial lane?

- ○ Yes
- ○ No

P2.2Q10. If "yes", take a picture of the sign

P2.2Q11. Is there a height or clearance restriction to enter this alleyway?

- ○ Yes
- ○ No

P2.2Q12. If "yes", what is the clearance?

P2.2Q13. Do you feel safe entering the alley?

- ○ Yes
- ○ No

P2.2Q14. Are there any obstructions inside the alleyway?

- ☐ Construction
- ☐ Gate/Fence
- ☐ Blocked by a vehicle
- ☐ Pavement condition
- ☐ Other
- ☐ None

P2.2Q15. Are there other objects present in the alleyway?

- [ ] Bollards
- [ ] Debris
- [ ] Street furniture
- [ ] Dumpsters
- [ ] Garbage cans/bins
- [ ] Other
- [ ] None of the above

P2.2Q16. What is the functional width of the narrowest point of the alleyway?

Part 3: Private Loading Infrastructure

P3Q1. Is there a gate, roll-up, corridor, or garage doors to access the infrastructure?

- ○ Yes
- ○ No

P3Q2. If "yes", take a picture of the entrance to the loading facility

P3Q3. If "yes", what is the vertical clearance of the entrance?

P3Q4. If "yes", what is the horizontal clearance of the entrance?

P3Q5. If there is a sign of maximum vertical clearance allowed to access the infrastructure, take a picture

P3Q6. Are there any visible security measures that limit the usage of the infrastructure by a delivery vehicle?

- [ ] Physical barrier
- [ ] Access Code/Pass
- [ ] Personal Interaction
- [ ] None
- [ ] Other

P3Q7. Is the infrastructure visible or partially visible?

- ○ Yes
- ○ No

P3Q8. If "no", take a picture of the indication of a dedicated loading/unloading and proceed to P3.1 Undefined Infrastructure

P3Q9. If "yes", take a close-up picture of the loading facility

P3Q10. What is the level of the infrastructure respective to the street?

- ○ Substructure (below street)
- ○ Superstructure (above street)
- ○ Street Level

P3Q11. How many commercial vehicles can this facility accommodate?

- ☐ Unsure
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7
- ☐ 8
- ☐ 9
- ☐ 10
- ☐ 11

P3Q12. What kinds of commercial vehicles can this facility accommodate?

- ☐ Vans/Pickup Trucks
- ☐ Light Trucks
- ☐ Heavy Trucks
- ☐ Unsure

P3Q13. Is the infrastructure inside the building?

- ○ Yes
- ○ No

Part 3.1: Undefined Infrastructure

P3.1Q1. Is there a door for truck access?

- ○ Yes
- ○ No
- ○ Unsure

P3.1Q2.If "yes", take a picture of the door

P3.1Q3.If "yes", input door height

P3.1Q4. If "yes", input door width

P3.1Q5. Is this facility likely a loading bay?

- ○ Yes
- ○ No
- ○ Unsure

Part 3.2: Loading Bays

P3.2Q1. What is the vehicle entrance maneuverability?

- ☐ Drive In

- [ ] Back In
- [ ] Unsure

P3.2Q2. What is the entrance angle respective to traffic flow?

- ○ Perpendicular
- ○ Parallel
- ○ Angled

P3.2Q3. Is there a door for truck access?

- ○ Yes
- ○ No
- ○ Unsure

P3.2Q4. If "yes", take a picture of the door

P3.2Q5. If "yes", how many loading spaces have direct access to a truck door?

P3.2Q6. What is the truck door height?

P3.2Q7. What is the truck door width?

P3.2Q8. Is there a loading dock?

- ○ Yes
- ○ No

P3.2Q9. Number of truck spaces with direct access to loading dock platform

P3.2Q10. What is the dock height?

P3.2Q11. Take a picture of the dock

Part 3.3: Exterior Loading Area or Dock

P3.3Q1. What type of facility is it?

- ○ Exterior Loading Area
- ○ Exterior Loading Dock

P3.3Q2. Is the infrastructure partially or completely covered?

- ○ Yes
- ○ No

P3.3Q3. If "yes", What is the minimum clearance between coverture and ground of parking space?

P3.3Q4. Is there a loading dock?

- ○ Yes
- ○ No

P3.3Q5. Total number of truck spaces with direct access to loading dock platform

P3.3Q6. What is the dock height?

P3.3Q7. Take a picture of the dock

P3.3Q8. Is there a door for truck access?

