Written Testimony of

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Good morning, Chairs Norton and Lipinski and Ranking Members Davis and Crawford as well as distinguished Members of the Committee. Thank you for the opportunity to speak to you about this important topic. My name is Anne Goodchild and I am a professor and the Director of the Supply Chain Transportation and Logistics Center at the University of Washington. I am an urban freight expert. The freight system, ultimately, allows for economic specialization; it supports city living, provides markets to producers, and strengthens competition. On its own, the transportation and logistics sector represents approximately 10% of the US gross domestic product – a larger sector than either retail, or financial services[1]. The freight system is more than interstates, ports, pipelines and rail facilities. The freight system is city streets, local highways, sidewalks, bike lanes, and front steps – the last mile of where these supply chains is carried out. It is the delivery man walking to your door or mailbox. When we talk about freight infrastructure investment and building a better freight system, we must remember to include the last mile and particularly the Final Fifty Feet to the final delivery destination. Without completing this final step, supply chains fail to deliver the economic and social benefits they promise.

[1] https://www.bea.gov/system/files/2019-10/gdpind219_2.pdf

Last mile costs businesses a disproportionate amount of time and money

The last mile is essential, and expensive; the most difficult and costly mile of all. While estimates vary, the cost of the last mile has been estimated at between 25% and 50% of total supply chain transportation costs[2][3].

The last mile is costly because:

1) It relies more on human labor than the other segments of supply chain transportation with drivers going door-to-door to drop off packages. In cities, drivers can spend 80 or 90% of their time outside the vehicle[4].
2) Goods are more fragmented the farther you travel down the supply chain. Upstream, goods are moved in large, consolidated shipments such as single commodities but the closer goods get to the consumer the more they are broken down into shipments for individual customers.
3) 80% of Americans live in congested regions[5] where travel speeds are slower and less reliable. This increases the number of vehicles and drivers required to do the same work.
4) There can be high rates of failed deliveries requiring repeated delivery attempts and resulting in ballooning costs. Failed delivery attempts can mean that two or three additional trips are require to accomplish the same task.

While the high cost of the last mile is in part due to the distributed nature of deliveries, the cost is inflated by congestion, a lack of reasonable parking options, and other constraints put on commercial vehicle operations such as specific street or time of day bans.

Online shopping growing and speeding

Online shopping rates are growing and this is increasing demand for last mile delivery. UPS, the world's largest package delivery company, experienced 23% revenue growth from 2014 to 2018 (5.5% annually[6]). With one-click shopping and free home delivery it is now often cheaper and easier to order something online than it is to go to the store. Retail e-commerce sales as a percent of total retail sales

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[2] https://www.kuebix.com/the-high-costs-of-final-mile-delivery/
[3] https://www.supplychaindive.com/news/last-mile-spotlight-retail-costs-fulfillment/443094/
[4] https://www.greenbiz.com/article/we-will-still-need-drivers-driverless-future
[5] http://css.umich.edu/factsheets/us-cities-factsheet
[6] https://www.forbes.com/sites/greatspeculations/2019/10/18/ups-revenues-strong-last-few-years-but-slower-growth-ahead/#323b065368e4

in United States rose to 9% in 2017 and this figure is expected to reach 12.4% in 2020[7]. With store-based shopping, most Americans use their personal vehicles for shopping trips; driving to the store alone, purchasing a few items, and returning home in their car. With an online purchase, the trip - now a delivery - is made with a commercial vehicle, extending the supply chain from the store or warehouse and bringing increasing numbers of commercial vehicles into towns and neighborhoods. The volume of daily deliveries to homes has soared – from fewer than 360,000 a day in New York City in 2009 to more than 1.5 million today[8]. Households now receive more deliveries than businesses; and this, with online retail representing only 10% of all retail. Imagine how many more trips there will be when online retail hits 20% or 50%.

