

TOWN OF LEESBURG HISTORIC DOWNTOWN LOADING ZONE MANAGEMENT STUDY



TOWN OF LEESBURG

Historic Downtown Loading Zone Management Study

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ABOUT GAP-TA

Visit vtrans.org/about/GAP-TA for information about the Growth and Accessibility Planning Technical Assistance program. OIPI will provide a blurb describing the GAP-TA program.

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CONTENTS

Introduction and purpose	6
Commercial Vehicle Loading Zone Management	6
Project Background	6
Executive Summary	6
Curbside Policies and Programs	7
Zoning and Town Code Recommendations	8
<hr/>	
Existing Conditions	9
Loading Zones	9
Loading Zone Geometry	10
Video Data Analysis	11
Policies	15
<hr/>	
Peer Jurisdictions	17
Peer Jurisdiction Interviews	17
Peer Jurisdictions and Leesburg	17
<hr/>	
Policies and recommendations	18
Curbside Policies and Programs	19
<hr/>	
Appendix A: Business Survey Results – Average Number of Deliveries a day	23
Appendix B: Loading Zone Video Data Analysis	24
Appendix C: Application Memo	28
Application Memo Appendix A: Final Vendor Review	31
Application memo Appendix B: Additional Vendor Research	42

LIST OF FIGURES, TABLES, ETC.

Figure 1: Town of Leesburg Historic Downtown District	9
Figure 2: Loading Zone Sign Text	10
Figure 3: Loading Zone Details	10
Figure 4: Video Analysis Loading Zone Locations	11
Figure 5: Basic Loading Zone Usage	12
Figure 6: Total Duration of Usage Types	12
Figure 7: Total Time of Vehicles by Time of Day	13
Figure 8: Total Count of Authorized and Unauthorized Vehicles by Time of Day	13
Figure 9: Total Usage Time by Vehicle Classification	14
Figure 10: Town of Leesburg Parking Violations	16
Figure 11: Peer Jurisdictions	17
Figure 12: Curbside Policies and Programs Recommendations and Priority Level	18
Figure 13: Zoning and Town Code Recommendations and Priority Level	18
Figure 14: Loading Zone Locations	24
Figure 15: Basic LZ Usage	24
Figure 16: Total Duration of Usage Types	25
Figure 17: Duration of Stops for all LZs	25
Figure 18: # of Vehicles Stopped by Time of Day	26
Figure 19: Total Usage Time by Vehicle Classification	27
Figure 20: Percentage of Time Vehicles in the Loading Zone Were Interrupting the Flow of Traffic	27
Figure 21: Vendor Study Matrix	30

INTRODUCTION AND PURPOSE

Commercial Vehicle Loading Zone Management

Loading and deliveries are essential to a vibrant community and economy. Restaurants often receive produce, fish, and meat deliveries daily in addition to linen, alcohol, cans and other sauces or miscellaneous item deliveries, resulting in up to dozens of deliveries each day for each restaurant. In addition to the typical freight deliveries, there are personal vehicles picking up and delivering food and other goods competing for freight delivery loading and unloading space as delivery applications and online shopping have become more prevalent.

Some buildings have space for receiving and loading goods in loading docks and loading bays. However, in older neighborhoods and Towns such as the historic downtown of Leesburg this is less common. Furthermore, some spaces are inaccessible to newer, larger trucks because they cannot maneuver into the alley or the loading space. All of this results in loading and unloading occurring at the curb and competition for space where there are already many other demands: vehicle parking/storage, pickup and drop off, micromobility, transit, etc.

Loading and unloading on the curb can cause conflicts with operation of the adjacent public streets, sidewalks, and other curb users. Deliveries are a required component of daily life, as such loading and unloading needs to be managed to ensure effective, efficient, and safe use of curb space facilitates the needed deliveries.

Project Background

The Historic Downtown of the Town of Leesburg is a vibrant and dynamic neighborhood with numerous historic sites and museums, offices, restaurants, breweries, boutiques, antique shops, and public open spaces. The Town is committed to preserving the character in the Historic Downtown, which has major thoroughfares running through it including North King Street and Market Street. Transportation is recognized as one of the most important services provided by the government in the Town of Leesburg, connecting citizens with jobs, schools, activities, and is critical to the economic vitality of the region. As the region grows in both residents and visitors, preserving the historic character must be balanced with providing safe and effective transportation services and options.

In the last decade, Downtown Leesburg has seen a resurgence in activity as less trafficked uses like antique shops were replaced with restaurants and breweries. This remarkable success has, however, led to some challenges. Residents, business owners, and visitors have all noticed increased traffic and congestion. One component of this

recent activity results in more vehicles looking to use space along the curb for loading and unloading of goods and passengers. This has resulted in traffic being blocked, motor vehicle accidents, and in some cases damage to the Town's infrastructure.

To address these issues and ensure continued success of the Historic Downtown, the Town of Leesburg commissioned this Historic Downtown Loading Management Study (Study) to understand, address, and alleviate loading issues in the Historic Downtown. This consultant led effort had a project team that consisted of staff from the Department of Public Works, Police Department, Planning and Zoning, and Economic Development. The business community in the Historic Downtown also participated in the project. The project team convened two virtual meetings with the business community to better understand their perspectives, document issues and concerns, share project progress, and to gather additional feedback through polls and surveys.

This report summarizes the project team's efforts over the past six months and documents results from the project tasks in the following chapters:

1. Existing Conditions
2. Peer Jurisdictions
3. Policies and Recommendations

Implementing the policies and recommendations identified in the Study will move loading zone management forward in the Town of Leesburg.

Executive Summary

The Historic Downtown of the Town of Leesburg is a vibrant and dynamic neighborhood with numerous historic sites and museums, offices, restaurants, breweries, boutiques, antique shops, and public open spaces. The Town of Leesburg is committed to preserving the character in the Historic Downtown while providing safe and efficient transportation connecting citizens with jobs, schools, activities, and facilitating economic growth in the region. Residents, business owners, and visitors notice the increased traffic and congestion in the Historic Downtown, with particular attention and frustration related to freight, trucks, and deliveries and curb congestion in general. The Historic Downtown Loading Management Study studied existing on-street loading zone conditions, analyzed use of a subset of loading zones in Historic Downtown, conducted a policy scan and peer jurisdiction interviews, and developed recommended policies and programs.

Based on the analysis conducted, the following issues were identified with respect to loading zone management in the Historic Downtown:

- A significant amount of unauthorized use was observed in the video analysis of the loading zones. Most of this unauthorized use was within personal vehicles utilizing loading zone space or utility vehicles utilizing loading zone space.
- Demand did not exceed supply for the loading spaces observed in the Historic Downtown.
- Few instances of blocking the street were observed in video data however it is a noted concern of area businesses and residents.
- No violation exists related to illegal use of the loading zones in Leesburg and existing loading zone signage is inconsistent.
- Peer jurisdictions, in general, were pleased with existing loading operations and had advanced programs that include pickup and dropoff spaces and developing relationships with commercial delivery drivers.
- There is no existing established relationship between the Town and delivery drivers in the Historic Downtown.

Additional insights and nuance deduced from the data, analysis, and other efforts as a part of this Study are available in the full report. Based on the identified issues the project team identified the following recommendations:

Curbside Policies and Programs

Review Loading Zone Fines and Pricing

Fines are not necessarily effective for the commercial industry though they can be an effective deterrent for personal vehicle drivers. Given the large amount of unauthorized use in the loading zones, reviewing existing fines will help the Town determine if implementing a new fine for unauthorized loading zone use will support the program moving forward.

Develop Historic Downtown curb management plan and priorities

Curb management is most effective when conducted as a holistic effort. Loading zones are one part of the curb and, though great insights are discovered through their analysis, understanding demand for the whole curb facilitates a comprehensive curb management approach.

Create an on-going curb management task force

Communication is key. Developing and implementing a curb management task force allows the Town to keep an open line of communication related to loading zone and curb issues both internally (amongst Town agencies) and externally (with loading zone stakeholders such as businesses and delivery drivers).

Maintain a digital inventory of curb uses

A digital inventory will help the Town holistically manage the curb space by first understanding the existing allocations of curb space and how that aligns with the Town's vision, goals, and objectives.

Monitor use of curb spaces

Beyond understanding allocation, information related to existing demand of the whole curb allows the Town to make changes based on both observed use and desired use based on the Town's transportation priorities.

Create flexible curb space

There are many demands placed on a curb, to be able to accommodate the most effective and efficient use of that finite curb space flexible use can be employed. Flexible curb space refers to curb space where the designated use of the space changes throughout the day, based on time of day, or by season.

Develop an enforcement education campaign

Curb policies and programs are notoriously difficult to enforce given the 24/7 nature of curb use and the, at times, quick nature of use or space turnaround, among other reasons. However, in a limited area like the Historic Downtown of the Town of Leesburg there is an opportunity to create a partnership with enforcement to execute an educational campaign to educate the commercial vehicle community of Town expectations and to create relationships so enforcement partners can notify the parking task force or loading zone planners when issues arise.

Creating a geographic perimeter boundary for transportation network companies

Transportation network companies (Uber, Lyft, etc.) are often a pain point at the curb, they lead to increased congestion on the roadway and at the curb. Geofencing is a feature deployed within most existing ridesharing applications and is common for pickup and drop off activity across the country. The geofence, once set up, appears in apps for pickups so the drivers and passengers are both notified and aware of the location they will need to be in order to be picked up or, in the case of the driver, to pick up the passenger.

Standardize Loading Zone Signs

Standardizing the loading zone signs will more clearly communicate the types of uses allowed, length of time allowed, and time of day where there are and are not restrictions.

Zoning and Town Code Recommendations

Work with business owners to develop loading management plans

As buildings are redeveloped and new businesses move into the Historic Downtown, they will undergo the zoning and permitting process with the Town of Leesburg. This is a critical opportunity for the Town to discuss how commercial delivery loading and unloading and pickup and drop off will happen at that location.

Develop a service vehicle and loading/unloading passes program

The Town of Leesburg can assign service vehicle and commercial vehicle loading and unloading passes to businesses. Utilizing the pass program, each delivery driver will need to obtain a pass from the business when they deliver, allowing the driver and business owner to have a conversation and be more aware of where loading and unloading is occurring. If and when there is an issue with a commercial vehicle, the pass can be checked to determine which business they are delivering to, and the Town and enforcement partners can then work with both the delivery driver and the business to resolve any issues.

Require service vehicle spaces and/or package delivery consolidation spaces in new parking garages

While the curb is a preferred space for service vehicles and delivery companies to load and unload or park while they work in the case of service vehicles, it is not the only space available. Parking garages, surface lots, or alleys can be designated service vehicle or package delivery spaces, removing this demand on curb loading zones.

Implementing these policies and recommendations will continue to advance both loading zone management and curb management overall in the Historic Downtown of the Town of Leesburg. These actions will also help the Town prepare for increased automation. As technologies advance and vehicles are more able to operate independently and speak with one another, understanding existing and desired use of the curb and beginning to utilize application and geofencing technologies, will prepare the Town for increased vehicle automation in the future.

EXISTING CONDITIONS

This Historic Downtown of Leesburg can be seen in Figure 1. For the purposes of the Study, the Historic Downtown is defined as having the same Boundaries and the Old & Historic District. Within this boundary a large amount of commercial activity is concentrated on N. King Street, Market Street, and Loudoun Streets.

Loading Zones

There are 14 on-street loading zones in the Historic Downtown as shown in Figure 1 (more detailed geographic information of them can be found in the Appendix). Two of those loading zones are 30 feet in length, one is 35 feet in length, and the remainder are 40 or over feet in length. They are located on both sides of the street and at far, near, and mid-block locations. Six of the 14 loading zones

have only one sign posted. The following are the types of signs at loading zones in the Historic Downtown, followed by the number of loading zones with that type of sign. Figure 2 shows the different text on loading zone signs in the Historic Downtown followed by the number of signs with that text. The Town Code indicates that loading zones will be marked by durable painted lines or curbs extending the length of the space, it does not require signs at each end of the zone. However, if the curb or pavement is not painted and there is only one sign it can be difficult to know where the end of the loading zone is. Loading zones in the study area were reviewed, no issues with delineation was found but is something to keep in mind as new loading zones are installed.

Some no parking loading zone signs have a time indicated, from 7 am through 6 pm. Some passenger loading zone signs have a time indicated, from 5 pm through 6 am. However, if no time limit is posted, loading and unloading of materials or passengers should not exceed 30 minutes.

Figure 1: Town of Leesburg Historic Downtown District

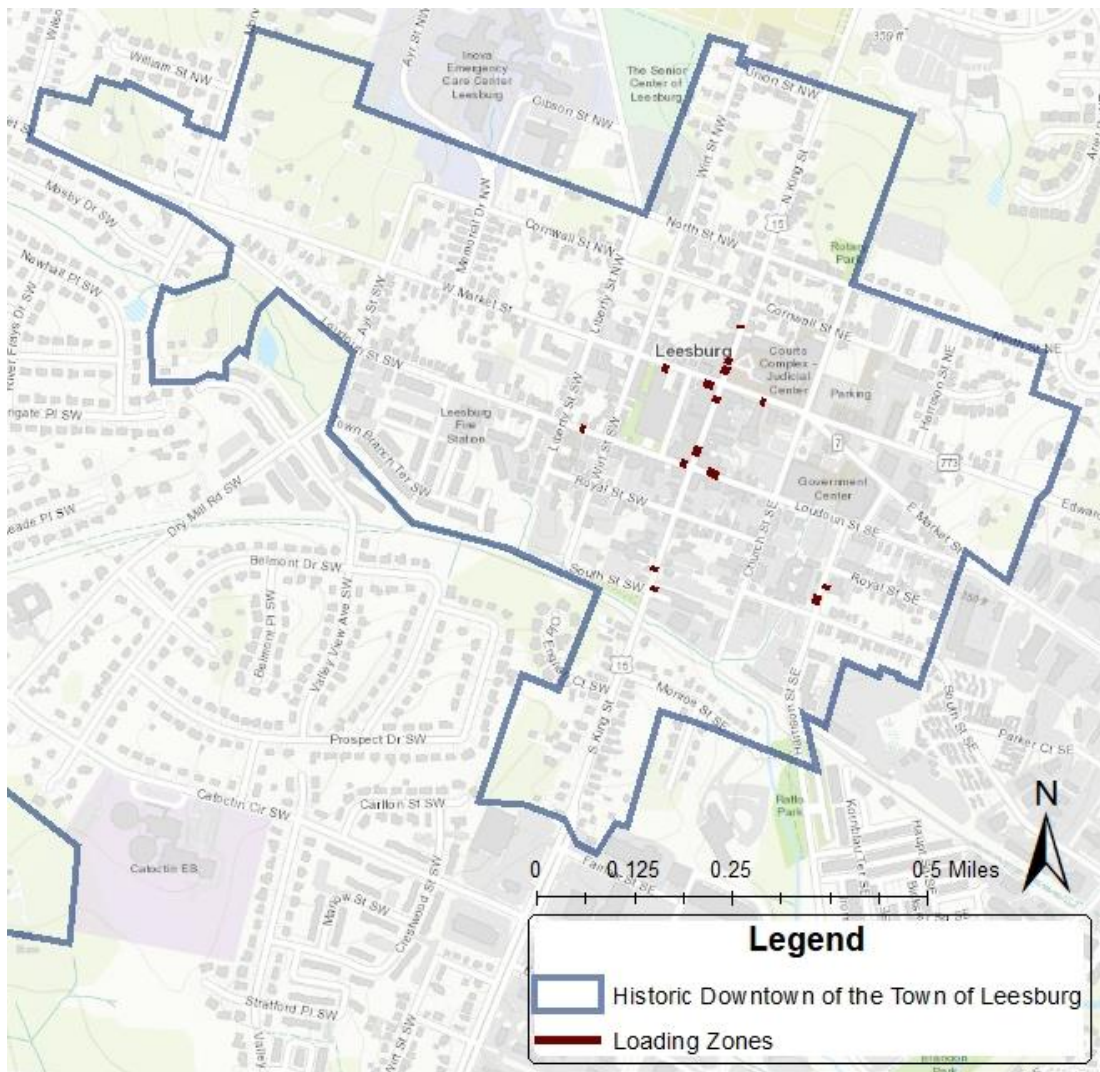


Figure 2: Loading Zone Sign Text

Loading Zone Sign	Number of Loading Zones
No Parking Loading Zone; Golf Carts	6
20 Minutes; Passenger and Commercial Loading Zone; Enforced 24 Hours	2
Passenger Loading Zone; No Parking	2
No Parking; Loading Zone	4

Loading Zone Geometry

Loading zones at the far or near side of blocks are easiest to access, with the preference being near side so a truck can simply pull into the space. This also provides flexibility with respect to the length of the vehicle as they will have space at the end of the loading zone to load and unload. A 40-foot beverage truck might fit into a 45-foot mid-block loading zone but might have difficulty loading and unloading depending on the goods being delivered or picked up. If that same truck accessed a 45 foot near side loading zone, they would have some feet of extra space to load and unload. **Error! Reference source not found.** provides details for each loading zone in the Historic Downtown.