- ○ Yes
- ○ No
- ○ Unsure

P3.3Q9. If "yes", how many loading spaces have direct access to a truck door?

P3.3Q10. If "yes", what is the door height?

P3.3Q11. If "yes", what is the door width?

Part 4: Informal Loading Spaces

P4Q1. Take a photo of the informal loading space

P4Q2. Take a photo of any indications of loading activity taking place at this location

P4Q3. Is there indication or signs of the following official uses of this space?

- [ ] Employee parking
- [ ] Customer parking
- [ ] Other
- [ ] None of the above

P4Q4. How many commercial vehicles could this space accommodate?

P4Q5. What kinds of commercial vehicles can this facility accommodate?

- [ ] Vans/Pickup Trucks
- [ ] Light Trucks
- [ ] Heavy Trucks
- [ ] Unsure

P4Q6. Did you observe loading activity taking place here during your observation?

- ○ Yes
- ○ No
- ○ Unsure

Part 5: Additional Information

P5Q1. What is the land use of the adjacent building?

- [ ] Residential
- [ ] Commercial

P5Q2. If

- [ ] Retail
- [ ] Grocery Store
- [ ] Offices
- [ ] Restaurant/Cafe
- [ ] Medical
- [ ] Other

P5Q3. Were there any negative altercations or issues experienced when conducting the data collection for this site?

- ○ Yes
- ○ No

P4Q4. Were there any illegal loading activities observed when conducting the data collection for this site?

- ○ Yes
- ○ No

P5Q5. If "yes", what kind of illegal loading activity did you witness?

- [ ] Double parking
- [ ] Time restriction
- [ ] Usage restriction
- [ ] Sticking out into traffic
- [ ] Sticking out past the loading area
- [ ] Other

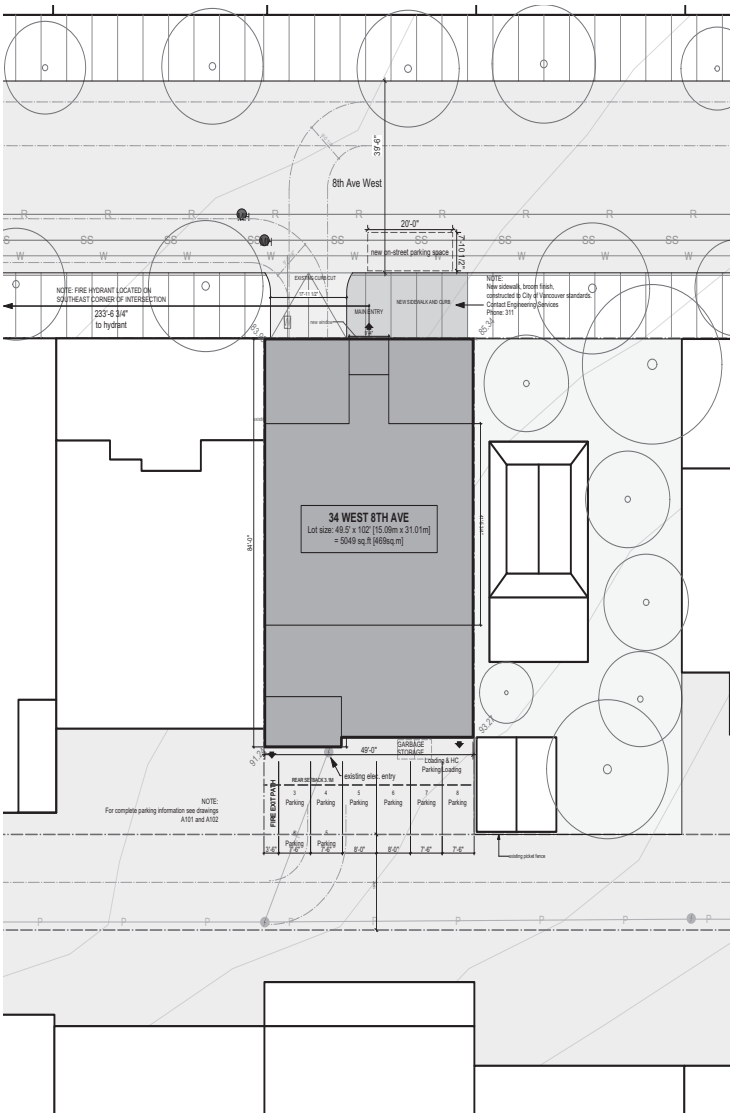
P5Q6. Any Additional Observations

P4Q7. Is a follow up required? (all undefined infrastructures require follow up with development permit)

- ☐ Yes - Second site visit
- ☐ Yes - Online via Google Maps
- ☐ Yes - Online via development permit
- ☐ Yes - Contact the associated business
- ☐ No

P4Q8. If yes, what is the address of the adjacent building?