In addition to growth in the number of deliveries, the pace of delivery of speeding. Amazon, which currently holds about a 50% share of the online market in the US has, in the last 3 years, halved their average click-to-door speed from about 6 days to about 3 days[9]. Other retailers are attempting to keep pace. Just this week I received an email from Amazon notifying me that Amazon Fresh would now deliver at "ultrafast speeds" in my area: "You can schedule same-day deliveries from 6:00am - 10:00pm and get FREE 2-hour scheduled delivery windows on orders over $35". Free two-hour delivery. This was not in response to a request, rather this is being rolled out to all Prime members. Depending on your location, you can also get 1-hour delivery for a small additional fee. This is also available in DC and Northern VA. There has also been a proliferation of on-demand delivery services, particularly in the food delivery sector, where online platforms now serve close to 30% of the market.

The US leads the world in online shopping activity and speed of delivery[10]. Supply chains have spent decades investing in technology and building the information systems required to deliver on home delivery and service promises. More recently, venture capital has also invested in transportation and logistics, with PitchBook reporting $14.4 billion invested globally in privately owned freight, logistics, shipping, trucking, transportation management system (TMS), and supply chain tracking startups since 2013[11]. Not only do these changes affect transportation and logistics companies, but these changes affect peripheral sectors as companies reorganize their operations to service these new demands.

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[7] https://nrf.com/insights/economy/state-retail
[8] https://www.nytimes.com/2019/10/27/nyregion/nyc-amazon-delivery.html
[9] https://www.emarketer.com/chart/221703/average-click-to-door-speed-us-digital-purchases-made-on-amazon-vs-other-retailers-dec-2015-march-2018
[10] https://unctad.org/en/pages/PressRelease.aspx?OriginalVersionID=505
[11] https://www.joc.com/technology/vcs-taking-long-odds-big-logistics-wins_20190523.html

As customers are offered, and accept, shorter and shorter click-to-delivery times, delivery companies have less opportunity to make consolidated, efficient deliveries. Instead of waiting for more orders and sending out full trucks, vehicles are sent out to meet their quick delivery promise; reducing vehicle utilization. This increases the number of vehicles on the road, increases the cost per delivery, and increases vehicle emissions.

There is a Significant Impact on Cities

It is the roads and sidewalks built by American cities and towns that enable this last mile delivery. In Seattle, 87% of buildings in greater downtown rely solely on the curb for freight access[12]. These buildings have no off-street parking or loading bays.

Our cities were not built to handle the nature and volume of current freight activity and are struggling to accommodate growth[13]. At the same time, delivery of goods is just one of the many functions of our transportation networks. The same roads and sidewalks are also used by pedestrians, cyclists, emergency vehicles, taxis, ride hailing services, buses, restaurants, and street vendors, to name a few.

Capacity on our transportation networks is increasingly scarce. Texas Transportation Institute's 2019 Urban Mobility Report, a summary of congestion in America, is titled "Traffic is Bad and Getting Worse"[14]. Over the past 10 years, the total cost of delay in our nation's top urban areas has grown by nearly 47%. It is on top of this already congested network, that we add this growing last mile traffic. American cities have yet to make any headway with congestion, and delivery traffic both adds to, and suffers from, this condition.

To address congestion, many state Departments of Transportation are working to provide safe and competitive alternatives to single occupancy vehicle travel such as transit, bicycling, and walking. Other federal agencies are also working on addressing this issue, such as the Department of Energy, which has awarded UW and Seattle an EERE grant. In building dedicated bicycle facilities, one common solution is to convert the curb lane to a bike lane, removing commercial vehicle load and unload space. At the same time, American's are increasingly using ride-hailing services such as Uber and Lyft[15]. This also

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[12] http://depts.washington.edu/sctlctr/sites/default/files/SCTL_Final_50_full_report.pdf
[13] https://www.nytimes.com/2019/10/27/nyregion/nyc-amazon-delivery.html
[14] https://mobility.tamu.edu/umr/b\
[15] https://www.citylab.com/transportation/2019/08/uber-lyft-traffic-congestion-ride-hailing-cities-drivers-vmt/595393/

increases the demand for curb space as passengers request pickup and drop-off instead of parking their own vehicle off-street.

