CURB OCCUPANCY TOOLKIT

Toolkit contents:

2.1. Seattle project synopsis

Seattle is widely thought to be the first city in the U.S. and the E.U. to comprehensively map the Center City area's commercial vehicle load/unload space network, including its curb space. The UFL curb occupancy study is linked to that inventory study, as cities like Seattle manage use of the curb through several types of curb designations that regulate who can park in a space and for how long. These designations, along with factors such as building and land use, directly impact how commercial operators use curb space.

Significantly, this occupancy case study of five Center City areas captures the parking behavior of commercial vehicles (CVs) everywhere along the curb as well as the parking activities of *all* vehicles (including passenger vehicles) in commercial vehicle loading zones (CVLZs.) Specifically, the research team documents: (1) which types of vehicles parked in CVLZs and for how long,

and; (2) how long CVs parked in CVLZs, in metered parking, in passenger load zones (PLZ) and other unauthorized spaces. In the UFL study, commercial vehicles (CVs) includes a wide range of delivery and construction vehicles, service vehicles and garbage trucks but excludes all passenger vehicles. Passenger vehicles include cars, pick-up trucks, and shuttle buses. While passenger vehicles could be performing delivery/commercial functions, passenger vehicles were not treated as commercial vehicles in this study due to challenges in systematically identifying whether they were making deliveries or otherwise carrying a commercial permit.

This study collects and analyzes data from a three-by-three city block grid around each of five archetypal buildings, representing a hotel, a high-rise office tower, a historical building, a retail center, and a residential tower. These same buildings served as study sites for tracking how goods move vertically within a building in the Final 50 Feet of the urban goods delivery system. The final 50 feet of supply chains starts when a CV driver parks in a load/unload space; includes their activities as they maneuver goods over curbs, along sidewalks and through intersections; and ends inside urban towers when they complete their deliveries or other work.

The occupancy study documents that each building and the built environment surrounding it has unique features that impact parking operations and, ultimately, congestion. The study's findings highlight the need to plan a flexible loading/unloading network with capacity for distinct types (time and space requirements) of CV parking demand. This study also drives home that the curb does not function in isolation, but instead forms one element of the Center City's broader, interconnected load/unload network. A curb occupancy study helps policymakers and transportation officials understand the load/unload network's interconnected nature, how the city's curbs are being used at street level, and how parking policies and built environment impact that use.

2.2. **Goals**

To conduct an occupancy study of representative Center City curb spaces using methods that are:

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

A curb occupancy study, as outlined here, can help cities actively manage curb space as part of the comprehensive load/unload network (which includes private loading bays/docks and alleys.)

2.3 **Method overview and step-by-step process to conduct a curb occupancy study**

A team of seven trained data collectors worked to document curb use over three days in each of five study areas, spanning roughly six weeks in October and December 2017. Collectors worked in four-to-five-hour shifts so that each study area, a three-by-three city block grid, would be continuously observed during daytime hours. Creating a three-by-three city block grid around a designated prototype building offered sufficient diversity of curb space types for commercial vehicle parking (both authorized and unauthorized). The study documents the parking behavior of delivery, service, and other commercial and passenger vehicles along representative Center City curb faces. In the UFL study, delivery commercial vehicles include box trucks, cargo vans, trucks with trailer, cargo bikes. Service commercial vehicles include vans or pick-up trucks used to provide services (e.g., installation, maintenance) with company logos visible to data collectors. Passenger vehicles include cars, pick-up trucks, and shuttle buses. While passenger vehicles could be performing delivery/commercial functions, passenger vehicles were not treated as commercial vehicles in this study due to challenges in systematically identifying whether they were making deliveries or otherwise carrying a commercial permit. Authorized and unauthorized curb spaces include travel lanes, bus lanes, curb segments close to hydrants, tow-away-zones, shuttle bus parking, intersections, on-street meter parking and temporary construction zones.

While a video camera-based data-collection was considered, a camera can be blocked by a large vehicle or other impediment. Human observers have the advantage of being able to easily sidestep potential obstacles to ensure clear sightlines along the curb, where traffic conditions are dynamic[L1].