Figure 3: Loading Zone Details

Loading Zone #	Closest Address	Loading Zone Length	Sign Text	Side of Street	Service Day Start	Service Day End	Service Hour Start	Service Hour End	Arrow Direction
1	200-217 W. Loudoun St.	50	No Parking; Loading Zone; Golf Carts	North	Sunday	Saturday	0000	2359	No Arrow
2	2-4 E. Loudoun St.	90	No Parking; Loading Zone; Golf Carts	North	Sunday	Saturday	0000	2359	West
3	25-27 S. King St.	75	20 Minutes; Passenger & Commercial Loading Zone; Enforced 24 Hours	West	Sunday	Saturday	0000	2359	North
4	1-3 W. Market St.	60	No Parking; Loading Zone; Golf Carts	South	Sunday	Saturday	0000	2359	No Arrow
5	1-5 S. King St.	40	20 Minutes; Passenger & Commercial Loading Zone; Enforced 24 Hours	West	Sunday	Saturday	0000	2359	South
6	9 E. Market St.	35	No Parking; Loading Zone; Golf Carts	South	Sunday	Saturday	0000	2359	No Arrow
7	1-7 N. King St.	55	No Parking; Loading Zone; 7am - 6pm	West	Sunday	Saturday	0700	1800	No Arrow
8	203 Harrison St.	65	No Parking; Loading Zones; Golf Carts	West	Sunday	Saturday	0000	2359	North
9	11-15 N. King St.	50	Passenger Loading Zone; No Parking; 5pm - 6am	West	Sunday	Saturday	1700	0600	South
10	21 N. King St.	30	No Parking; Loading Zone; 7am - 6pm	West	Sunday	Saturday	0700	1800	No Arrow
11	202 Harrison St.	40	No Parking; Loading Zone; Golf Carts	East	Sunday	Saturday	0000	2359	North
12	211 S. King St.	30	No Parking; Loading Zone; 7am - 6pm	West	Sunday	Saturday	0000	2359	No Arrow

Loading Zone #	Closest Address	Loading Zone Length	Sign Text	Side of Street	Service Day Start	Service Day End	Service Hour Start	Service Hour End	Arrow Direction
13	108 W. Loudoun St.	40	No Parking; Passenger Loading Zone	North	Sunday	Saturday	0000	2359	West

All but six loading zones in the Historic Downtown are longer than 45 feet (a typical beverage truck is 40 feet in length). At the loading zones less than 45 feet in length, LZs 6, 7, 10, and 11, only use of LZ 7 was analyzed. At LZ 7, conflicts related to blocking traffic due to not being able to access the zone were not noted in the video data.

Video Data Analysis

The Project Team utilized traffic light camera footage to analyze loading at six of the fourteen loading zones in the Historic Downtown. These six loading zones were selected due to their proximity to the traffic light cameras enabling clear and consistent footage to be collected and reviewed. Footage was reviewed on Tuesdays and Thursday's industry standard dictates they are typically higher volume delivery days, from the hours of 7 am through 6 pm. This trend of receiving more deliveries on Tuesday and Thursday was confirmed in the Historic

Downtown through a business survey, results can be found in Appendix A.

In total, the six loading zones (LZs) analyzed saw 177 stops during the period analyzed, which totaled to 3,482 minutes out of a total possible 7,320 (47.6%). The period analyzed is below:

- Tuesday, August 3, 2021 (7:00am – 5:00pm)
- Thursday, August 5, 2021 (7:00am – 5:00pm)
- Tuesday, September 7, 2021 (12:00pm – 6:00pm) (only LZ3 and LZ5)

LZ3 and LZ5 did not have video available for Thursday, August 5 from noon to 5pm, so video from September 7 from noon to 6pm was used instead.

The six LZs analyzed are shown in

Figure 4

Figure 14.

Figure 4: Video Analysis Loading Zone Locations



Figure 5 **Error! Reference source not found.** below shows the breakdown of the stops by LZ, the total duration of all the stops each LZ had, and the average stop time. While it is

difficult to draw conclusions based on this limited data set, some issues have been identified. The data indicate that the typical duration of a stop in a loading zone was

approximately 15 minutes. Some stops far exceeded this amount, typically freight deliveries from larger trucks (over 30 feet) will take an average of 30 minutes while quick pick up and drop off can occur within 15 or fewer minutes. LZ5 was used most frequently with 82 total stops in the time period analyzed, but LZ7 had the highest amount of total time used with over 1,000 minutes (91% of the total time analyzed). Based on the video data observed for this loading zone, LZ7 was utilized 91% of the total time due to two utility trucks and one pick-up truck occupying the space for most of the day on August 5 (these vehicles were not loading or unloading, so they should not have been stopped in a LZ). This “overstay” of a loading zoning limits the ability for the loading zone to be used for true loading and unloading activity, and results in ripple effects throughout the downtown. While this may not be a common occurrence to have such high utilization of any particular loading zone, issues like this do become disruptive to the overall loading zone issue in town as they make delivery space unavailable for other vehicles that might need them during that time. Therefore, it may be

important to identify strategies to limit these overstays, potentially including enforcement campaigns, issuing infractions, or raising the cost of the ticket.

Figure 5: Basic Loading Zone Usage

Loading Zone (LZ)	Total Stops	Total Duration of Stops (minutes)	Average Stop Length (minutes)
LZ1	21	528.0	25.1
LZ2	27	299.0	11.1
LZ3	28	498.0	17.8
LZ4	11	222.6	20.2
LZ5	82	844.0	10.3
LZ7	8	1,090.5	136.3
Total	177	3,482.1	19.7

Figure 6 shows a bar graph of the total time each LZ was observed (20 hours for all LZs except LZ3 and LZ5) broken out by three usage types. At any point during the observed hours, the LZ could have (1) an authorized vehicle, (2) an authorized vehicle, or (3) be empty.

vehicles are utilizing parking or other spaces to load and unload. Given the less than 50% utilization of loading in these spaces and the presence of unauthorized use we can safely conclude that there is a need for pickup and drop off zones and service vehicle parking, given that most unauthorized use observed in the video was either pickup and drop off or service vehicles. In the case of LZs 1 through 4, where they are over 50% empty, the Town can determine if those spaces should be available for loading at certain times of the day and potentially parking other times of the day.

As seen in the graph, most loading zones are in use less than 50% of the time. As noted above, high utilization of LZ7 is not representative of typical activity. It is enticing to deduce that the downtown overall has sufficient loading space available however since we only have data from a subset of curb space, it is not known whether commercial

Figure 6: Total Duration of Usage Types

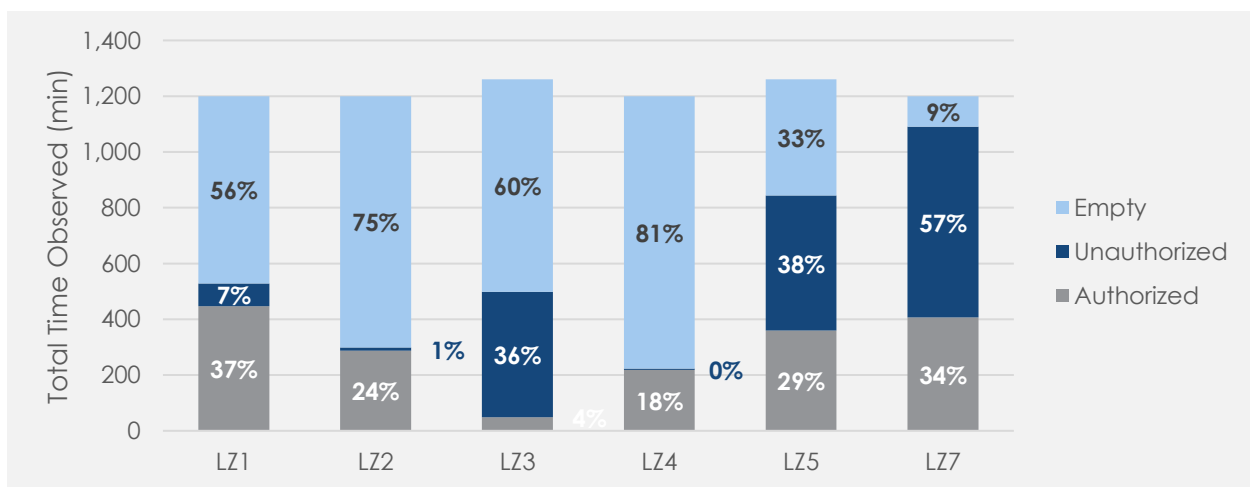


Figure 7 and Figure 8 show the total time vehicles used the loading zones and the number of authorized vehicles and unauthorized vehicles based on the time of day. Most

usage of these loading zones occurs during morning (from 7 am through 10:30 am) and mid-morning through afternoon (from 10:30 am through 2:30 pm). Authorized

and unauthorized vehicles compete most intensely for space in the loading zones during the afternoon hours. The mid-morning through afternoon period (between 10:30am and 2:30pm) saw the greatest number of stops compared to the morning and the late afternoon. This could be because when individuals would shop and eat lunch, which would correlate to an increase in unauthorized usage of these spots.

However, while the afternoon has the most total number of stops, the average stop length is just 16 minutes, compared to an average of 43 minutes for morning stops. While the LZs are used a fewer number of times in the morning, the duration of those stops are longer. This is due to stores

receiving deliveries in the morning to use for later in the day (like a restaurant getting fresh food delivered every morning), and actual deliveries take longer than quick stops to shop.

Within the loading zones observed, loading is occurring most frequently in the morning and afternoon. The Town can use this insight to inform program changes including designating these spaces for loading in from 7 am through 2:30 pm and switching use in the late afternoon and evening to pick up and drop off or parking spaces. Some loading does occur in the late afternoon and that should be noted, and limited space made available for those deliveries in the flexible curb program.