The result is too much demand for too little space, and there is ample evidence of a poorly functioning system. From a study in Seattle, 52% of vehicles parked in commercial vehicle load zones were passenger cars, and 26% of all commercial vehicles parked in passenger load zones. In New York City, UPS and Fedex received 471,000 parking violations in 2018. Everyone has seen an image of a truck parked in a bike lane, or been stuck behind a delivery truck occupying an entire residential street. While we might expect a small percentage of violations, these levels reflect a failure of planning and design to deliver reasonable alternatives to commercial vehicles, and a city that has not caught-up with the changes in supply chain and shopping patterns.

In addition to these operational challenges, commercial vehicles have impacts on American's health and safety. Per mile, trucks produce disproportionately more carbon dioxide and local pollutants (NOx, PM) than passenger vehicles so a substitution of delivery trucks for passenger vehicles has the potential to increase emissions[16]. However, delivery services also present an opportunity to reduce emissions per package as they can consolidate many packages into one vehicle; the same way transit or carpooling can be an emissions advantage over single occupancy vehicle trips. Research shows that in most cases a well-run delivery service would provide a carbon dioxide reduction over typical car-based shopping behavior[17]. While there is the opportunity for delivery services to provide this emissions benefit, the move towards very fast delivery erodes that benefit as delivery services are unable to achieve the same level of consolidation and begin to look more like butler services.

Diesel powered vehicles, often used for the movement of freight, produce disproportionately more particular matter and NOx pollution than gasoline engines, so the use of these vehicles in urban areas, where human exposure levels are higher, has significant negative outcomes for human populations in terms of asthma and heart disease[18]. This is particularly true for the very young, elderly, or immunosuppressed.

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[16] https://www.epa.gov/regulations-emissions-vehicles-and-engines/regulations-greenhouse-gas-emissions-commercial-trucks

[17] http://depts.washington.edu/sctlctr/research/publications/evaluating-impacts-density-urban-goods-movement-externalities

[18] https://www.lung.org/our-initiatives/healthy-air/outdoor/air-pollution/particle-pollution.html

While it may seem intuitive that replacing a car trip to the store with a truck delivery would be bad for the city, in fact, delivery services can reduce carbon emissions and total vehicle miles travelled. This is because the truck is not just delivering to one home, but to many. In this sense, the truck delivery behaves like a transit vehicle or very large carpool. This can reduce congestion by reducing the number of vehicles on the road. Delivery trucks can be an asset when performing in this efficient manner because they consolidate many goods into a single vehicle reducing per package cost, emissions, and congestion impacts.

Banning trucks and requiring or encouraging the use of smaller vehicles INCREASES the number of vehicles and the vehicle miles travelled; exacerbating traffic and parking problems.

Growth in two and one-hour delivery INCREASES the number of vehicles and vehicle miles travelled; exacerbating traffic and parking problems.

The Urban Freight Lab as a Public and Private Sector Collaboration

Businesses are challenged by the high cost of the last mile, and the increasing time pressure for deliveries. Cities are working to manage congestion, the competing demands of many users, emissions, and intense pressure for curb space. This presents a complex set of problems, where:

- private carriers are struggling to comply with city regulations and remain financially competitive while meeting customer expectations
- customers are benefiting from high levels of convenience but also experiencing high levels of congestion and suffering from the effects of growing emissions
- cities and towns are struggling to meet demands of multiple stakeholders and enforce existing rules

All of this, in a context where there are very limited data regarding truck or commercial vehicle activity, numbers of deliveries, or other measures of efficiency. The Freight Analysis Framework[19], which compiles the nation's most significant freight datasets such as the Commodity Flow Survey, breaks the country into 153 zones, so that most states can only see what came into or out of the state, not how vehicles move around within cities and towns. The more recently developed National Performance Management Research Data Set (NPMRDS)[20], presents truck specific data, and allows for highway

[19] https://www.bts.gov/faf
[20] https://ops.fhwa.dot.gov/perf_measurement/index.htm

speeds to be monitored at a county level, but does not show vehicle volumes, or give any insights into origin-destination patterns. At the national level, mode-specific datasets provide more spatial, temporal, and activity detail. For example, the Carload Waybill sample[21] provides important data on rail cargo movements and the Air Operators Utilization Reports[22] provide important data on airplane activity. Unfortunately, the Vehicle Inventory and Use Survey, which provided detailed data on truck and goods movements, was discontinued in 2002. This leaves cities and towns have no nationally consistent sources of or guidelines for collecting truck activity data.