By inventorying CVLZs and PLZs for each study area and comparing Seattle Department of Transportation's curb-use GIS database to the on-the-ground reality found in field testing, the research team built a customized curb map and data-collection form for each study area. Based on each study area map, data collectors were assigned up to four strategic positions on the blocks in each area to maximize both visibility all along the curb and the diversity of curb parking types captured (CVLZ, PLZ, hydrants, tow-away zones, and lanes, where inadequate commercial vehicle parking might occur). Any commercial vehicle parked anywhere along the curb for one minute or more was recorded as was any vehicle (including passenger) parked in a CVLZ for one minute or more. Customized data-collection forms were divided by specific curb spaces and zones to be monitored at each position, with space for the data collector to record:

- The start/end time a vehicle spent parked at the specific curb space (recorded to the minute)
- The type of vehicle parked at the specific curb space

2.3a **Step 1. Determine study parameters**

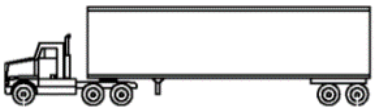
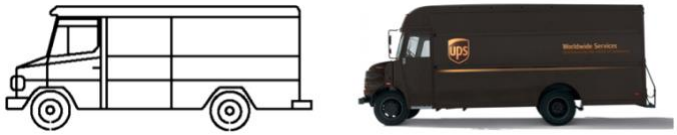
Based on project scope and budget, determine at the outset the:

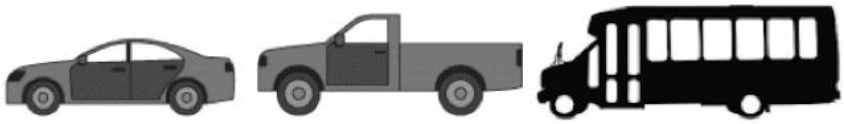
1. Scope/size of study area
2. Number and types of representative curb spaces to be observed
3. Location of each curb area to be observed
4. Data-collection/observation hours for study areas (unlike an inventory, periods of low activity should be avoided if the project seeks to document "typical" usage)
5. Use of human data collectors versus video/other technology to capture vehicle occupancy

2.3b **<u>Step 2. Use UFL's detailed vehicle typology to accurately track vehicle categories</u>**

The UFL typology covers 10 separate vehicle categories, from various types of trucks and vans to passenger vehicles to cargo bikes. **NOTE**: While passenger vehicles could be performing delivery/commercial functions, passenger vehicles were not treated as commercial vehicles in this occupancy study due to challenges in systematically identifying whether they were making deliveries or otherwise carrying a commercial permit[L2].

UFL curb occupancy vehicle typology

COMMERCIAL VEHICLES (CV)	
Delivery Commercial Vehicles (4 subtypes shown below)	
Truck with Trailer (T)	Truck with trailer, three or more axles.  s
Box Truck (B)	Single-unit trucks, three axles or less. 
Cargo Van (CV)	 A cargo van is a one-piece unit, while a box truck has a separate cab and cargo box.
Cargo Bike (C)	

Garbage Truck (G)	
Service Commercial Vehicles (Van or Pick-Up Truck) (SV)	
Van (V)	 A cargo or service van usually displays a business logo. If such information was not visible, the vehicle was recorded as a 'van.'
Construction Vehicles	 
NOT CATEGORIZED AS DELIVERY OR SERVICE COMMERCIAL VEHICLES IN CURB OCCUPANCY STUDY	
Passenger Vehicle (P)	
Taxi (X)	
Motorcycle (M)	
Others (O)	Includes fire and police trucks and vans, and other buses.

2.3c **Step 3. Assess each study area for data needed to build maps and data-collection forms**