Figure 7: Total Time of Vehicles by Time of Day

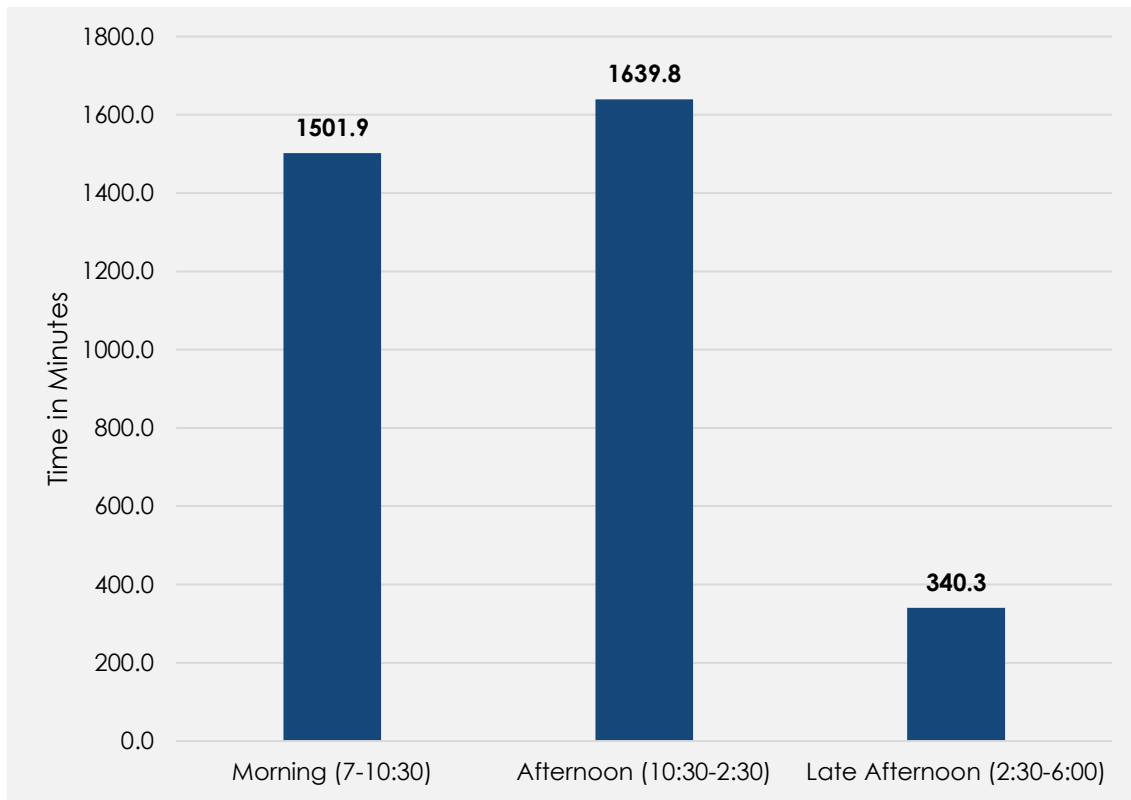


Figure 8: Total Count of Authorized and Unauthorized Vehicles by Time of Day

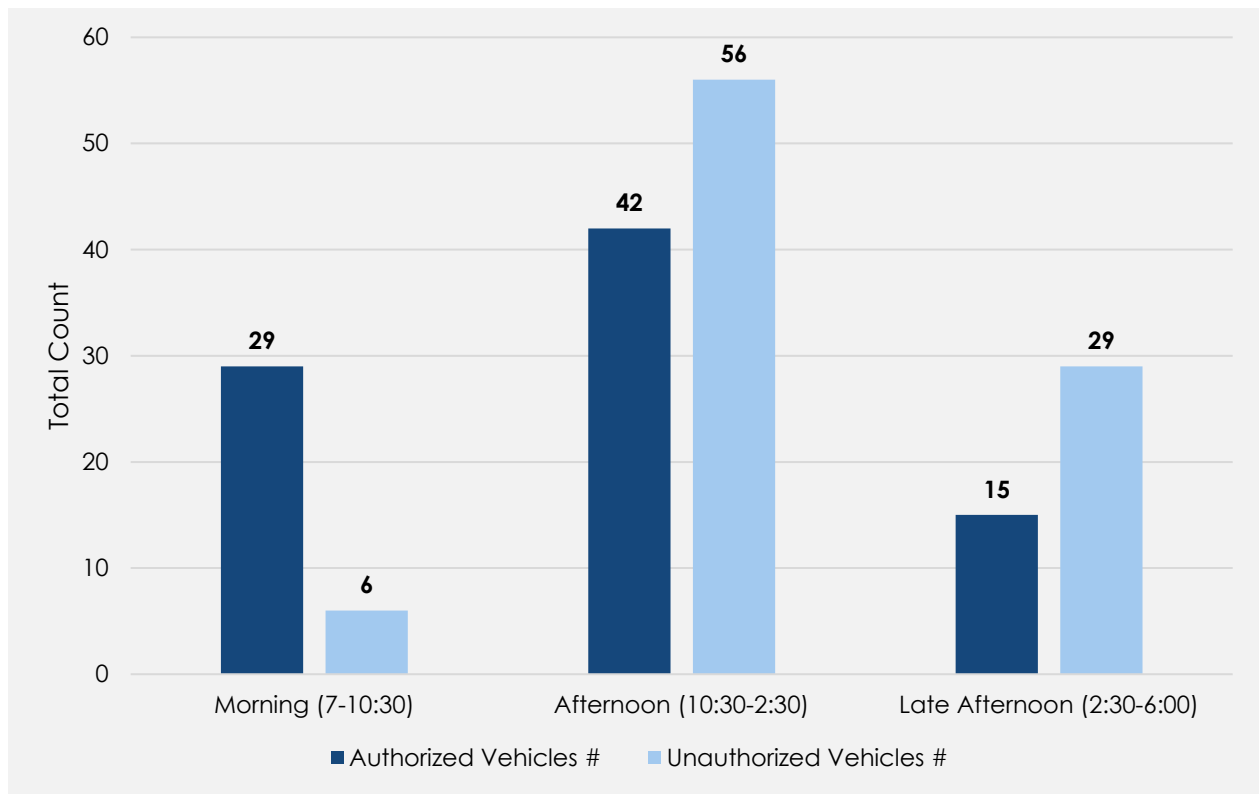


Figure 9 shows the total amount of time stopped in LZs by vehicle classification. Personal Vehicles have the most total usage time (918 minutes), largely because of the overwhelming number of personal vehicles in LZ5. Most of these vehicles seemed to be picking up food or waiting for deliveries from an adjacent restaurant. Strategies like designating 5- or 15-minute pickup and drop off zones can provide a designated space for these personal vehicles while preserving the loading spaces for delivery. Flexible curb space or designating a curb space for loading in the morning and afternoon and pickup and drop off in the evening is another potential solution.

Utility Trucks have the second-most total usage time (649 minutes), primarily because of the instances in LZ7. This is then followed by 40-foot trucks had the most usage with 488 total minutes. Utility trucks are not the intended users of loading zone spaces. Employing a service delivery pass program, providing service delivery shared parking spaces in off-street parking lots or existing parking garages, or behind businesses, when possible, can help to provide a designated space for utility vehicles and free up the loading spaces for their intended use.

The bars are color-coded by if they are authorized to use a loading zone (blue) or not (gray), but there may be select instances for each vehicle classifications that do not conform to the general case. For example, there was a 40-foot truck that stayed longer than the 20-minute time limit for LZ3, which would technically be an unauthorized use.

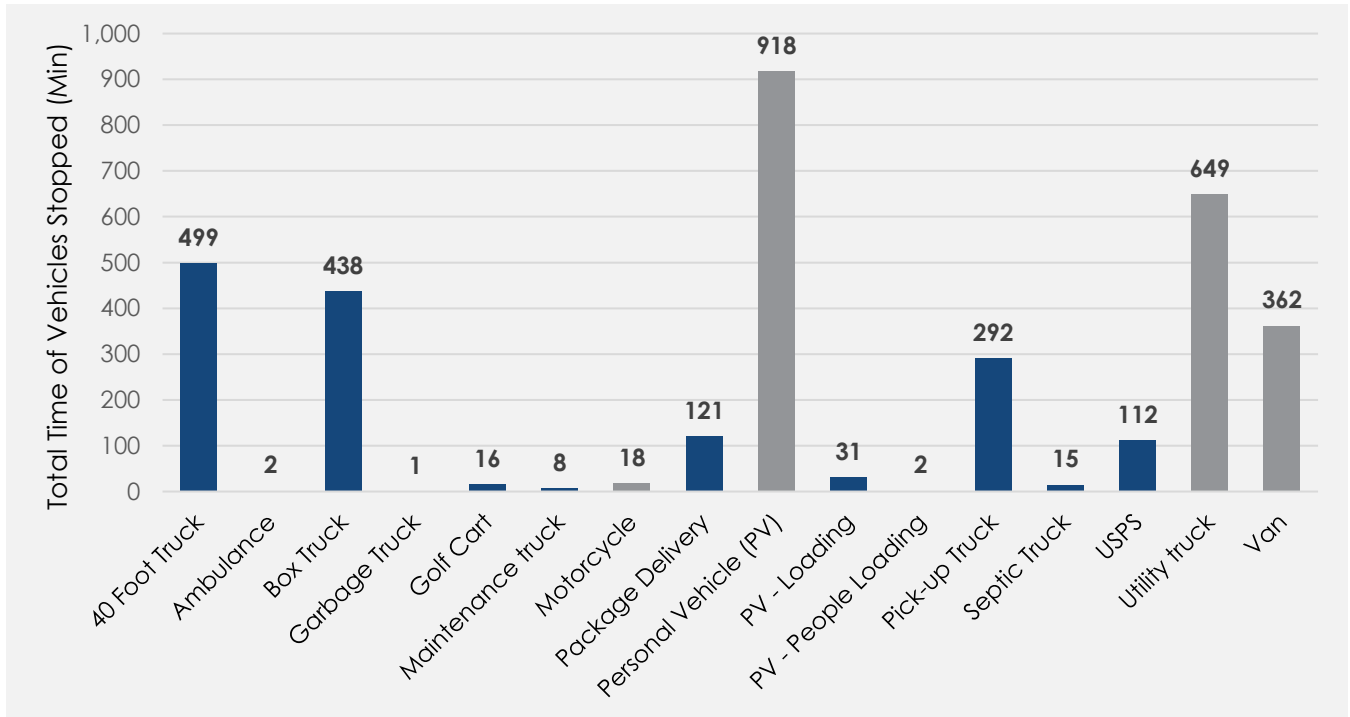
APPENDIX A: THE FULL REPORT ON LOADING ZONE VIDEO DATA ANALYSIS CAN BE FOUND IN APPENDIX A: BUSINESS SURVEY RESULTS – AVERAGE NUMBER OF DELIVERIES A DAY

Day of the Week	Total Deliveries
Monday	184
Tuesday	185
Wednesday	185
Thursday	265
Friday	183
Saturday	109
Sunday	60

Loading Zone Video Data Analysis. While this analysis is comprehensive for the days, times, and loading zones for which video was analyzed it is important to note that during the days and times of video analysis commercial vehicles could have been loading at other loading zones or in parking spaces elsewhere in the Historic Downtown of the Town of Leesburg. To obtain a complete and

comprehensive understanding of what demands are placed on the curb in the Historic Downtown it is important to have an understanding use of curb in the entire Historic Downtown.

Figure 9: Total Usage Time by Vehicle Classification



Policies

Policies related to loading and unloading of commercial vehicle loading zones can be found in the Leesburg Town Code¹ and the Zoning Ordinance². The Town Code includes all ordinances of the Town with supplements to the Code issued on an annual basis. The Zoning Ordinance was revised in 2003, as adopted by Council Ordinance No. 2003-0-2 and exists to advance the objectives in Section 15.2-2200 of the Code of Virginia and to implement the Town Plan.

The Town Code states that trained and uniformed parking attendants may enforce Article V of the Code: Stopping, Standing, and Parking. It also states that signs must be erected to designate the intended use of the curb, how and when loading zones can be used, curb use time limits, overtime parking and penalties, and truck operation restrictions. Related to commercial loading zones, the Town Code regulations that stand out include:

Sec. 32-145. – Manner of Using Loading Zones: This section indicates that loading zones must be used for loading and

unloading of goods or materials during the hours of operation and that a driver of a passenger vehicle may stop temporarily in a loading zone to load or unload passengers or bundles when the space is not being used by a commercial vehicle. As noted below in Sec. 32-141, there is no direct fine or penalty for illegal use of the loading zones. The Town can consider creating a violation for illegal use of loading zones. Even with an established violation, it can be difficult to enforce illegal loading zone use as it is subjective and relies on thorough officer training and their best judgement call in the field.

Sec. 32-141. – Parking prohibited in specific places; settlement of parking violations: This section indicates the fines for overtime parking, blocking a sidewalk, or a public driveway or alley. There is no violation for unauthorized use in a loading zone listed. A list of parking violations is available in

¹ <https://www.leesburgva.gov/government/town-code>

² <https://www.leesburgva.gov/departments/planning-zoning/zoning-information/zoning-ordinance>

Figure 10. Related to loading zone use, there is a violation for blocking a street. This is referred to as 'double-parking' and trucks are thought to be the usual offenders of this type of violation. However, with the rise in pickup and drop off and Transportation Network Companies (Uber, Lyft, etc.) personal vehicles are frequent offenders as well. Additionally, if and when a vehicle is blocking the street it typically does so due to there not being curb space available. At times curb space is not available due to illegal use of loading zones, or it could be that the truck is trying to get as close to its delivery point as possible and there is no designated curb space available. This is where a loading management plan and a fine for illegal use of a loading zone are helpful. Utilizing those policies, the root of the cause for double-parking or blocking the street is resolved.

Related to loading zones, the Leesburg Zoning Ordinance focuses on regulations and requirements for developments, including loading facilities requirements. Most regulations pertaining to loading are in Article XI: Parking, Loading, and Pedestrian Access.

In Article XI, the Leesburg Zoning Ordinance identifies whether a development will need to provide loading facilities and, when required, what size those facilities should be. In general, the standard loading facility should

be 15 feet wide and 30 feet long. This size does not accommodate a typical beverage delivery vehicle which is 40 feet in length. Depending on the type of use a larger "semi-trailer loading space" is required, this is typical for uses including grocery stores, service stations, wholesale, etc. In the Historic Downtown however, most new developments, if and when approved, will be utilizing existing space or retrofitting, resulting in a potential waiving of the loading requirement. Additionally, when loading is already provided in older or historic buildings it might be too small for trucks as the industry standard size for trucks has increased over the years. It is important to note that due to the specific conservation regulations the Historic District has, approval for new developments and for these to include allocated loading zones would be difficult. New development in the Historic Downtown is expected to comply, but new development in this area is rare.

The policies and zoning regulations related to loading in the Town of Leesburg are typical for what is seen in other jurisdictions. There are potential updates or revisions that would help to manage loading zones and loading in the Historic Downtown including establishing a violation for illegal use of a loading zone, establishing a loading zone and/or service delivery pass program, or requiring loading maintenance plans for existing and new uses in the Historic Downtown.

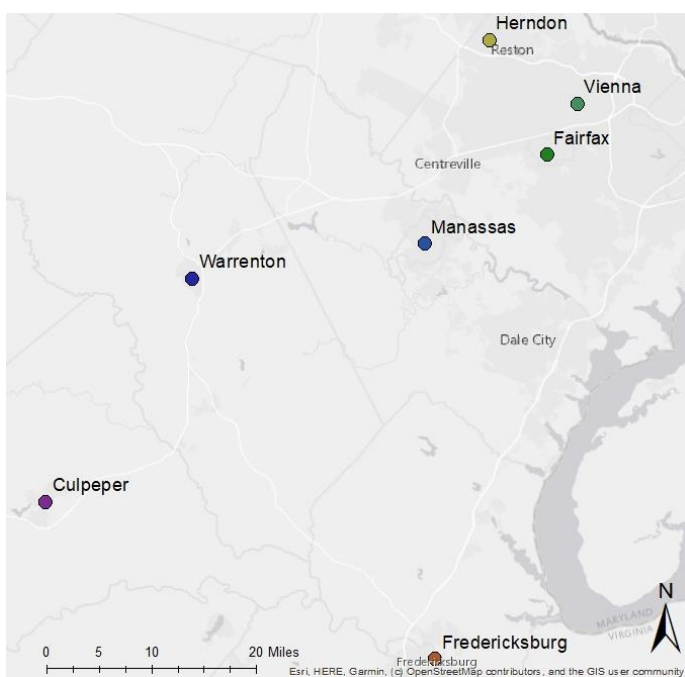
Figure 10: Town of Leesburg Parking Violations

Violation	Penalty Cost
In excess of any time limit established at the location	\$20.00
Parking on or so as to block a sidewalk	\$40.00
Parking so as to block a public or private driveway or alley	\$40.00
Parking on a crosswalk or within 20 feet of a crosswalk at an intersection	\$40.00
Parking within 30 feet upon the approach to any flashing beacon, stop sign or traffic control signal located at the side of a roadway	\$40.00
Parking on a yellow curb or in a marked safety zone, as defined by Code of Virginia § 46.2-100	\$40.00
Parking within 15 feet of the entrance to any fire or rescue station; or on the side of a street opposite the entrance to any fire or rescue station; or within 75 feet of the entrance when properly signposted	\$50.00
Parking or stopping on any street so as to obstruct traffic	\$40.00
Parking on the roadway side of any vehicle parked at the curb-edge of a street (double-parking)	\$40.00
Parking upon any bridge or other elevated structure upon a street or highway, or within a tunnel	\$40.00
Parking in a no parking (prohibited) zone	\$40.00
Parking across or on any line or marking painted on the street or in the town parking facility by the town to designate a vehicular parking space	\$20.00
Parking in a public parking lot without authorization of the owner	\$30.00
Parking in a fire lane or within 15 feet of a fire hydrant	\$50.00
Parking a vehicle in violation of section 32-143	\$40.00
Parking an inoperable vehicle on a public street	\$40.00
Parking on the wrong side of the street (left wheel to curb)	\$40.00
Parking within a parking space, including the hatch-marked area immediately adjacent to the parking space, reserved by appropriate signs for persons with disabilities on a public or private property, unless such vehicle displays a disabled parking license plate, organizational removable windshield placard issued pursuant to Code of Virginia § 46.2-1241, or DV disabled parking license plate issued under Code of Virginia § 45.2-739(B), and such person has a disability that limits or impairs his ability to walk or such person is transporting a person with a disability that limits his/her ability to walk or such person is transporting a person with a disability that limits his/her ability to walk	\$300.00

PEER JURISDICTIONS

The Town of Leesburg looked to similar jurisdictions in Virginia, with historic downtowns, to determine what policies and programs they have or will implement related to commercial vehicle loading in their historic downtowns. The project team selected Culpeper, Fairfax, Fredericksburg, Harrisonburg, Herndon, Manassas, Staunton, Vienna, and Warrenton (see Figure 11) as peer jurisdictions and reached out to planning, transportation, economic development, or enforcement contacts at each agency to conduct an interview and discuss their commercial vehicle loading programs and issues.