The most economically efficient solutions to these challenges will be identified through collaboration between cities and private partners. One particularly successful and innovative solution can be found in the Urban Freight Lab at the University of Washington (https://depts.washington.edu/sctlctr/urban-freight-lab-0). As the director of the Urban Freight Lab, I have built a coalition of private companies and public agencies who work together to identify and measure problems, and develop and pilot-test solutions that will provide benefits for a diverse group of public and the private sector stakeholders. The goal is to find win-win solutions for businesses and city dwellers, and to avoid short-sighted solutions like blanket truck bans[23].

The Urban Freight Lab is successful because:

1. All participants have skin in the game. Private sector contributions elevate public sector research funding and ensure that all participants fully engage. This is fundamentally different from an advisory board or oversight committee because members must report back to their leadership and justify participation with measurable returns on investment. This participation from the private sector improves relevance and timeliness of public sector support.
2. Collaboration amongst the private and public sector ensures that products of the lab are as mutually beneficial as possible.
3. Problems, evaluation metrics, and research ideas come from the group and are connected directly to real-world challenges faced, not the research directors, the public, or private sector alone.

[21] https://www.stb.gov/stb/industry/econ_waybill.html
[22] https://www.faa.gov/data_research/aviation_data_statistics/
[23] https://nyc.streetsblog.org/2018/08/20/city-abandons-clear-curbs-program-that-reduced-traffic-congestion-and-made-roosevelt-avenue-safer/

4. Private- and public-sector participants are senior executives who have the authority to make decisions in quarterly meetings. They do not need to return to the organization for approval.
5. Cities need freight planning capacity but currently don't have any. The work of the Urban Freight Lab fills gaps in problem definition, data collection, solution generation, orchestration and evaluation of pilot tests.
6. Robust analysis is conducted by University researchers - they serve an important role in taking an unbiased view and base their analysis on data.
7. Quarterly meetings are working meetings with detailed agendas and exit criteria. The focus is on making progress, making decisions, and moving forward, not simply information sharing.
8. Private sector partners are operational and technical staff with knowledge of operations.
9. Public sector partners represent a breadth of functions including planning, engineering, curb management, mobility, and innovation.
10. University research focusses on practical outcomes and does not hide in theoretical concepts.
11. Solutions are tested on the ground through pilots and real tests. The slow work of collaboration building and overcoming obstacles to implementation is part of the research.

Current private-sector lab members include Boeing HorizonX, Building Owners and Managers Association (BOMA) - Seattle King County, curbFlow, Expeditors International of Washington, Ford Motor Company, General Motors, Kroger, Michelin, Nordstrom, PepsiCo, Terreno Realty Corporation, US Pack, UPS, and the United States Postal Service (USPS). The Seattle Department of Transportation represents the public-sector.

Seattle is a growing City and has now been ranked in the top 4 for growth among major cities for five consecutive years. It is a geographically constrained city surrounded by water and mountains, and boasts some of the highest rates of bike, walk, and transit commuting in the country[24]; with less than a quarter of City Center commuters now driving alone to work. It is a technologically oriented City; with the region serving as the home to many technology companies such as Amazon, Convoy, Facebook, Google, Microsoft, and Tableau. The City was one of the first to launch PayByPhone, electronic toll tags, weigh-In-motion, high-occupancy-toll lanes, passive bicycle counters, real-time transit monitoring, bike and car share programs, and most recently, an Open Data Portal[25]. In this sense, the City provides an excellent example for experimentation where the public and private sector face intense pressure to look

[24] https://commuteseattle.com/mediakit/2017-mode-split-press-release/
[25] https://data.seattle.gov/

for new solutions and approaches; and levels of congestion and pressure that other US Cities can anticipate in their future as populations grow and infrastructure construction does not keep pace.