Appendix K: 34 W8th Broadway Development Application



Site Plan
Scale: 1/16" = 1'-0"

OWNER

34 West 8th Holdings Ltd.
m: 2861 West 6th Ave., Vancouver, BC V6K 1X2
Contact: Ian Moodie, Managing Director, ianmoodie@outlook.com

ARCHITECT

PLATFORM architecture + design ltd.
m: 409-2181 W. 12th Ave.,Vancouver, BC V6K 4S8
o: 1394 Kingsway, Vancouver, BC V5V 3E4
t: 778.885.4066
Architect: Jesse Garlick, jesse@p4ma.com

BUILDING CODE SUMMARY

Code Standard:	Vancouver Building By-Law 2014	
Major Occupancy:	Group F, Division 2	Light Manu.
Subsidiary Uses:	Group D	Office
Building Height:	Three Storeys + basement	
Building Area:	4054ft²	
Construction Type:	Combustible	
Fire Protection:	Not Sprinklered	

SITE INFORMATION

ADDRESS:
34 W. 8th, Vancouver, BC

LEGAL DESCRIPTION:
Lot 5, Block 49, DL 200A Group 1, Plan 197, NWD

PLANNING AND BYLAW SUMMARY

CURRENT USE:	Recording Studio/Offices
PROPOSED USE:	Software manufacturing/Offices

FLOOR SPACE RATIO

Max	Existing	Proposed
3.00	2.18	2.38

SITE COVERAGE

Site Area	Bldg. Footprint	Coverage
5049 ft²	4052 ft²	80%

BUILDING HEIGHT

Building height allowable	18.3m (60')
Building height existing	13.94m (45'9")
Building height proposed	13.94m (45'9")

ZONING SUMMARY

Municipality:	City of Vancouver
Development Zone:	I-1

SETBACKS:

	Reqd.	Exist.	Proposed
Front (N):	n/a	0.0m	0m
Side (E):	n/a	.08m	.08m
Side (W):	n/a	.17m	.17m
Rear (S):	3.1m	6.5m	6.5m
	*refer to legal survey		

PARKING:

	Reqd.	Exist.	Proposed
car	14	10*	8+1**
bicycle	2	none	16 (Class A)

LOADING:

Reqd.	Exist.	Proposed
1	1	1

*including loading space
**proposed design creates one additional on-street parking space

NOTE:
For floor area summaries, see sheet A004

GENERAL NOTE

All work to comply with the current edition of the Vancouver Building Bylaw, the National fire code of Canada, and all current covering building codes, regulations, by-laws and referenced standards.

DRAWING LIST

A001	COVER PAGE + SITE PLAN + NOTES
A002	SITE SURVEY
A003	CONTEXT BOARD
A004	FLOOR AREA OVERLAYS
A101	BASEMENT PLAN + DEMO PLAN
A102	1ST FLOOR PLAN + DEMO PLAN
A103	2ND FLOOR PLAN + DEMO PLAN
A104	3RD FLOOR PLAN + DEMO PLAN
A105	ROOF PLAN + DEMO PLAN
A201	BUILDING SECTIONS
A202	BUILDING ELEVATIONS
A301	WALL SECTIONS

LEGEND

SS	Sanitary line		Access
R	Storm line	CB	Catchbasin
W	Water line	VB	Valvebox
	Existing vegetation		
	Neighbouring building		
	Property line		
	Existing hydro pole		
MH	Manhole		