Figure 11: Peer Jurisdictions



Peer Jurisdiction Interviews

The project team interviewed representative from each of the nine peer jurisdictions. These jurisdictions are in various places and positions with respect their position and programs related to commercial vehicle loading in the Historic Downtown. Many jurisdictions were pleased with how their loading is currently happening in their Historic Downtown and are not looking to change much. In these instances, there is typically a small downtown area and local enforcement has good relationships with the delivery drivers while the planners have continuous relationships with the businesses. The Town of Leesburg has not yet developed this type of program or relationship with the delivery drivers in Historic Downtown. The combination of enforcement working with delivery drivers and planners helping to address any business owner/employee issues results in loading issues being addressed ad hoc as they occur. Most of the jurisdictions, like Leesburg, have

regulations related to required loading facilities though, also similar to Leesburg, in the Historic Downtown those facilities are often existing or not required due to space constraints. Where loading zones exist in the Historic Downtowns the jurisdictions have a list of where they are located, though most do not have a digital inventory. Additionally, a natural flow of flex use of curb space was noted across the board where loading occurred more in the mornings and transitioned to other uses in the late afternoon/evenings.

Staunton, like Leesburg, has noted some safety issues in their Historic Downtown. They are currently working with VDOT to identify improvement at downtown intersections and to bike and pedestrian facilities in general. Manassas conveyed that they are happy with how loading currently occurs though they are looking at curb management issues in the Historic Downtown related to how automated vehicles and increased Transportation Network Companies (TNCs) will navigate and access curb in the future.

Several jurisdictions including Warrenton, Harrisonburg, and Fredericksburg implemented 10- or 15-minute pickup and drop off spaces, meant to facilitate deliveries of food or goods for residents as a result of increased deliveries during the COVID-19 global pandemic. These spaces are not meant for commercial goods loading and unloading. Most of these jurisdictions will be keeping these spaces as the COVID-19 pandemic moves from reaction to maintenance phases across the nation.

Harrisonburg is currently developing new zoning regulations and looking to add requirements related to providing dedicated loading spaces in parking garage areas. They also are looking to designate truck-routes via Google maps and/or other navigational applications.

Peer Jurisdictions and Leesburg

Out of the nine peer jurisdictions interviewed, most were in a position similar to the Town of Leesburg in that each jurisdiction approached their loading issues as needed to respond to specific challenges they he each faced. This involved collaboration with many departments (including the police, economic development, planning and zoning, parking, etc.), and they worked to establish and maintain relationships with the downtown businesses. Key actions/initiatives noted in peer jurisdictions that could be implemented and helpful in the Town of Leesburg include:

- Improved collaboration with businesses and delivery drivers to understand loading patterns and needs and to discuss viable alternatives
- Enforcement education campaign for commercial vehicles
- Instituting pickup and dropoff designated spaces (10/15 minute limits)
- Creating a Curb Management Task Force

These and other projects and programs will be further discussed in the Policies and Recommendations section.

POLICIES AND RECOMMENDATIONS

This section presents a summary of the policies and recommendations proposed to further develop a loading zone management program in the Town of Leesburg. It is critical to continue to work with the business community, residents, public agencies, and private delivery companies to address needs and identify workable solutions appropriate to the context of individual streets.

Additionally, commercial vehicle loading is one of many demands of curb use and space. Recommendations and policies will focus on commercial vehicle loading but will touch on curb management in general as each of the demands and uses of the curb affects the other. When considering curbside loading, parking demands, pickup

Figure 12: Curbside Policies and Programs Recommendations and Priority Level

Figure 12) and Programs and Zoning and Town Code (presented in Figure 13). Priority level 1 are those where action can be taken immediately. Priority level 2 are those that will require additional time and resources to complete. Priority level 3 are longer-term recommendations, some may require considerable time, effort, and resources.

and drop off demands, emergency vehicle access, and micromobility (residents or visitors on bicycles or scooters) should be considered as well. The transportation environment for vulnerable road users, including bicyclists and pedestrians, can feel unsafe, uninviting, or uncomfortable when large vehicles are not provided or not using the provided loading facilities or when those facilities are not designed with safety for all users in mind. Managing loading zones, and the wider curb in general, helps ensure the transportation network remains safe and comfortable for all users.

In response to the challenges identified by the project team and Stakeholders, the policies and recommendations listed below were identified for further consideration. There are two categories of policies and recommendations: Curbside Policies (presented in

The figures below identify each recommended policy along with the level of priority for that recommendation. More information about each recommendation follows.

Figure 12: Curbside Policies and Programs Recommendations and Priority Level

Recommendation	Priority Level
Review loading zone fines and pricing	2
Develop Historic Downtown curb management plan and priorities	2
Create an on-going curb management task force	1
Maintain a digital inventory of curb uses	3
Utilize cameras to monitor use of curb spaces and curb space infractions	3
Discuss flexible curb space options with the curb management task force	3
Develop an enforcement education campaign	1
Create a geographic perimeter boundary for transportation network companies	3
Monitor loading zone geometry	2
Standardize loading zone signs	1

Figure 13: Zoning and Town Code Recommendations and Priority Level

Recommendation	Priority Level
Work with business owners to develop loading management plans	2
Investigate a service vehicle and loading/unloading passes program	3

Recommendation	Priority Level
Require service vehicle spaces and/or package delivery consolidation spaces in new parking garages	3

Curbside Policies and Programs

Review loading zone fines and pricing

Although some fines are set by the state, there is some value in studying the fine amounts to determine if the Town of Leesburg would like to establish new violations (for illegal use of loading zones) or to increase other fines (overstay). Pricing also might be a viable and advisable option in the future. At present, the project team recommends utilizing the enforcement campaign partnership to begin to educate and further develop relationships with the commercial vehicle drivers in the region and local businesses to communicate new policies and expectations, as a starting point. With respect to violations, tickets are not an effective way to change commercial vehicle drivers' behavior, most commercial vehicle companies build tickets into their operating revenue, and it is seen as an unavoidable cost of doing business. A more effective approach is to develop relationships and open lines of communication to work towards an operating environment that works well for the Town and the commercial vehicle stakeholders. Ticketing for unauthorized use of the loading zones could be an effective deterrent. Currently, a vehicle would pay less if they were to violate the terms of a loading zone rather than a meter, this might be encouraging unauthorized use in loading zones.

Jurisdictions across the nation are exploring progressive fines where a fine for a type of violation increases each time the same individual is ticketed. While this can be an effective deterrent, the Town of Leesburg currently issues paper tickets through one of the enforcement arms making tracking number of tickets in the field not possible. As such, the pricing options are not currently recommended for immediate action though they can be considered for future action.

Develop Historic Downtown curbside management plan and priorities

Commercial goods loading and unloading or loading are one part of the complex curbside space and transportation system. Curbside space is a limited resource on which many demands are placed from emergency service access to vehicle storage (parking), to pick up and drop off spaces. Additionally, modern technologies can rapidly change the demands on a curbside as has been seen with transportation network companies like Uber and Lyft and delivery services like Doordash. As demands for commercial goods, loading and unloading, and pickup and drop off services continue to increase, available curbside space remains the same, new technologies are introduced and adopted, and there is a

continued increase and demand for safe pedestrian and vulnerable road user activity, understanding curbside use and managing the curbside space holistically will allow the Town of Leesburg to ensure the curbside is being utilized in line with the Town's vision and goals.

This can be accomplished through developing a Curbside Management Plan and beginning to monitor and analyze use of the entire curbside space to better understand where demand exceeds supply, where supply exceeds demand and to develop projects and programs to update curbside space to best align with the Town's priorities. With the variations in land use in Leesburg as a whole, focusing on certain areas and providing area specific curbside recommendations is advised. Areas can include the Historic Downtown or commercial mixed-use areas. The Study can provide information and updates for Legacy Leesburg including updating parking ratios and parking maximums.

Create an on-going curbside management task force

Regular internal and intra-agency coordination will be critical to keep curbside and/or loading zone management projects, programs, and initiatives moving forward and in order to monitor project and program effectiveness and industry changes as they occur. Creating a curbside management task force, recommended to function as a Committee in this case, will allow the group to address major loading zone issues, examine demand, nearby metered parking use, illegal parking or loading, and congestion and focus on areas in the Town of Leesburg where loading conflicts occur most frequently. This group, similar to the project team, should include representatives from public works, economic development, enforcement partners, and others as applicable. Equally important is the curbside management task force's outreach and communication with loading zone and curbside management stakeholders. As the Town of Leesburg seeks to optimize loading operations stakeholder engagement is a critical component to both convey new initiatives, programs, and policies and to understand issues and challenges faced by those operating at the curbside daily.

Maintain a digital inventory of curbside uses

The Town of Leesburg now has an inventory of the loading zones, this is an invaluable piece of information allowing the Town to monitor these zones to understand use and determine what business are nearby. Beyond loading, understanding available curbside for other demands will be critical as the Town builds out a curbside management program. Inventorying meters, pickup and drop off spaces, any bike or pedestrian or micromobility facilities, and any other curbside uses will provide a complete inventory of curbside uses. Knowing curbside uses will allow the Town to understand,

track, and manage curb uses and demands. An inventory can also help the Town understand and address issues as they arise.

Utilize cameras to monitor use of curb spaces and curb space infractions

Once an understanding of how curb space is allocated in the Town of Leesburg has been developed (an inventory of curb uses), monitoring curb use will provide valuable information allowing the Town of Leesburg to understand demand on the curb and to determine how that curb space can best be utilized to meet the Town's goals and objectives. There are many ways to monitor curb use, the most comprehensive way to track use is to capture and analyze video data 24 hours a day, seven days a week. The Town already has some camera infrastructure in place that can be used for this effort. This will provide the most complete picture of utilization of the space. Ideally footage or usage of all curbs can be captured and analyzed, however this is an expensive undertaking. The Town can start by monitoring and evaluating portions of the curb, for example, loading zones. This will provide a complete snapshot of curb demand in loading zone spaces. The project team evaluated options for partnering with a third-party application to monitor and analyze loading zone uses. The results of that effort can be found in Appendix D:.

Beyond applications, the Town can utilize traffic camera footage for select curb uses including loading zones, and meter use data to monitor and analyze parking meter use. These efforts will provide some information about utilization the Town can use to monitor projects and programs though they will not provide information on complete curb usage. Information including demand by vehicle type or mode on a space-by-space and minute-by-minute basis, duration of stays, and time-of-day trends will help the Town understand patterns and needs within different demand types on the curb. Additionally, implementing data collection will allow the Town to develop and implement data management policies and programs, another positive step towards preparing for a more automated future.

Discuss flexible curb space options with the curb management task force

Flexible curb space refers to curb space where the designated use of the space changes throughout the day, based on time of day, or by season. This is a helpful program due to the fact that curb demands currently do and will always exceed curb supply. Developing a comprehensive understanding of demand and use will allow the Town to develop a suite of uses for optimal curb space allocation. Decisions for how to change the curb use can be made after analyzing curb monitoring data and decisions like additional loading zones where needed and making those spaces loading zones in the morning and early afternoon and parking or some other use in the late afternoon or evening. The video data analysis indicated demand is highest in the morning and afternoon at the six loading spaces monitored, switching three of

these as an initial pilot to loading in the morning and early afternoon and pickup and drop off space in the evening could provide additional information and data to the Town and a good test case for flexible hours for a shared space at the curb. The project team noted from the data that there is demand for both pickup and drop off services and package delivery in the area. Another potential pilot application for flexible curb use would be to allocate pickup and drop off spaces for these uses. This space could become parking in the evening if pickup and drop off and package delivery services are not needed during that time, thus making its use flexible throughout the times of the day/night. In the video data LZ 1 was utilized most frequently for package delivery while LZs, 2, 3, and 5 were used most frequently for passenger loading and unloading. For each of these potential pilots the curb task force should be utilized, and stakeholders engaged in the outset including industry partners. Creation of flexible curb space should be a topic for discussion and implementation by the Curb Management Task Force.

Develop an enforcement education campaign

Curb policies and programs are notoriously difficult to enforce given the 24/7 nature of curb use and the, at times, quick nature of use or space turnaround, among other reasons. However, in a limited area like the Historic Downtown of the Town of Leesburg there is an opportunity to create a partnership with enforcement to execute an educational campaign. This serves to educate the commercial vehicle community of Town expectations and to create relationships so enforcement partners can notify the parking task force or loading zone planners when issues arise. This type of relationship building was noted in the Peer Jurisdiction interviews and was viewed as successful in the jurisdictions where it was employed. The enforcement education campaign operates in partnership with the Curb Management Task Force. Additionally, since the most frequent unauthorized use of loading zones was observed in the afternoon, the enforcement campaign can focus on providing outreach during that time to educate drivers regarding proper use of the loading zones.

Create a geographic perimeter boundary for transportation network companies

Transportation network companies (Uber, Lyft, etc.) are often a pain point on the curb, they lead to increased congestion on the roadway and at the curb. A few peer jurisdictions have, as a result of COVID and increased pickup and drop off activity, designed 10- or 15-minute pickup and drop off spaces at the curb. A step beyond designating spaces is geofencing pickup and drop off zones. Geofencing is a feature deployed within most existing ridesharing applications and is common for pickup and drop off activity across the country. The geofence, once set up, appears in apps for pickups so the drivers and passengers are both notified and aware of the location they will need to be in order to be picked up or, in the case of the driver, to pick up the passenger. Drivers are less likely to adhere to a geofence for drop-off's however the Town of Leesburg enforcement partners can continue to work with transportation network companies to encourage

compliance. Implementing a geofence will organize transportation network companies' activity in the Historic Downtown, focusing specific areas of the curb for this use and opening up other areas, and will help the Town prepare as automated vehicle technologies advance, for accommodating autonomous vehicles access to the curb.

Monitor loading zone geometry

As part of the Study, the project team conducted a cursory review of the various loading zone locations and sizes. Loading spaces should be continually reviewed for accessibility, utility, and opportunities for better delineation as further analysis takes place. Loading zones analyzed as a part of the Study, in Historic Downtown, were observed to be adequate given the geometric constraints imposed by the downtown and no geometric changes are recommended at this time. However, as more of the curb is monitored additional issues may become known related to loading zone and street geometry and truck movements in the Historic Downtown. Additionally, as new loading zones are developed, considerations for the size and placement of loading zones should be considered.