With this private- and public-sector funding the Urban Freight Lab has:

- produced foundational research on the Final Fifty Feet of the supply chain[26]
- developed and applied approaches to quantify urban freight infrastructure[27]
- developed and applied approaches to measure infrastructure[28]
- generated and tested approaches to reducing dwell time and failed deliveries in urban areas including common lockers[29]
- developed and implemented an approach to measuring the volume of vehicles entering and exiting the City of Seattle.[30]

Ongoing work is supported in large part by a grant from the Department of Energy U.S. Department of Energy: Energy Efficiency & Renewable Energy (EERE) titled Technology Integration to Gain Commercial Efficiency for the Urban Goods Delivery System, Meet Future Demand for City Passenger and Delivery Load/Unload Spaces, and Reduce Energy Consumption. This project, funded by DOE, provides $1.5 million over 3 years with matching funds from the City of Seattle, Sound Transit, King County Metro, Kroger, the City of Bellevue, and CBRE. The project will evaluate the benefit of integrated technology applications on freight efficiency. Within the scope of this grant, Urban Freight Lab members and the Seattle DOT will be involved in developing and testing applications of technology in the Belltown area of Seattle that will increase commercial efficiency and reduce impact of freight activity on city residents[31].

Moving Forward

Shopping patterns have evolved, but our infrastructure has not. We need to rethink how we use our streets, curbs, and sidewalks if we want to maintain and grow our current shopping and delivery habits.

By consolidating many goods into a single route, delivery services could be an asset to communities; growing economic activity, reducing total vehicle miles travelled and associated carbon emissions, and

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[26] https://depts.washington.edu/sctlctr/sites/default/files/SCTL_Final_50_full_report.pdf
[27] https://depts.washington.edu/sctlctr/sites/default/files/SCTL_Alley_Infrastructure_Occupancy_Study_12-11-18.pdf
[28] https://depts.washington.edu/sctlctr/sites/default/files/SCTL_Alley_Infrastructure_Occupancy_Study_12-11-18.pdf
[29] https://depts.washington.edu/sctlctr/sites/default/files/SCTL_Urban_Freight_Lab_5.18.18.pdf
[30] https://depts.washington.edu/sctlctr/research/publications
[31] https://depts.washington.edu/sctlctr/research-projects/current

supporting communities[32] less dependent on cars. However, the current trend towards faster and faster deliveries; and businesses subsidizing delivery costs means we see lower vehicle utilization, higher numbers of vehicles and congestion, and increased emissions.

While some town and city governments have invested measuring the state of urban freight in their communities and developed improvements, most have limited resources and no guidance from the state or federal level. For example, they do not know how many trucks operate in the region, what they carry, whether the current curb allocation is satisfactory, or what benefit might result from improvements.

New modes, technologies, and operational innovations provide opportunities for win-win solutions. These new conditions may allow new modes such as electric assist cargo bikes[33] to outcompete existing modes. Electric and hybrid vehicles can reduce both global and local pollutants. New technologies such as robotics, artificial intelligence, and electronic curbs may fundamentally shift the existing infrastructure paradigms. Private companies are ready to test these innovations, and the US and state DOTs can play a role in supporting these tests and conducting evaluations.

Investments in the freight system must include the last mile, and in particular the final fifty feet of the delivery route as a consideration to ensure economic vitality and support quality of life. This includes supporting towns and cities in investigating and understanding the current state of goods movement at the municipal scale, identifying and evaluating new solutions for cities and towns to adapt to changing supply chains, integrating freight planning and passenger planning, and ultimately providing healthy environments for businesses to thrive and great places to live.

[32] http://depts.washington.edu/sctlctr/research/publications/evaluating-impacts-density-urban-goods-movement-externalities

[33] http://depts.washington.edu/sctlctr/research-projects/ups-e-bike-delivery-pilot-test-seattle-analysis-public-benefits-and-costs-task