ISSUED FOR DEVELOPMENT PERMIT
JAN 7, 2016

Appendix L: Data and Asset Mapping

Ash Street - Yukon Street

Legend

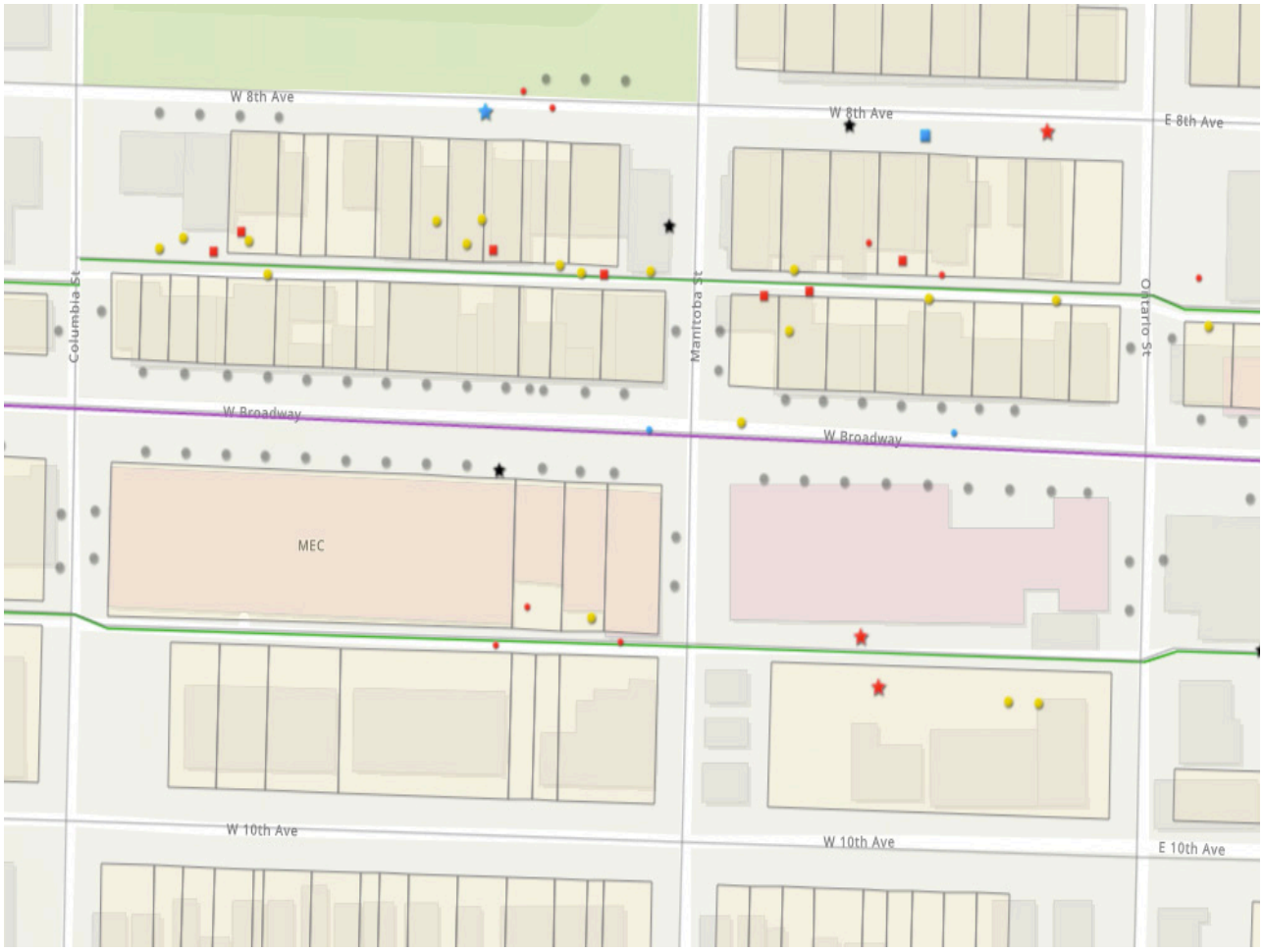
- Private Loading Facilities
  - Loading Bays
  - Exterior Loading Areas
  - Exterior Loading Docks
- Informal Loading Areas
- City Managed Curbside Zones
  - Commercial Loading Zones
  - Loading Zones
  - Passenger Zones
- Commercial Lanes
- Undefined Infrastructure
- Truck Routes
- Parking Meters
- Property Parcels

Yukon Street - Columbia Street

Legend

- Private Loading Facilities
  - Loading Bays
  - Exterior Loading Areas
  - Exterior Loading Docks
- Informal Loading Areas
- City Managed Curbside Zones
  - Commercial Loading Zones
  - Loading Zones
  - Passenger Zones
- Commercial Lanes
- Undefined Infrastructure
- Truck Routes
- Parking Meters
- Property Parcels