Standardize loading zone signs

The loading zone signs in the Historic Downtown do not convey the 30-minute time limit, most do not include hours of operation, and some allow golf cart use or passenger loading while others do not. Standardizing the loading zone signs will more clearly communicate the types of uses allowed, length of time allowed, and time of day where there are and are not restrictions. This will also facilitate a more comprehensive enforcement effort and can be conducted in tandem with an enforcement campaign (see recommendation below).

ZONING AND TOWN CODE

Work with business owners to develop loading management plans

As buildings are redeveloped and new businesses move into the Historic Downtown, they will undergo the zoning and permitting process with the Town of Leesburg. This is a critical opportunity for the Town to discuss how commercial delivery loading and unloading and pickup and drop off will happen at that location. After zoning and permits have been approved, the Town must react to issues as they arise, collaborating with developers and businesses in the zoning and permitting process will allow the Town to address potential issues proactively. A way to address any loading issues proactively is to develop a loading management plan for each new business and/or development. The loading management plan. This document would address how deliveries larger than can fit in the loading dock, if a loading dock is provided, will load and unload, the number and size of deliveries expected for each business and where each of those vehicles will load and unload, an understanding that someone will be appointed to manage receiving deliveries at that business, an understanding that a call box should be installed in the loading dock to facilitate smooth receiving of deliveries and pickups, language related to off-hour deliveries if they will be accepted at that location, and a discussion of what building features will facilitate those off-hour deliveries (for example, double entry walk-ins, key boxes, double entryways, etc.). This plan will be kept and utilized if/when loading issues connected to that building do arise.

Investigate a service vehicle and loading/unloading passes program

Presently, commercial vehicles load and unload where they can access the business they are delivering to or working with. This results in the business not always being aware of where that commercial vehicle is loading or unloading or not being aware of issues that driver might be encountering as they attempt to deliver to the business. The Town of Leesburg can assign service vehicle and commercial vehicle loading and unloading passes to businesses. Utilizing the pass program, each delivery driver will need to obtain a pass from the business when they deliver, allowing the driver and business owner to have a conversation or be more aware of where loading and unloading is occurring. The business owner then can communicate issues and challenges through the parking task force. Additionally, if and when there is an issue with a commercial vehicle, the pass can be checked to determine which business they are delivering to and the Town and enforcement partners can then work with both the delivery driver and the business to resolve any issues. Through the service vehicle pass program specifically, the Town can identify where service delivery drivers should park, if the Town prefers, they utilize a loading zone for the day or a parking meter, which can be specified in the pass program.

Require service vehicle spaces and/or package delivery consolidation spaces in new parking garages

While the curb is a preferred space for service vehicles and delivery companies to load and unload or park while they work in the case of service vehicles, it is not the only space available. Where parking garages or surface lots exist or are in development the Town of Leesburg can look to require businesses and developers to allocate space for service vehicles and/or package delivery vehicles or mini package delivery consolidation spaces. This frees up the curb space these vehicles would have utilized and provides, for those businesses, dedicated spaces for these services to access their building.

As a part of the loading zone application research effort (Application Memo) and the list of policies and recommendations, the project discussed the possibility of curb pricing, specifically two options for curb pricing: requiring payment for the use of loading zones and increasing the price of tickets related to loading zone violations. With respect to curb pricing, application vendors who monitored via a sign-in to use the space rather than utilizing video data noted that pricing use for loading zones correlated heavily with adoption of the application. This makes sense that commercial vehicle drivers would be less likely to 'sign-in' to use a loading zone if there is not a payment required for that space. As payment is required, the 'sign-in' is not a choice, it must be done to pay for the space. Without payment there is little incentive for the driver to participate. With respect to increasing the price of tickets related to loading zone violations, the project team found that at present there are two violations related to loading zone use: a fine for an overstay (Sec. 32-141, \$20

fine) and parking in a no parking (prohibited) zone (Sec. 32-141, \$40 fine). There are additional fines that could apply to vehicles using a loading zone improperly including parking on any street so as to obstruct traffic (Sec. 32-141, \$40 fine) and parking on a crosswalk or within 20 feet of a crosswalk at an intersection or parking on or so as to block a sidewalk (Sec. 32-141, \$40 fine). There is no explicit existing fine for an unauthorized vehicle in a loading zone though the parking in a no parking (prohibited) zone fine could apply to them. As comparison, the fine for violating a meter is \$50 (Sec. 32-252).

Implementing these policies and recommendations will continue to advance both loading zone management and curb management overall in the Historic Downtown of the Town of Leesburg. These actions will also help the Town prepare for increased automation. As technologies advance and vehicles are more able to operate independently and speak with one another, understanding existing and desired use of the curb and beginning to utilize application and geofencing technologies, will prepare the Town for increased vehicle automation in the future.

APPENDIX B: BUSINESS SURVEY RESULTS – AVERAGE NUMBER OF DELIVERIES A DAY

Day of the Week	Total Deliveries
Monday	184
Tuesday	185
Wednesday	185
Thursday	265
Friday	183
Saturday	109
Sunday	60

APPENDIX C: LOADING ZONE VIDEO DATA ANALYSIS

In total, the six loading zones (LZs) analyzed saw 141 stops during the period analyzed, which totaled to 3,021 minutes out of a total possible 6,600 (45.8%). The period analyzed is below:

- Tuesday, August 3, 2021 (7:00am – 5:00pm)³
- Thursday, August 5, 2021 (7:00am – 5:00pm)³

The six LZs analyzed are shown below in

Figure 14. LZ1, LZ2, LZ3, LZ4, LZ5, and LZ7 were the six LZs analyzed.

Figure 14: Loading Zone Locations



Figure 15 shows the breakdown of the stops by LZ, the total duration of all the stops each LZ had, and the average stop time. LZ5 was used most frequently with 54 total stops in the time period analyzed, but LZ7 had the highest amount of total time used with over 1,000 minutes (91% of

the total time analyzed). This high value for LZ7 is due to two utility trucks and one pick-up truck occupying the space for most of the day on August 5 (these vehicles were not loading or unloading, so they should not have been stopped in the LZ)

Figure 15: Basic LZ Usage

Loading Zone	Total Stops	Total Duration of Stops (minutes)	Average Stop Length (minutes)
LZ1	21	528.0	25.1
LZ2	27	299.0	11.1
LZ3	20	249.0	12.5
LZ4	11	222.6	20.2

³ LZ3 and LZ5 did not have video available for the period between noon and 5pm on 8/5

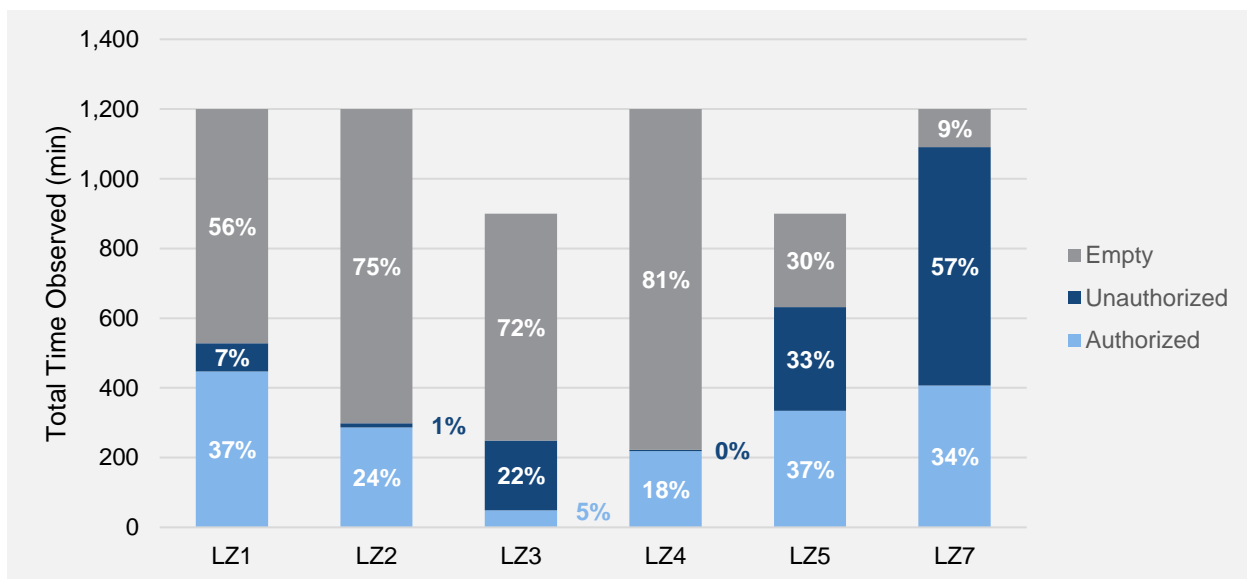
Loading Zone	Total Stops	Total Duration of Stops (minutes)	Average Stop Length (minutes)
LZ5	54	632.0	11.7
LZ7	8	1,090.5	136.3
Total	141	3,021.1	21.4

Figure 16 shows a bar graph of the total time each LZ was observed (20 hours for all LZs except LZ3 and LZ5) broken out by three usage type. At any point during the observed hours, the LZ could have (1) an authorized vehicle, (2) an authorized vehicle, or (3) be empty.

As seen in the graph, LZ4 was used the least out of all observed LZs, with it being empty over 80%. LZ2 and LZ3

were similar, with 75% and 72% empty, respectively. In terms of the percentage of unauthorized parking, LZ7 and LZ5 experienced the highest percentages of unauthorized parking (57% and 33% respectively). LZ3 was also particularly bad as 22% of the time a vehicle was using the LZ, it was unauthorized, compared to a 5% authorized usage rate.

Figure 16: Total Duration of Usage Types



The average stop length for all the loading zones was just over 20 minutes. As seen in

Figure 17, over half of the vehicles were stopped for 15 minutes or less, and there were more stops that were 1 minute than there were stops over 1 hour.

Most of the stops that were under 5 minutes were stops from personal vehicles that should not have been using the

loading zone. They normally consisted of someone stopping in the zone and going into a store along the sidewalk. Stops that were under 1 minute long were disproportionately unauthorized (this was personal vehicles dropping people off), with over 80% of stops being unauthorized.

Figure 17: Duration of Stops for all LZs

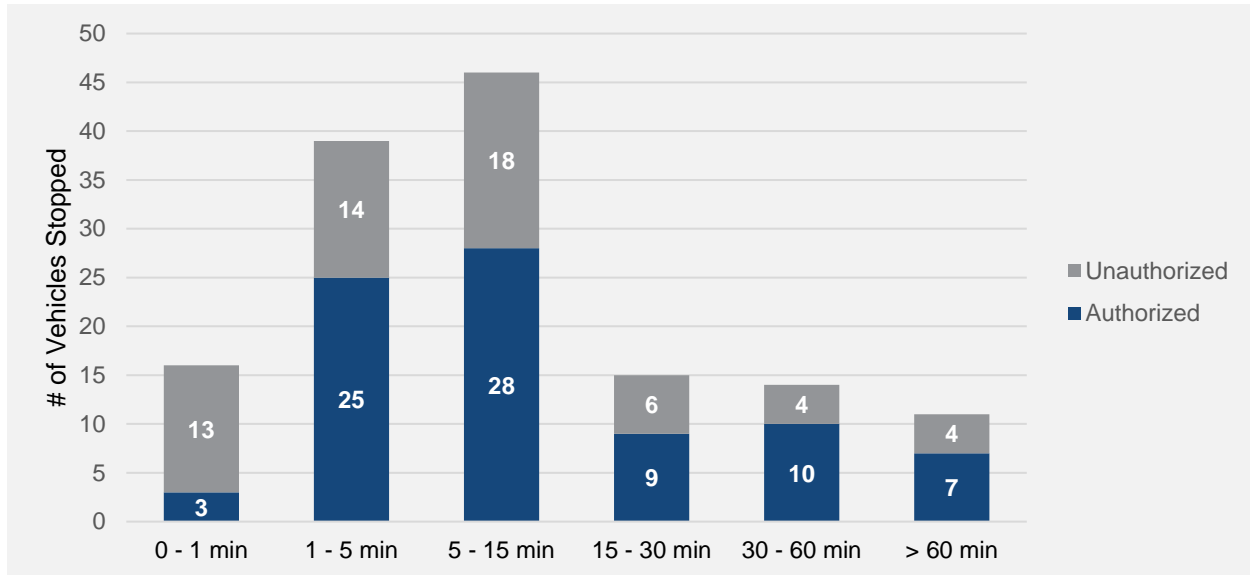


Figure 18 shows the total number of vehicles stopped at all loading zones by time of day. The afternoon period (between 10:30am and 2:30pm) saw the greatest number of stops compared to the morning and the late afternoon. This could be because when individuals would shop and eat lunch, which would correlate to an increase in illegal usage of these spots

However, while the afternoon has the most total number of stops, the average stop length is just 16 minutes, compared to an average of 43 minutes for morning stops. While the LZs are used a fewer number of times in the morning, the

duration of those stops are longer, which leads to the spaces being occupied for a greater percentage of the available time than in the afternoon. This could be because stores would get deliveries early in the morning to use for later in the day (like a restaurant getting fresh food delivered every morning), and actual deliveries take longer than quick stops to shop.

This sentiment is also reflected in the fact that the stops in the morning were disproportionately authorized, as opposed to the afternoon and late afternoon were only about half were authorized.

Figure 18: # of Vehicles Stopped by Time of Day

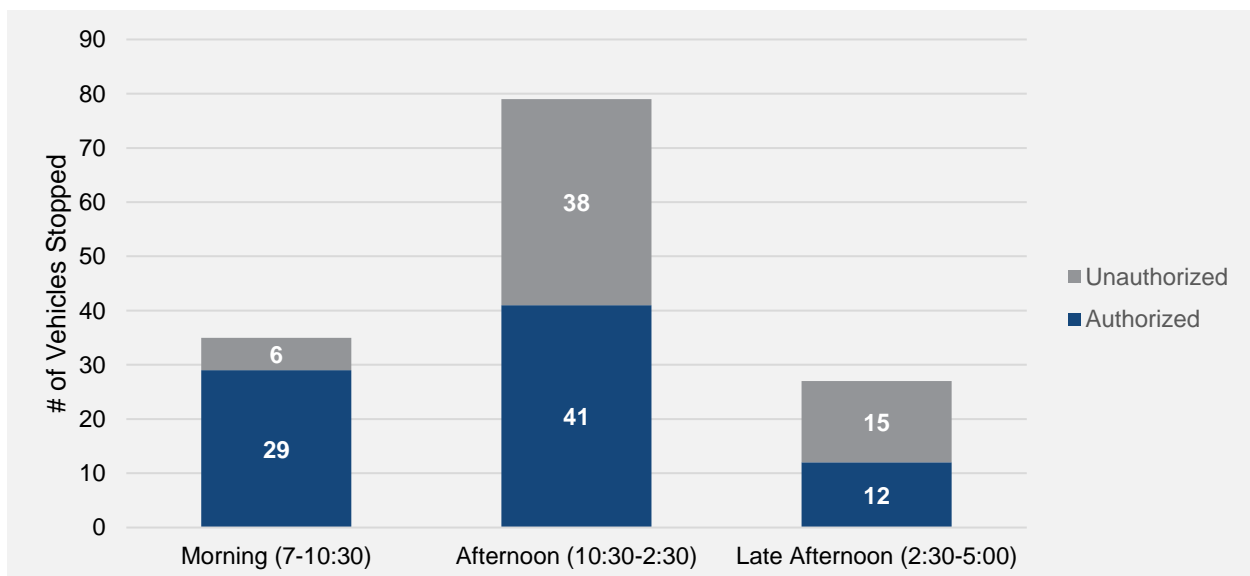


Figure 19 shows the total amount of time stopped in LZs by vehicle classification. Utility Trucks have the most total usage time, largely because of the instances in LZ7. Besides that, 40-foot trucks had the most usage with 488 total minutes, followed by personal vehicles and other box trucks with over 400 minutes for each.