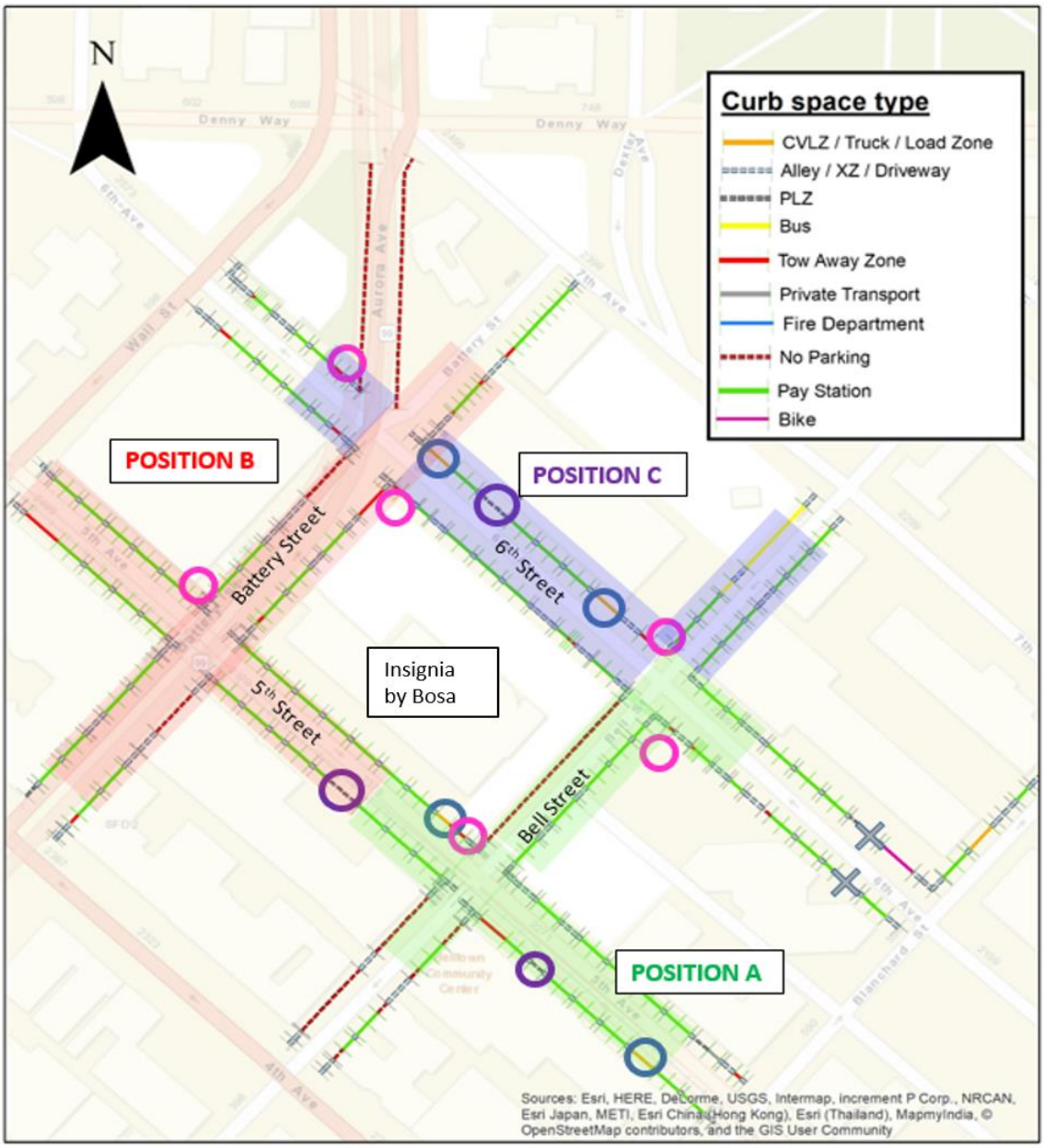
Identify the different types of curb parking and their characteristics (e.g. length, location, use restrictions).

If using a GIS curb space database, confirm accuracy in field and revise as needed.

Determine number/location of data collector positions for each study area based on visibility, number, and distribution of CVLZs and passenger load zones (PLZs) serving the building.

Ensure positions keep data collectors are out of regular traffic flow and vehicle entry/exit.

See a sample map of three positions from the UFL occupancy study below:



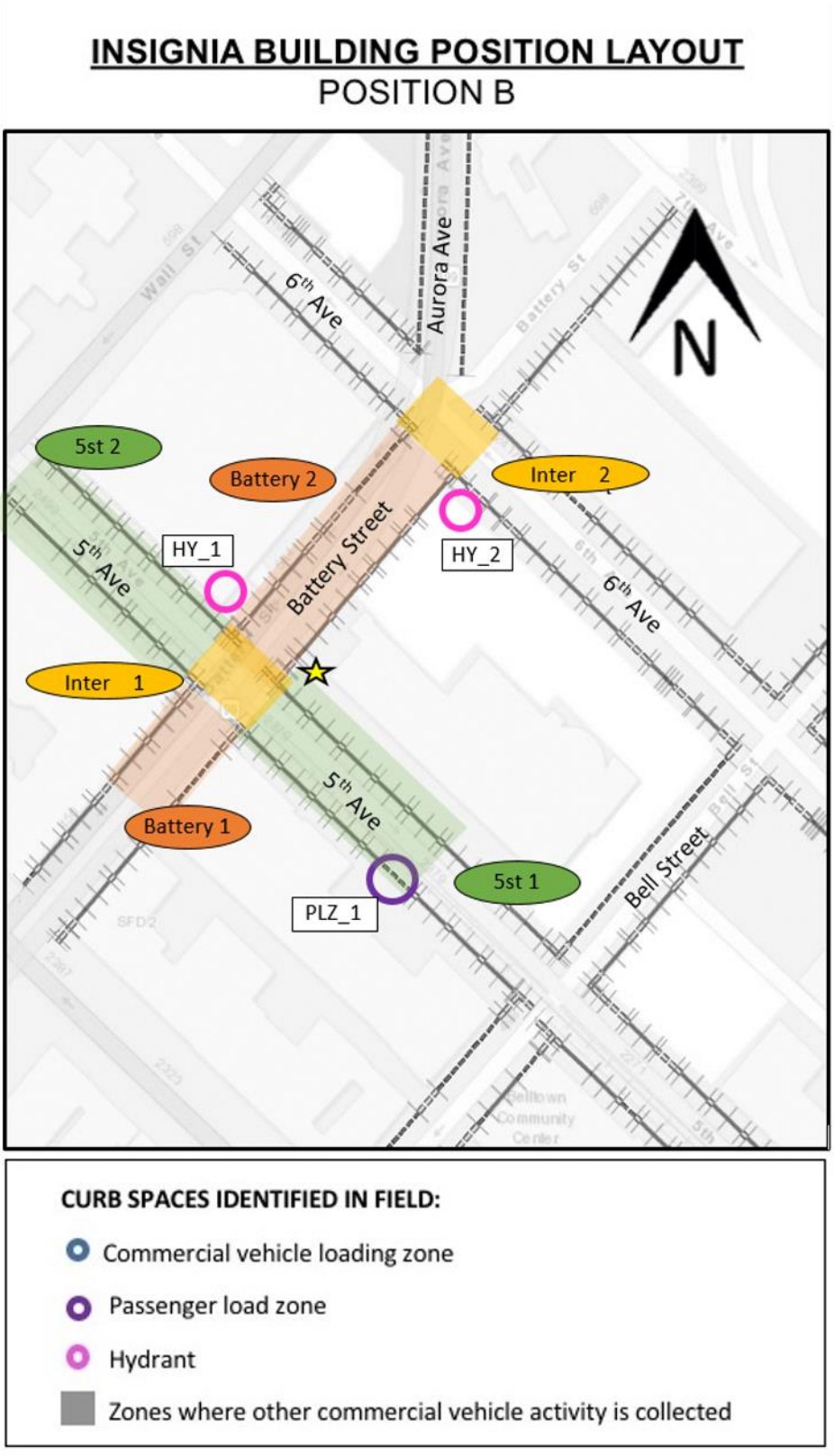
CURB SPACES IDENTIFIED IN FIELD:

- Commercial vehicle loading zone
- Passenger load zone
- Hydrant
- Zones where other commercial vehicle activity is collected
- Curb space does not appear in field as it is indicated in curb use GIS data
- Commercial vehicle loading zone not considered in analysis
- Passenger load zone not considered in analysis

2.3d **Step 4: Prepare customized data-collector position maps and data-collection forms**

For each position in each study area, collectors need:

Position map. Include easily identifiable curb space features in field for each data-collector position (marked with star), as shown below.



Data-collection forms. Create a paper form in Microsoft Excel as shown below, ordered to

allow data collectors to easily scan the curb and color-coded to allow collectors to easily find specific curb features (hydrant, PLZ, intersection etc.) on the position layout map.

	Curb Space Data Collection: Insignia Building - Position B							Collector initials:				Date:						Sheet						
	Vehicle type code: Truck (T) | Box truck (B) | Cargo Van (CV) | Service Van (SV) | Van (V) | Passenger & Pick-up (P) | Motorcycle (M) | Cargo-bikes (C)																							
	Vehicle color code: USPS (US) | Blue (B) | Black (BK) | Brown (BW) | Green (G) | Gold (GO) | Red (R) | Silver (S) | White (W)																							
	PLZ_1		5th 1					Battery_1				5th 2						Battery_2						
Time	a	b	Right Curb a	Right Curb b	Center	Left Curb a	Left Curb b	Turn lane	Center	Left curb	HY_1	Right Curb a	Right Curb b	Center	Left Curb a	Left Curb b	Inter 1	Right Curb a	Right Curb b	Center	Left Curb a	Left Curb b	HY_2	Inter 2
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Observations																								

Pilot-test maps and forms before official collection begins.

2.3e **<u>Step 5. Select data-collection tools</u>**

For each data-collection shift, collectors need:

Position map
Clipboard
Security vest
Data-collection forms
Binoculars (as needed)
Digital watch/timekeeping device to record start/end time of each vehicle's parking
Official document from sponsoring agency (including agency official contact information) explaining

2.3f **Step 6. Recruit and train data collectors**

Recruiting: Project budget; timeline; survey length/complexity; security concerns; time needed for in-field collection, including commute time to/within study area, and in-office quality-control determine number of data collectors and supervisors needed. In the UFL curb occupancy study, three to five collectors (number based on study area visibility and built environment) worked per four-to-five-hour shift, per three-by-three city block study area.