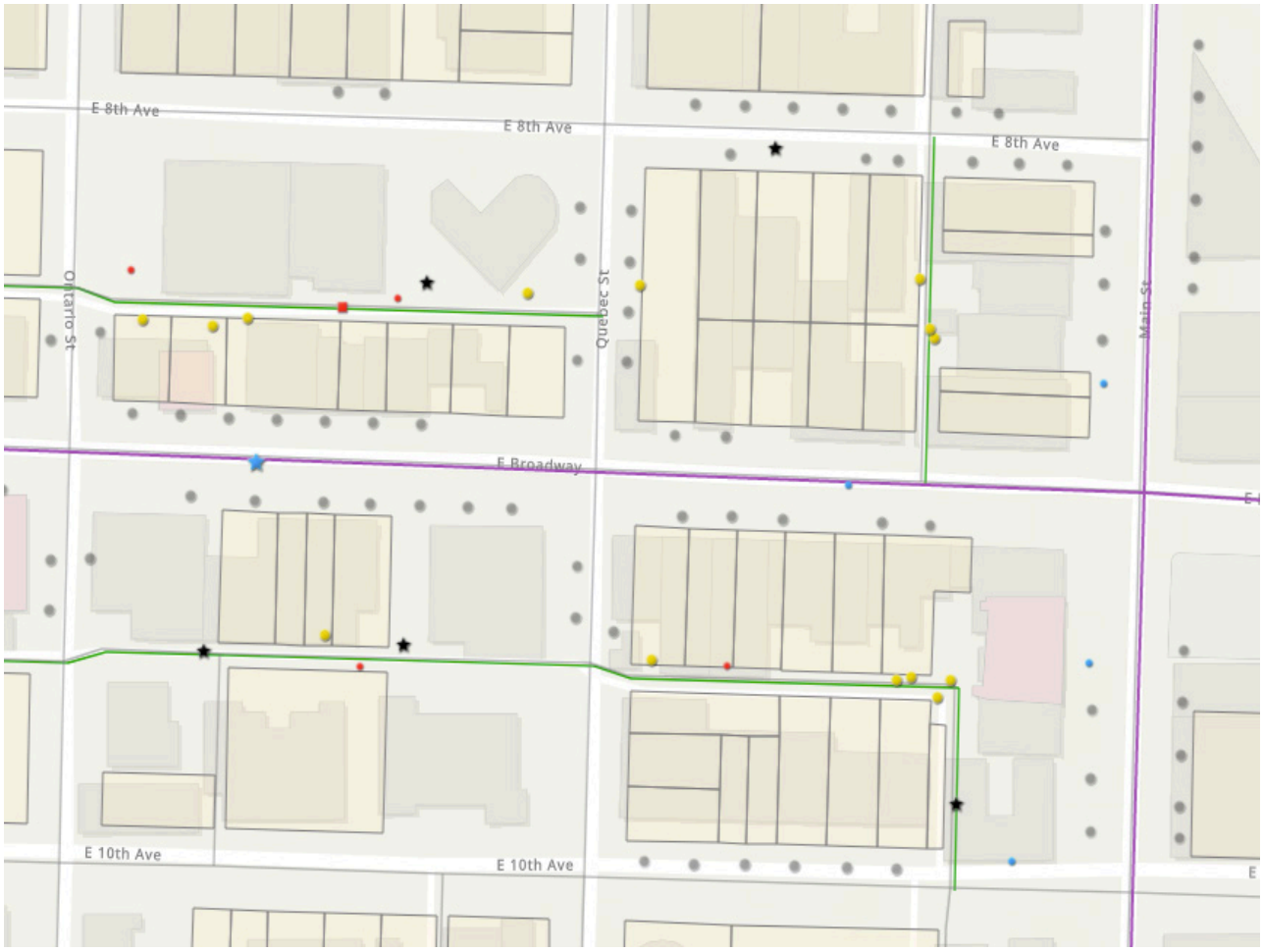
Columbia Street - Ontario Street



Legend

- Private Loading Facilities
  - Loading Bays
  - Exterior Loading Areas
  - Exterior Loading Docks
- Informal Loading Areas
- City Managed Curbside Zones
  - Commercial Loading Zones
  - Loading Zones
  - Passenger Zones
- Commercial Lanes
- Undefined Infrastructure
- Truck Routes
- Parking Meters
- Property Parcels

Ontario Street - Main Street



Legend

- Private Loading Facilities
  - Loading Bays
  - Exterior Loading Areas
  - Exterior Loading Docks
- Informal Loading Areas
- City Managed Curbside Zones
  - Commercial Loading Zones
  - Loading Zones
  - Passenger Zones
- Commercial Lanes
- Undefined Infrastructure
- Truck Routes
- Parking Meters
- Property Parcels

Appendix M: List of Notable Urban Freight Management Strategies

1. **Urban Freight Sensor Project | Seattle**[33]
   The Urban Freight Lab was awarded a grant for $1.5 million to install sensor technology in Commercial Vehicle Load Zones. The goal of this project is to reduce the time searching for available load zones. This project also has the opportunity to collect valuable data. Seattle is currently seeking proposals and partnerships for the purchase, installation, and maintenance of vehicle detection sensors to monitor and provide real-time occupancy data for on-street load zones for a pilot project. The pilot project will serve to inform both the City and the University of Washington Urban Freight Lab about how sensor equipment can improve urban freight processes.