The bars are color-coded by if they are authorized to use a loading zone (blue) or not (gray), but there may be select instances for each vehicle classifications that do not conform to the general case. For example, there was a 40-foot truck that stayed longer than the 20-minute time limit for LZ3, which would technically be an unauthorized use.

Figure 19: Total Usage Time by Vehicle Classification

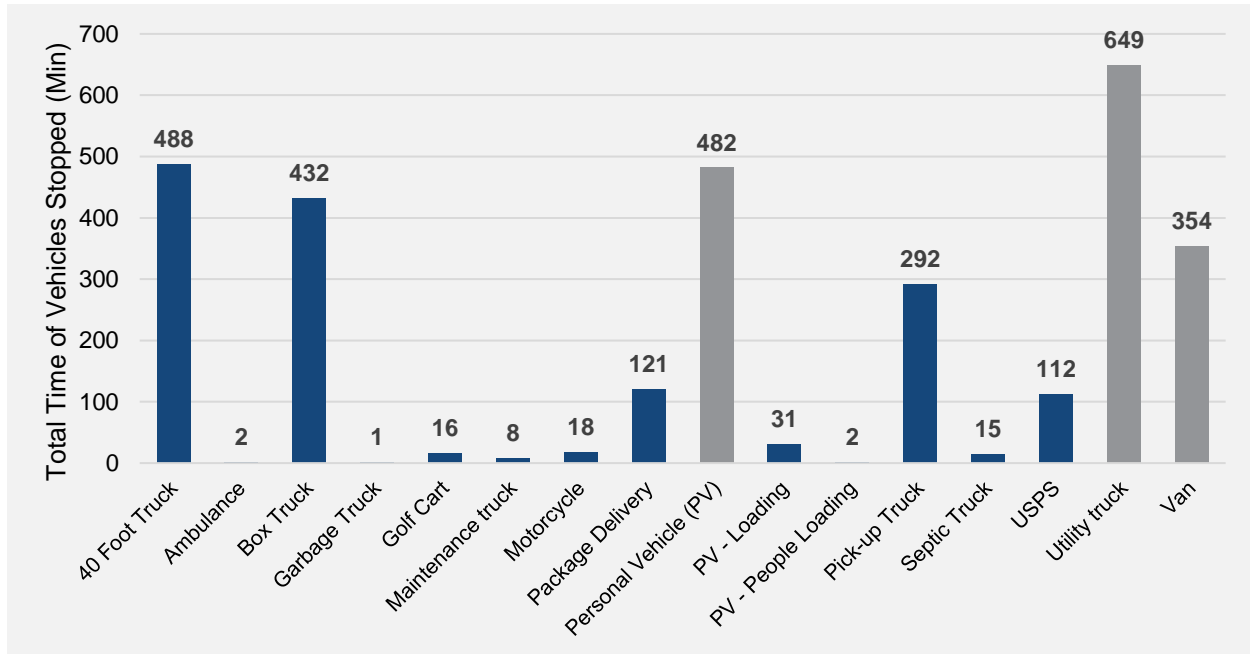
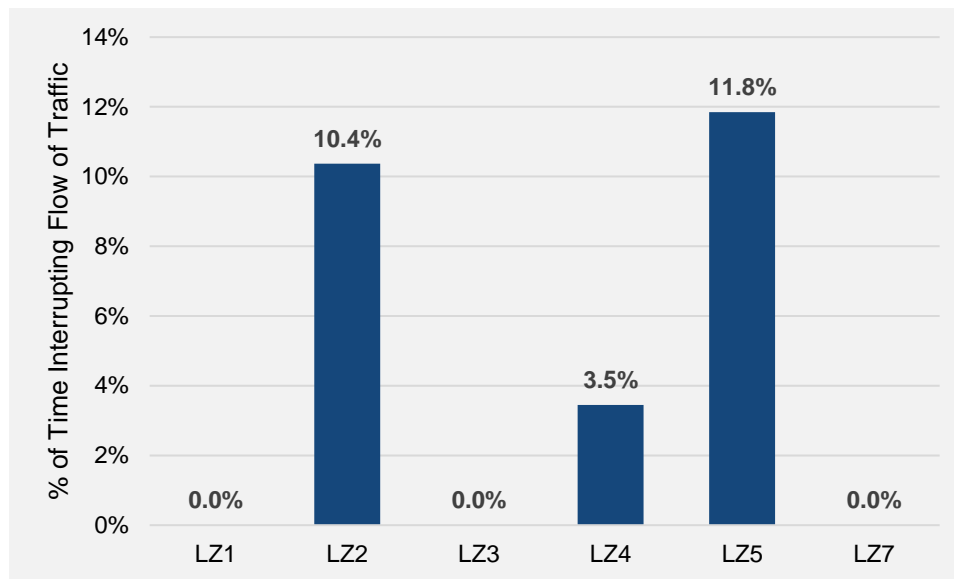


Figure 20 shows the percentage of total stopped time when vehicles using the loading zone were interrupting the flow of traffic. "Interrupting the flow of traffic" is defined in this case to mean when the parked vehicle is blocking part of the travel lane. There were instances (mostly of larger trucks) where passing vehicles would cross over the center line to pass a vehicle parked in an LZ, but this appeared to be because they wanted to give the parked vehicle extra space, not because it was impossible to stay in the travel lane. Instances like this were not characterized as "interrupting the flow of traffic".

Three of the LZs (LZ1, LZ3, and LZ7) did not experience any substantial blocking of traffic. LZ5 and LZ2 were each above 10%, which means 1/10 of the time each had a vehicle in it, that vehicle was interrupting the flow traffic. These were instances of a large truck (normally a 40-foot truck or box truck) being a little too wide for the loading zone.

Figure 20: Percentage of Time Vehicles in the Loading Zone Were Interrupting the Flow of Traffic



APPENDIX D: APPLICATION MEMO

Introduction

The goal of this effort is to evaluate a variety of technologies to maximize the efficient management and use of fifteen existing loading zones for the Town of Leesburg and provide guidance on potential next steps to improve practices.

The effort first required the definition of a framework to evaluate key needs and requirements for a service package to monitor loading zones and/or operate a reservation system for commercial vehicle drivers. Using the framework, the team performed an online industry search and vendor investigation into existing companies operating in the curb space and the types of services and product offerings available to implement such a service. Each company was evaluated against the Figure 21: Vendor Study Matrix and informs the recommended next steps.

Study Process and Outcomes

Study Criteria

The Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT) provides common frameworks for planning, defining, and integrating intelligent transportation systems. The evaluation criteria takes into consideration ARCT-IT needs and requirements as outlined for Loading Zone Management.⁴ The criteria include:

established framework, highlighting benefits and drawbacks of each solution. Following the evaluation, a summary was presented to the Town of Leesburg to understand the town's priorities related to the criteria and the industry vendors.

Based on the feedback, the team conducted vendor interviews to gather more in-depth detail on solution capabilities with respect to the town's priorities. This information refined results with respect to Leesburg's prioritized criteria as summarized in

Item 1: Monitoring: A parking operation can monitor occupancy of spaces in a loading zone. As part of this, a parking element monitors the status of each loading zone under its control. The parking element would provide real-time status of the loading zone availability to drivers or fleet operators.

Item 2: Reservation: A driver or fleet operator has the capability to request the reservations of the loading zone space under its control. The reservation utilizes a driver application to request a current or future reservation. The system will transmit and collect information related to the location, availability, and policies.

⁴ <https://www.arc-it.net/html/servicepackages/sp202.html#tab-5>

Item 3: Payment: The parking operation has the capability to support a system of electronic payment either at the time of use or in advance for loading zone spaces.

Item 4: Enforcement: The parking operation has an application that can assist with proactive loading zone enforcement. Functionality includes the ability to check, monitor, and alert enforcement staff about loading zone compliance. The solution might function as a stand-alone service or integrate to existing solutions.

Item 5: Dashboarding: The parking operation has ability to collect and analyze information related to loading zone performance to monitor and evaluate usage trends and inform policy decisions.

Item 6: Cost: Information pertaining to the cost incurred and responsibilities of the city for a pilot or long-term solution.

Phase 1: Vendor Screening

Application memo Appendix B: Additional Vendor Research).

With the initial screening complete, the team presented the criteria and vendor options to Leesburg to gain initial feedback and establish priorities. The need for loading zone Monitoring, Dashboarding, Enforcement and Cost solutions were confirmed with the criteria of Reservation and Payment identified as low priority and thus removed from the final evaluation. Monitoring and Dashboarding were identified as of primary importance.

CS started by performing a web-based investigation into curb-technology companies, primarily focusing on loading zone management products and services. The team reviewed materials such as company websites, industry articles, and publicly available case studies to screen solution fit. The following companies were identified as the key focus for the remainder of the Study:

- Automotus
- Cleverciti
- Coord
- Curbflow
- Parkunload

The following companies were identified as heavily involved in the curb space but removed from consideration after determining their offerings did not match Leesburg's needs: Populus, Passport, CurbiQ, Gridwise, and Lacuna Technologies (initial writeups for some of these companies can be found in

Phase 2: Vendor Interviews

CS performed outreach and conducted interviews for the final vendor list. The resulting information was used to complement online research and refine and summarize evaluations against the prioritized criteria. For each vendor, a score of one (least suitable) to five (most suitable) was assigned for individual criteria with a final score calculated as the average across all performance criteria. Study results are summarized in

FIGURE 9 AND A DETAILED WRITE UP OF EACH VENDOR CAN BE FOUND IN

Application Memo Appendix A: Final Vendor Review.

Figure 21: Vendor Study Matrix

Vendor	Monitoring		Dashboard		Enforcement		Cost		Average Score
Coord	<ul style="list-style-type: none"> • App driven check-in/check-out service akin to parking meters 	2	<ul style="list-style-type: none"> • Sessions, revenue, dwell time, utilization rate, scans. • Charts, time-series data, data export 	4	<ul style="list-style-type: none"> • Enforcement mobile application with license plate scanning 	3	<ul style="list-style-type: none"> • ~\$25k for pilot program • Option for revenue sharing model • Not including sensing technology integration 	3	3
Parkunload	<ul style="list-style-type: none"> • App and Bluetooth beacon check-in/check-out service akin to parking meters 	2	<ul style="list-style-type: none"> • KPIs, real-time and historic parking information • Availability map, proof-of-parking, regulation per zone, data export 	4	<ul style="list-style-type: none"> • Enforcement mobile application utilizing Bluetooth technology 	3	<ul style="list-style-type: none"> • Deployment: 100 euro per zone • Operation: 3 euro per space per month 	4	3.25
CurbFlow	<ul style="list-style-type: none"> • Smart Vision cameras algorithmically detect vehicle occupation 	5	<ul style="list-style-type: none"> • Count: people, vehicles, bicycles • Object Detection: vehicle, type, classification • Behavioral: double parking, idling occupancy, dwell time Length: measure available space in real time 	4	<ul style="list-style-type: none"> • Enforcement companion mobile application. Ping app when detects policy infringement 	4	<ul style="list-style-type: none"> • \$1,500 per camera • Installation costs as applicable • \$3-\$7k per month 	2	3.25
Automotus	<ul style="list-style-type: none"> • Smart Vision cameras algorithmically detect vehicle occupation 	5	<ul style="list-style-type: none"> • Traffic counts, occupancy, double park events, violation rates, dwell time, etc. 	4	<ul style="list-style-type: none"> • Multiple levels of automated enforcement. • Notify enforcement officers with photo and location • End-to-end integration 	5	<ul style="list-style-type: none"> • Platform development: \$50-\$250k • Purchase, install, monitor: \$15-\$20k annually per smart loading zone • Option for revenue sharing model 	1	3.75
Cleverciti	<ul style="list-style-type: none"> • Smart Vision cameras algorithmically detect vehicle occupancy 	5	<ul style="list-style-type: none"> • Real-time length of stay/overstay, area of interest comparison, traffic flow trend analysis • Price changing strategy monitoring • On the fly policy changes e.g., for a special event 	4	<ul style="list-style-type: none"> • Integrates with third-party parking management solutions 	4	<ul style="list-style-type: none"> • 36-month Solution as a Service • Sensors only: \$19,968 • Sensors & digital signage: \$65,793 	3	4

APPLICATION MEMO APPENDIX A: FINAL VENDOR REVIEW

Coord

Coord helps cities manage their streets, providing tools to digitally inventory, allocate, price, and operate the curb at scale. As part of their 2020 digital curb challenge, Coord implemented Smart Zone pilot programs with the cities of Aspen, Nashville, Omaha, and West Palm Beach to help them better manage commercial loading zones. Coord Smart Zones are spaces along the curb that cities digitally manage. Drivers use a mobile app to see real-time availability of zones and route, reserve, book, and pay for their use.

Monitoring (Score: 2)

The Coord Smart Zone solution manages loading zones using a reservation-payment solution facilitated via mobile application. With this, most pilots do not support comprehensive real-time monitoring using sensing technology and instead occupancy is derived by reservation. Coord has worked with sensing technology vendors to integrate cameras or other devices with their Smart Zone program, but it is not part of the core service. Instead, the Smart Zone program identifies occupancy using half-mile reservations and check-in/check-out service akin to parking meters. Data accuracy is incentivized by user adoption driven by payment and enforcement.

In a Coord powered smart zone program, a city or other curb manager designates a stretch of the curb as open to drivers that book during certain hours and days of operation using Coord's mobile application, Coord Driver. They use signage to communicate basic information, but then designate all other regulations digitally (e.g., user groups, prices, time limits, hours to which each regulation applies). Drivers use the Coord Driver mobile application to select and navigate to zones, with the system reserving the spot when the vehicle is a half-mile away from the zone. Drivers that do not enter their destinations ahead of time can arrive at an empty zone that shows availability and start a session using the same selection process. As a policy rule, during its hours of operation, a Smart Zone can only be used if the spot was booked using the Coord Driver application.

The most recent video outlining Smart Zones with the Coord Driver program can be found [here](#).