Training: Two sessions recommended, with first done in classroom-type setting and second done in field.

First session: Covers study parameters, vehicle typology, data-collection method, key curb terms, position map and data-collection forms.

Second session: Covers (and lets collectors practice in field) using position map and pilot-testing data-collection form to record CVs that park anywhere along the curb and all vehicles that park in CVLZs.

2.3g **Step 7. Collect data**

Develop check-out/check-in process for collectors' needed shift materials.

Ensure continuous observation of the curb in each study area. In the UFL project, data collector shifts ranged from 4-5 hours to ensure continuous observation of each three-by-three city block grid study area during daytime hours over three weekdays.

Provide regular breaks to collectors assigned to a curb position (who must not take their eyes off the curb while in position.) Such breaks can include rotating position collectors into the role of monitoring other collectors in nearby study areas.

Establish comprehensive security protocol and multilayer communications plan for all interested parties to avoid unsafe situations in field, including instructing data collectors to carry official documents from sponsoring agency (including official contact information) explaining project and granting data-collection authorization.

Recruit and inform police and other relevant agencies to help communicate with all building managers in the survey area.

- In Seattle, police notified all survey area building managers in real time where/when collectors were working via pre-existing information exchange for building operators and the police.
- Seattle Department of Transportation webpage communicated to public and stakeholders where and when data collectors were working.

2.3h **Step 8. Create data transcript**

Establish a method for data collectors to transcribe recorded field observations no more than 24 hours after their shift ends, allowing them to double-check entries (first step in data cleaning). In the UFL project, data collectors received a Google Excel sheet for each study area, shown below.

Day	Study Area	Curb ID	Curb Type	Start Time	End Time	Vehicle Type

2.3i **Step 9. Clean data**

A data-collection lead must review the data and check for data transcript errors and missing values.

2.3j **Step 10. Assemble and summarize data**

Assemble data in final format that best meets city and/or researcher needs, such as a final spreadsheet listing every vehicle observed, the study area it was in, the type of curb space it was parked in, and the amount of time it was parked there. This allows for a broad range of data analysis relevant to the study project goals.

2.4 **Takeaways**

Cities that want to strategically manage their load/unload space network, which includes private loading bays and alleys, can use the toolkit to replicate the UFL curb occupancy study and generate much-needed data and findings to inform policy and practice.

The Seattle curb occupancy study produces several key findings that give policymakers and transportation officials new understanding of the Seattle Center City area curb system and how the system can best be managed to avoid massive gridlock. Among those findings are that:

1. Commercial and passenger vehicle drivers use CVLZs and PLZs fluidly: commercial vehicles are parking in PLZs and passenger vehicles are parking in CVLZs.

2. Most commercial vehicle (CV) demand is for short-term curb parking: 15 or 30 minutes.

3. Service CVs made up more than one-third of the total CVs parked at the curb; urban parking schemes must factor in current service CV parking behavior and their future parking demand.

4. Forty-one percent of CVs parked in unauthorized curb locations. But a much higher share parked in unauthorized areas near the two retail centers as compared to the predominately office and residential areas. Curb parking behavior is associated with granular, building-level urban land use, even as other factors such as the total number, length and ratio of CVLZs versus PLZs varied widely across the five study areas.

In many cities, curb space is allocated by vehicle type: to transit, passenger, or freight vehicles. Yet the curb occupancy study shows drivers often do not follow those designations in their parking choices. And it shows that many commercial vehicles park for short periods of time. Cities seeking to mitigate gridlock can manage curb space more flexibly, allowing different vehicle types to park in the same spaces based on the amount of time and space (due to vehicle size) they need. Curb space could be more effectively managed using emerging technologies that offer integrated data systems and real-time data to improve the productivity of finite load/unload spaces and reduce drivers circling the block in search of parking. Curb space should be managed in concert with the other elements of the load/unload network, not in isolation.

2.5 **Supporting materials/links**

g. Appendix D (study area maps)
h. Appendix E (Four Seasons Hotel position layout and photos)
i. Appendix F (Step by Step)
j. Project SOW from SDOT/UFL (Attachment with price edited out; Barb)
k. Training materials, including security/safety protocol
l. Sample sponsoring agency document for data collectors to carry in field