2. **Freight on Transit | Toronto**[34]
   This research project began at the University of Toronto where a web-based approach was used to obtain expert assessments of the benefits, challenges, and opportunities of freight on transit. The main advantages of freight on transit are reduced congestion, emissions, delivery time, and delivery cost.

3. **Health Consolidation Centre Feasibility Study | Toronto**[36]
   Freight consolidation is the concept of combining shipments in order to create more efficient routes for goods movement. This particular study examined the potential for freight consolidation in major hospitals in downtown Toronto. It was determined that the consolidation of goods has the potential to reduce the number of trucks in a given area, thereby reducing congestion and greenhouse gas emissions. The study reviewed delivery patterns, current practices, and identified opportunities to improve efficiencies.

4. **Off-Peak Delivery: A Pilot Project for the Chicago Region | Washington D.C.**[37]
   Washington D.C. is currently recruiting businesses to participate in an off-peak delivery pilot program. This program will offer a sliding scale of incentives that may range from a large one-time incentive to pay for facility or equipment changes to enable unassisted overnight deliveries to smaller incentives for night-time staff to receive deliveries. This short-term initiative has the potential to reduce illegal parking and reduce peak hour traffic with no interruption of deliveries.

5. **Efficient Delivery Toolkits | London**[38]
   Since 2015, the City of London's re-timing deliveries program has helped to re-time businesses at over 500 sites, moving 166,000 deliveries out of the peak times each year. Additionally, in partnership with Business Improvement Districts, the City of London has identified four ways for businesses to streamline their deliveries: Complete a delivery monitoring survey to get a full picture of deliveries and service visits, reduce the frequency of deliveries, reduce the number of suppliers, reducing personal deliveries.

6. **Consolidation Centers | London**[39]
   The City of London has implemented consolidation centers in Bristol and Bath Consolidation Centre, the London Borough Consolidation Centre, and Regent Street Clipper Consolidation. A major engagement exercise with City businesses is underway to promote and encourage the use of a consolidation service. This will include the development of a consolidation toolkit for City businesses, informed by monitoring of the benefits arising from consolidating deliveries to the existing Guildhall complex. The City of London intends to continue to use the planning process to require all new major developments to use a consolidation service to reduce deliveries to their buildings.

7. **Cargo Cycle Delivery Scheme Christmas Pilot | London**[40]
   This scheme is part of the City of London's plans for a Low Emission Neighborhood and is jointly funded by the Mayor of London and the City Corporation. In December 2017, the City of London paid the fees to purchase the bikes, covered the initial costs of the operator, and offered credit to businesses for free deliveries by cargo cycle. Following the success of this pilot project, the city of London is preparing for a longer 2-year lease at Smithfield's Market. The goal of the project is to offer local businesses fast, efficient and cost-effective delivery and distribution services within central London while providing zero-emission services that help to address the critical issues of congestion and air pollution.

8. **NYCDOT Midtown Commercial Vehicle Parking Program | New York**[41]
   This curbside management initiative replaced single-space parking meters with ticket dispensing "muni-meters". These meters allow commercial vehicle operators to purchase prepaid parking tickets for up to three hours. To promote curb-space turnover, an escalating pricing rate structure of $2 for 1hr, $5 for 2hrs, and $9 for 3hrs was introduced at these muni-meters. After the implementation of these muni-meters, the average duration of curbside occupancy decreased from 160 to 45 minutes. The increased turnover of the valuable curbside space helps drivers find loading areas and spend less time looking for parking.

9. **Designating THRU and non-THRU Streets | New York**[42]
   In Fall 2020, THRU Streets for cross-town travel and institute policies were implemented along designated streets. This allowed NYCDOT to classify "non-THRU" streets that were designated curbside areas for truck loading/unloading. By adding muni-meters and parking restrictions to both sides of streets that previously had parking on one side, the City created 150 additional spaces for loading and unloading. As a result, enhance loading and unloading on non-THRU streets as well as a significant reduction in travel time and crashes.