Dashboarding (Score: 4)

The Coord System continuously captures data about which user types, where, when, and for how long drivers are using the loading zones. Users can select different zones and report on information including sessions, revenue, dwell time, utilization rate, and scans. This information is viewable in time-series charts with date ranges selected by the user. Data can be exported to .csv format and is accessible via API.

Enforcement (Score: 3)

Enforcement officers enforce Smart Zone rules using the Coord Inspector application, which can be downloaded on city issued devices. Instead of using traditional methods of inspecting spaces against time limits, officers use Coord Inspector to scan license plates and determine if the space has been booked.

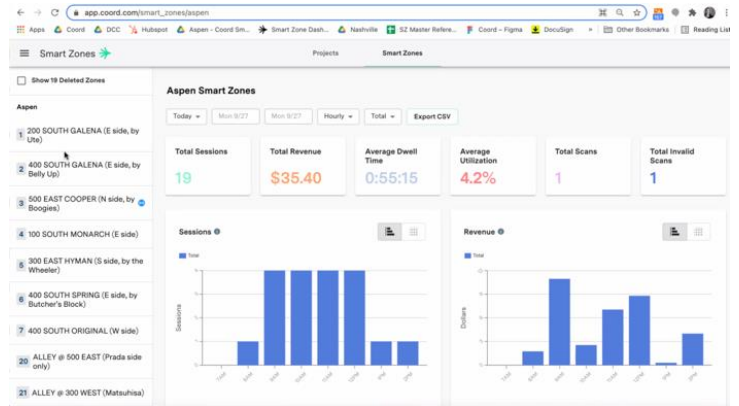
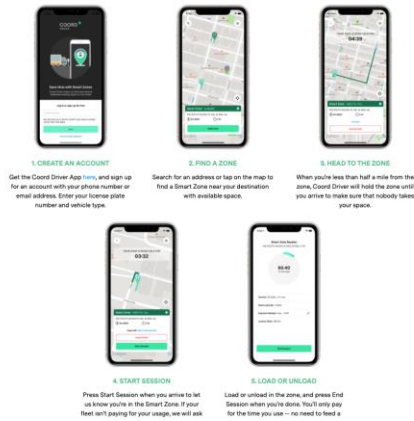
The Coord Driver application has features that allows the driver to alert enforcement if they had reserved a Smart Zone and find it occupied. The inspector application is alerted of the non-compliance and if the officer is nearby and available, they scan the license and enforce the incident. Furthermore, the information is captured in the Coord System and displayed in the Coord Smart Zone dashboard for analytical and deployment planning purposes. Enforcement is not an automated process as most cities do not have the authority for automatic ticketing.

Cost (Score: 3)

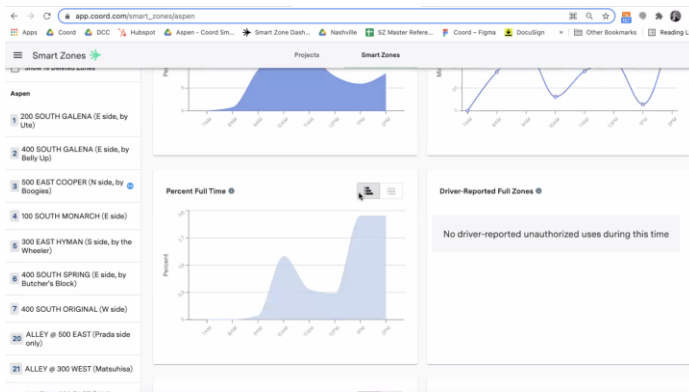
The Coord Smart Zone is an end-to-end solution to effectively manage loading zones. Since the program requires driver usage and adoption of mobile applications, it heavily relies on payment. Payment facilitates the fleet manager onboarding experience and helps ensure utilization that drives accurate data reporting.

The Smart Zone program usually works with cities that are larger than Leesburg. The typical business model involves Coord retaining 30% of the fees that the city charges with the city keeping the rest. Due to the program's reliance on city size, the model requires a certain scale to be viable. With that, Coord estimated that a Leesburg program would cost \$25,000. This cost would not include any integrated sensing technology, which would include additional costs for Coord integration and/or device procurement and management.

Images

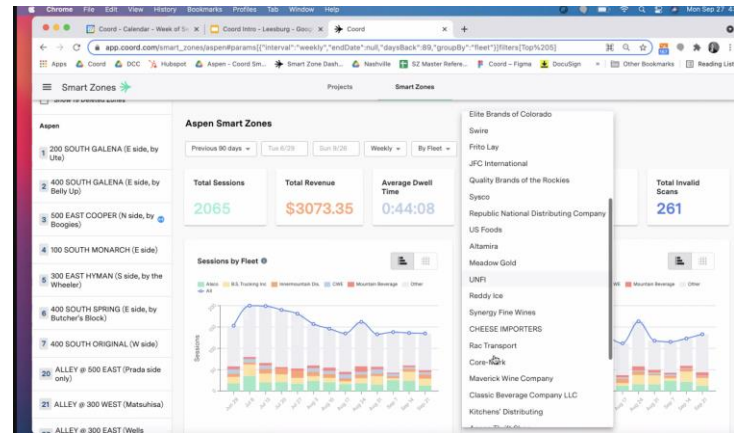


Coord Smart Zone Application Workflow



Coord Dashboard View

Coord Dashboard View



Coord Dashboard View

Parkunload

Parkunload is a digital platform to regulate, control and monitor restricted parking zones using mobile applications and Bluetooth technology. Cities can use Parkunload to manage free, restricted, and time-limited parking zones. Parkunload is headquartered in Barcelona, Spain but has an additional office in Miami, Florida.

Monitoring (Score: 2)

The focus of the Parkunload solution is to manage loading zones using a reservation solution facilitated via mobile application. With this, most pilots do not support live-feed monitoring using sensing technology and instead occupancy is derived by reservation. The Parkunload program identifies occupancy using check-in/check-out service akin to parking meters. Data accuracy is determined by user adoption facilitated by marketing campaigns and enforcement efforts.

To reserve a loading space/zone, riders must use the Parkunload mobile application. Drivers register on the app using their phone number and set-up their vehicle and driver profiles, setting information such as license plate, vehicle type, and emissions badge. Drivers approach the digital parking zone and when the vehicle is near the loading zone sign, the Parkunload app detects the vehicles position using Bluetooth technology and displays the

parking permit and the maximum parking time for the vehicle. The driver uses either the app or a separately purchased device called the “Smart Parking Button” to signal the start and end time of the parking session. Throughout the time-period, the app displays the remaining time and provides notification of any status change.

A video of the Parkunload solution in action can be seen on their [site](#).

Dashboard (Score: 4)

The Parkunload solution includes a web interface that cities can use to provide several services. These include KPI and dashboard, real-time and historic parking information, charts, availability map, proof-of-parking data, regulation per zone, and data export.

Enforcement (Score: 3)

The Parkunload solution includes a mobile application for parking enforcement agents. The application provides information and notifications on vehicle status and their remaining parking time in real-time per smart parking zone.

Cost (Score: 4)

The following pricing information was provided by Parkunload:

PROJECT

DEPLOYMENT STAGE

Implementing Parkunload in the city

- Definition of the deployment project
- Supply of Bluetooth devices
- Parkunload platform configuration
- Customized vertical sign design
- Coding and Deployment Plan per street
- Training and communication plan

99€/zone*
From 2 a 20 spaces per zone

DEPLOYMENT IN LESS THAN 6 WEEKS

* Min. 50 smart zones (~200 parking spaces).
Excluding the supply of vertical signage, to be provided by the municipal supplier

SERVICE

OPERATIONAL STAGE

Parkunload's Software as a Service

- 24x7 SaaS Cloud Platform
- App for drivers and App for wardens
- SW and HW maintenance plan
- Technical support and customer service
- Unlimited access to BackOffice panel
- Report and analysis of data by zone

299€/space*
per Month

ADDITIONAL VOLUME DISCOUNTS

* Min. 50 zones (~200 parking spaces)

©2021 Parkunload - Sustainable Loading and Delivery Zones (S-LOADZ) 10

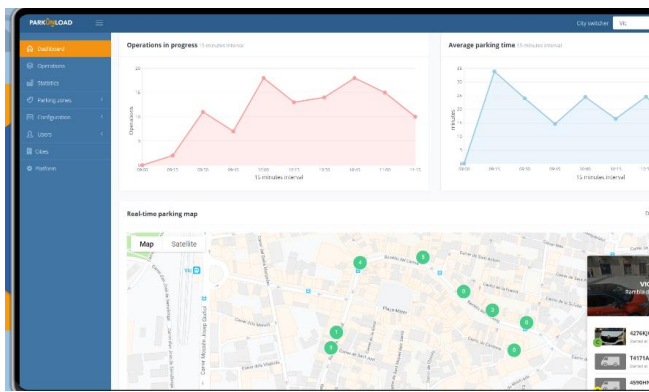
Images



INFORMATION COLLECTION: OPERATIONS CAPTURED THROUGH PARKUNLOAD PLATFORM

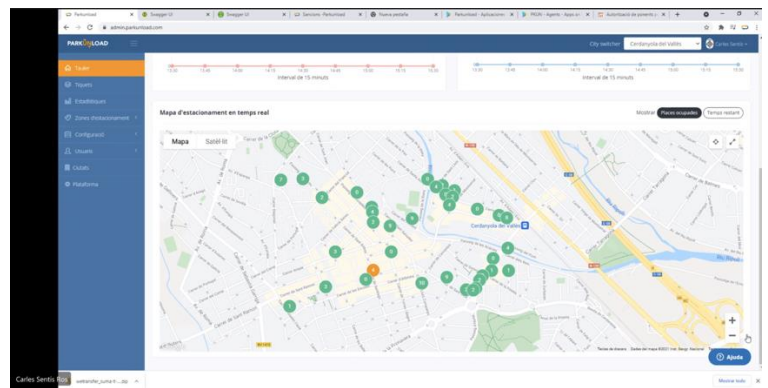
Smart road signs Extremely quick, energy-saver and precise method to identify and locate smart loading zones.	Mobile app for drivers To easily register their parking operations and gather occupancy information (free parking slots).	Mobile app for parking agents To efficiently control the status of the vehicles in the smart loading zones of the city.	Web-base BackOffice To set-up the platform, def particular pa permit and ti per zone anc statistics.

Parkunlod Workflow



Parkunload Dashboard View

Parkunload Platform Overview



Parkunload Dashboard View

CurbFlow

Curbflow uses Computer Vision (CV) to help provide real-time services and data to help manage curb space. CurbFlow's solutions utilize a network of CV devices to capture live street views and use machine learning algorithms to collect data such as real-time parking availability and display current street information in their app and integrated systems. CurbFlow has utilized their technology across multiple business applications and previously implemented loading zone pilots with the District Department of Transportation (DDOT) and the City of Columbus. While still open to working with public cities, due to COVID-19, CurbFlow pivoted their core business strategy away from the public sector to focus on partnerships with retail merchants and commercial real estate to help them quantify their curb space.

Monitoring (Score: 5)

CurbFlow's main service is their ability to provide live feed monitoring through their CV devices. CurbFlow assembles their own camera hardware and has developed machine learning algorithms that are trained on camera targets to recognize data such as space occupancy, space length detection, double-parking, vehicle classifications (truck vs. van), license plates, and logo detection. Depending on the need, CurbFlow's computer vision models support data collection including:

- Counting (people, vehicles, bicycles)
- Object detection (vehicle, type, classification, etc.)
- Behavioral Detection (double parking, idling)
- Behavioral Measurement (occupancy, dwell time)
- Length Detection (measure available space in real time)
- Object Tracing & Speed (from where, to where?)
- Reading & ID'ing (Logos, License Plate Recognition)

Dashboarding (Score: 4)

With their devices, data is delivered via APIs to partners and customers in the form of mobile and desktop applications and web-based dashboards. The system can

be used to review information at a specific location or to communicate aggregate results and operational intelligence. Dashboards come with a subscription for unlimited number of users with typical business hour support. The following screenshots communicate dashboard content used over a series of CurbFlow solutions.

Enforcement (Score: 4)

For the pilot with Columbus, CurbFlow created an enforcement companion application, which was embedded in Parking Enforcement Android devices, allowing for proactive enforcement in real time. The camera devices can ping the app whenever a car or a vehicle is captured performing in an unauthorized manner. These policies could include double-parking or dwelling beyond a designated time-limit. For Columbus, the city was specifically interested in knowing if a passenger car was dwelling for greater than 5 minutes.

Cost (Score: 2)

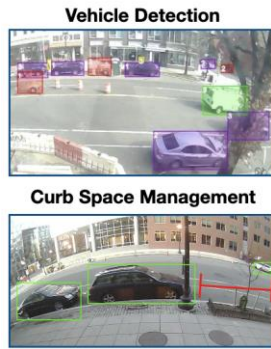
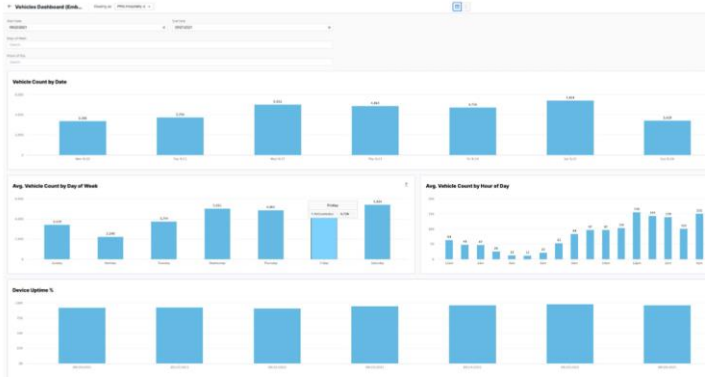
The typical cost for a CurbFlow deployment depends on three primary factors:

Hardware: Assuming outdoor devices, the cost for each camera device is \$1,500. Each camera can capture around 100ft of curb space.

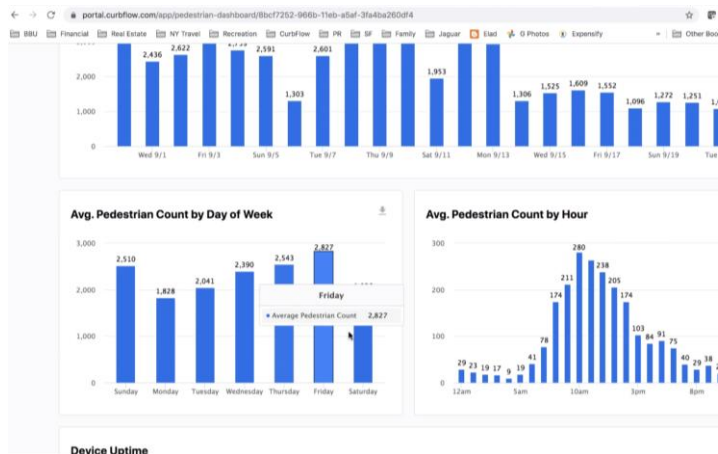
Installation: Typically, the client utilizes their own staff or contracts locally to perform installation. If CurbFlow is requested to install the cameras themselves, they would passthrough those costs to the client.

Software Subscription: The exact cost will depend on the scope of service, but it can be expected to be \$3-\$7k per month. The range in cost correlates to the number of data models the client wants to use. Additional models correlate to increased training of the algorithms and thus increased costs. For instance, a loading zone project might utilize Object Detection (vehicle classification), Length Detection (measure space available), and Behavioral Measurement (Occupancy, Dwell Time).

Images



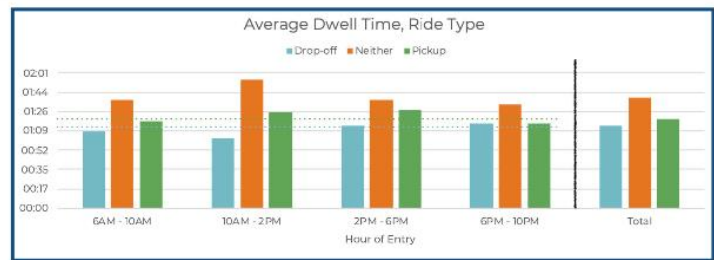
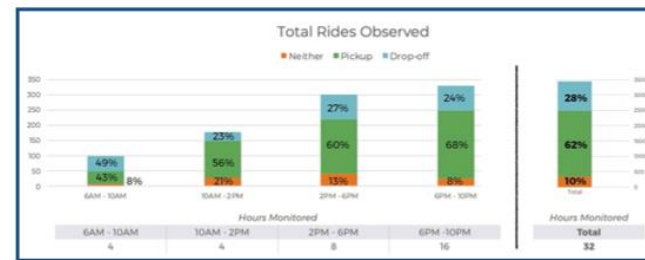
CurbFlow Dashboard View



CurbFlow Computer Vision

ID	Device ID	Device Port ID	Extrinsics	Intrinsics	Zone
CFSN00104	8be82e5e...	1	false	true	false
CFSN00059	8be1a2ec...	3	false	true	false
CFSN00039	8c05fbc0...	3	false	true	false
CFSN00055	8bc059f1e...	1	false	true	false
CFSN00072	8bc861ba...	3	false	true	false
CFSN00074	8be0f612...	3	false	true	false
CFSN00046	8bc936b2...	1	false	true	false
CFSN00076	8bcf004c...	3	false	true	false
CFSN00020	8bd23ab4...	3	false	true	false
CFSN00027	8bd180b4...	3	false	true	false
CFSN00032	8bd9777a...	3	false	true	false
CFSN00065	8bcd9b3a...	1	false	true	false

CurbFlow Dashboard View



CurbFlow Dashboard View

Automotus

Automotus is a technology company that installs cameras and uses computer vision technology to help cities monitor movement at the curb. Their solution provides access to real-time curb and street activity data across freight, ride hailing, delivery and passenger vehicles, and buses, e-scooters, bikes, and pedestrians. Curb availability can be accessed in real-time through a mobile app or integration of the data via an open API into any freight, ride hailing, or food delivery vehicle wayfinding system. Automotus can automate the payment process and as well as enforcement by sending real-time violation alerts to enforcement officers and sending citations directly to vehicle owners.

For cities, Automotus specifically states their solutions help to:

- Align policies and pricing with multimodal demand
- Share real-time availability data with drivers
- Automatically invoice fleet operators by the minute
- Identify violations in real time and automate enforcement

Monitoring (Score: 5)

Automotus uses camera-based analytics to provide comprehensive monitoring and analysis of all forms of curb activity across different modes of transportation (TNC's, freight, on-demand delivery, scooters, pedestrians, bikers, etc.). The cameras use computer vision and edge-processing to break down information including traffic counts, occupancy, double park events, violation rates, dwell time and other relevant data points to cities. Machine learning algorithms recognize vehicles with a range of identifiers including automatic license plate reading, commercial tags, or special parking stickers. The result is new insights into who is parking at a location and if there are parking infractions. Automotus solution can integrate their video analytics into existing cameras, but the cameras require specific specifications to achieve accuracy levels (minimum level of 97%). For cities, Automotus works directly with commercial fleet managers, as opposed to the drivers themselves, to onboard operators at a company level, sharing real-time information back and forth, leveraging vehicle license plates as permits for access to defined loading zones.

Dashboarding (Score: 4)

City staff use a web-based dashboard to monitor all forms of curb activity and street activity including freight, ride hailing, passenger vehicles, buses, bikes, e-scooters, and pedestrians. Analytics include traffic counts, occupancy, double park events, violation rates, dwell time, and more. Once monitoring is set up, cities gain insights that can help inform policy decisions such as the location, size, and price of a dedicated smart zone. The typical Automotus deployment starts with data collection, followed by reallocation, then pricing, and future decision refinement. Dashboards allow download of raw data from dashboard for external analysis.

Enforcement (Score: 5)

Automotus enforcement enables multiple levels of automation. Cameras detect curb violations including double-parking, dwell time threshold violations, incorrect vehicle type (freight, passenger vehicle, etc.), and unpaid parking. Patrolling enforcement officers are immediately notified with a photo and location of the violation. Automotus's solution can also offer end-to-end integration with Conduent and other enforcement systems.

Cost (Score: 1)

Costs are typically derived as hardware as a service and software as a service business models. Automotus's solution often utilizes monetization of parking zones, which can be used to subsidize fee by passing along a transaction fee as part of parking payment. If parking is not part of a deployment a direct quote is required.

As part of an RFI for ParkColumnus, the following pricing information was identified:

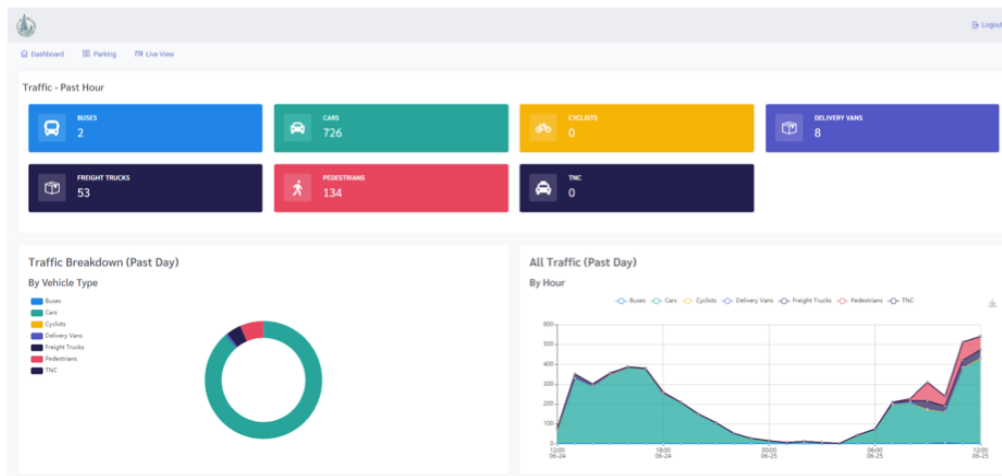
- Depending on desired features it would cost \$50,000-\$250,000 to develop a loading zone management platform. The range depends on level of integration and desired functionality for individual drivers.
- It would cost \$15k-\$20k annually per smart loading zones to purchase and install monitoring systems at each loading zone and support maintenance.

Automotus includes language to forego all upfront and annual licensing fees for a performance-based model, whether as part of a transaction fee or revenue-sharing program.

Images



Automotus Computer Vision



Automotus Dashboard View

Cleverciti

Cleverciti develops high-tech “smart parking” solutions for outdoor and on-street parking detection, monitoring and guidance. Its end-to-end solutions are designed to strengthen parking detection, improve guidance, and enhance communication. The core components to a smart parking solution are a sensor, a communication method to the driver, and a monitoring dashboard. Cleverciti provides solutions for space management, parking guidance, curb management, permits, payments, dynamic reservation, advertising, and smart lampposts. In support of these domains, Cleverciti has developed a series of hardware and software solutions to fit specific user requirements.

Monitoring (Score: 5)

A smart parking solution requires a sensor to collect and process data at the location of the parking area or parking space. The Cleverciti Sensor is an overhead high-definition camera that is installed on existing infrastructure such as lampposts, buildings, or walls. A single sensor covers 25-50 parking spaces with the number increasing with the cameras mounting height. For on-street parking, monitoring of 10 spots/sensor is considered a success. The solution uses edge computing, artificial intelligence, and deep learning to measure exact position and size of open parking spaces, which can provide drivers and parking operators with real-time information on available spaces. Cameras interface with different solutions including:

- Parking providers (parkmobile, passport, paybyphone)
- Clevercit Circ 360 (digital signage to indicate parking availability)
- Cleverciti Cockpit (Clevercity dashboard solution)
- Custom client solutions via open API

Sensors monitor curb space and can identify information including space occupancy, length of stay, and company

identification. Since the cameras monitor overhead, they do not capture license plate information.

Dashboard (Score: 4)

Cleverciti Cockpit is a dashboard solution that provides access to real-time parking and occupancy. Primary features include:

- See real-time length of stay and overstays, compare areas of interest, and analyze traffic trends and investment strategies
- Change parking guidance signs on-the-fly, e.g., for a special event. Block certain parking spaces or zones on a temporary or scheduled basis
- Integrate third-party solutions such as payment providers, parking search apps, or third-party garages via REST APIs
- Export reports for deeper analysis

Enforcement (Score: 4)

Cleverciti solution supports enforcement via its dashboard monitoring and integration with parking management solutions.

Cost (Score: 3)

The cost of a solution is relative to the scope of the project and the exact hardware, software, and operational needs. For Leesburg, Cleverciti provided two quotes:

- A 36-month Solution as a Service deployment that includes cameras and dashboarding
- A 36-month Solution as a Service deployment that includes cameras, dashboarding, and digital signage.

See the next page for a detailed breakdown of each quote:

Cost Details

Description	Quantity	Unit Price	Sum (One Time)	Sum (Monthly)
Space Management with Cleverciti Sensor (One-Time)	13	127.00	1,651.00	
Space Management with Cleverciti Sensor (monthly)	13	9.20		119.60
Cellular Connectivity Sensor (US - T-Mobile)	13	16.40		213.20
Enhanced Analytics	13	1.40		18.20
Parking enforcement and automated alerting	13	3.50		45.50
Shipping	13	100.00	1,300.00	
Travel Expenses	2	1,500.00	3,000.00	
Installation	13	500.00	6,500.00	
Consultation, Planning & Design	1	7,517.00	7,517.00	

All amounts are quoted in USD.

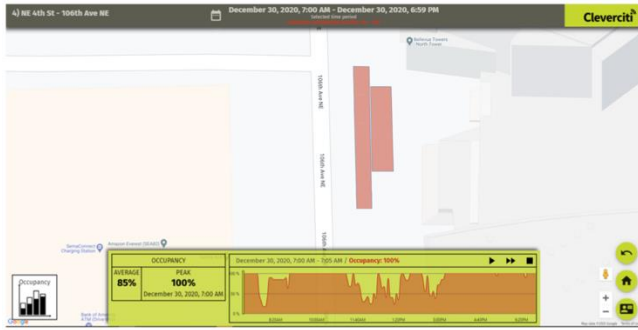
	Total (One Time)	Total (Monthly)
Grand Total	19,968.00	396.50

Description	Quantity	Unit Price	Sum (One Time)	Sum (Monthly)
Space Management with Cleverciti Sensor (One-Time)	13	127.00	1,651.00	
Space Management with Cleverciti Sensor (monthly)	13	9.20		119.60
Cellular Connectivity Sensor (US - T-Mobile)	13	16.40		213.20
Enhanced Analytics	13	1.40		18.20
Parking enforcement and automated alerting	13	3.50		45.50
Shipping	28	100.00	2,800.00	
Travel Expenses	4	1,500.00	6,000.00	
Installation	28	500.00	14,000.00	
Consultation, Planning & Design	1	7,517.00	7,517.00	
Cleverciti Circ 360 (monthly)	15	116.00		1,740.00
Cleverciti Circ 360 (One-Time)	15	2,255.00	33,825.00	

All amounts are quoted in USD.

	Total (One Time)	Total (Monthly)
Grand Total	65,793.00	2,136.50

Images



Visualize actionable trends

View historical data to predict parking demand, parking habits and more to support smart decision-making regarding infrastructure changes and more.



Cleverciti Dashboard

Cleverciti Dashboard



Detect floating spaces

Take control of less-defined parking areas by accurately monitoring the position and size of parked vehicles while measuring the length of each available space to determine if another vehicle can fit.

Cleverciti Dashboard

Cleverciti Dashboard

APPLICATION MEMO APPENDIX B: ADDITIONAL VENDOR RESEARCH

Lacuna Technologies

Lacuna Technologies is the technology arm of the consulting firm Ellis and Associates. They focus on understanding and managing the curb holistically by promoting and building solutions that utilize open data standards that help to manage the public right of way. They are leading members of [Open Mobility Foundation](#) and are specifically known for their contributions to the [Mobility Data Specification](#) project. Ellis and Associates performed a loading zone project with the City of Seattle where they worked with the city to install in-ground sensors at around 75 loading zones to understand turnover rate and size of vehicles. Lacuna does not deliver a specific hardware/software loading zone product and focuses on software as a consulting service that utilizes available vendor technology and open data standards to provide curb insights to determine better right of way management practices.

Populus

Populus is a platform that helps cities and private mobility providers deliver safe, equitable, and efficient streets through better data and analytics. They provide three solutions – Mobility Manager, Street Manager, and Curb Manager - that together form a comprehensive platform for mobility management.

Curb Manager helps cities pull together disparate datasets representing their curb assets into standardized formats that are easy to visualize, analyze, and update for future needs. With this consolidated data, cities can evaluate demand on the curb from micro mobility vehicles, paid parking, and commercial fleets, and gain a view of granular occupancy data on the curb. Curb manager also has features to create new curb policies that align with city goals and provides cities with digital solutions that communicate and enforce new policies for commercial fleets.

Passport

Passport is a transportation software and payments company that builds technology to manage streets and sidewalks more efficiently. Passports digital platforms helps cities manage parking and mobility infrastructure and provides solutions relating to parking, payments, permits, enforcement, and micro-mobility. While Passports solution does not appear to currently support loading zone management, their technology could potentially align and be expanded to support such efforts.

CurbIQ

CurbIQ is a product of technology-driven design firm, IBI Group. They build a suite of tools to digitize curbside regulations and help cities better understand how their curbs are working today, giving them modern tools to improve operations in the future. Their solutions include curb data collection methods to convert existing regulations into CurbLR format; map-based visualization tools to view curb regulations; and a GIS platform to manage curbside regulation.

Gridwise

Gridwise develops gig mobility solutions to empower gig worker and industry stakeholders to maximize their income and save money on their taxes. System features include:

- Track mileage and performance.
- Compare performance to other drivers in the area.
- Calculate tax deductions and prepare detailed tax reports.
- Keep track of driver expenses and understand net income.
- App switcher feature to easily switch between rideshare and delivery apps.
- See how many passengers are arriving and departing from the airport throughout the day.
- See what events are going on in your city, how big they are, and when they will end

