Integrated Strategies to Address Emerging Freight and Delivery Challenges in New York City

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Final Report

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16. Abstract

This report has three critical objectives. First, to highlight the changing nature of freight deliveries even as zoning policy for off-street loading has changed little over the last 65 years. Second, to consider policy and physical approaches to addressing the increasing number of freight deliveries, based on best practices, that take into account the range of issues including off-street and on-street constraints, differing densities and contexts, and urban design concerns relative to retail and sidewalk use. Third, to develop a quantitative approach to projecting freight demand that will aid in future policy and management considerations.

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Abstract

This report has three critical objectives. First, to highlight the changing nature of freight deliveries even as zoning policy for off-street loading has changed little over the last 65 years. Second, to consider policy and physical approaches to addressing the increasing number of freight deliveries, based on best practices, that take into account the range of issues including off-street and on-street constraints, differing densities and contexts, and urban design concerns relative to retail and sidewalk use. Third, to develop a quantitative approach to projecting freight demand that will aid in future policy and management considerations.

Keywords

Freight Management, On Street Delivery, Off Street Delivery, Zoning, Policy, Freight

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Acronyms and Abbreviations

CEQR	City Environmental Quality Review
CompStat	Computer Statistics
DEC	Department of Environmental Conservation
DEP	Department of Environmental Protection
EV	Electric Vehicle
EVSE	Electric Vehicle Service Equipment
FAR	Floor Area Ratio
FTG	Freight Trip Generation
GHG	Green House Gas Emissions
LTG	Large Freight Generator
NYCDCP	New York City Department of City Planning
NYCDOT	New York City Department of Transportation

Summary

S.1 Overview

Trucks play an essential role in transporting goods and providing services throughout New York City. They also represent a nuisance for many of NYC's densest neighborhoods, pitting the convenience of deliveries against the flow of traffic, the health of street life, and the quiet of residential streets. The noise, environmental pollution, traffic congestion, and safety concerns generated by freight movement in the City represents a daily challenge for pedestrians, businesses, and residents.

Manhattan alone generates 180,000 truck trips per day representing 37,000 freight-related businesses.[1] A single small business in Manhattan can generate upwards of 60 delivery trips per week.[2] Simultaneously, the rise of smartphone-enabled mobility firms such as Uber and Lyft, the explosion of food trucks, and the escalating pressures of same-day delivery services such as Amazon Prime Now and Google Express[3] have strained NYC streets in new and unforeseen ways. These combined pressures are indicative of a new era in transportation policy, traffic management, and the structure of last mile deliveries, as consumer expectations shift with the new era of on-demand mobility services.

A comprehensive review of the policies and regulations that govern NYC freight delivery is needed as existing regulations have not changed substantially since 1952.

S.2 Objectives and Approach

This report has three critical objectives:

- Highlight the changing nature of freight deliveries even as zoning policy for off-street loading has changed little over the last 65 years.
- Consider policy and physical approaches to addressing the increasing number of freight deliveries, based on best practices, that take into account the range of issues including off-street and on-street constraints, differing densities and contexts, and urban design concerns relative to retail and sidewalk use.

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1 Holguin-Veras, Joseet et al. (2015). Improving Freight System Performance in Metropolitan Areas: A Planning Guide. *NCFRP Report 33*, 146.

2 NCFRP Report 33, 155.

3 Bensinger, Greg and Dulaney, Chelsey. (2014). Amazon Unveils One-Hour Delivery Service. *Wall Street Journal* 18 Dec 2014. Retrieved 24 June 2015 <http://www.wsj.com/articles/amazon-com-launches-superfast-delivery-in-nyc-1418903192>

- Develop a quantitative approach to projecting freight demand that will aid in future policy and management considerations.

Following a comprehensive review of the zoning code, an investigation was undertaken into three distinct areas of NYC with the intention to outline a potential method for re-assessing the loading berth requirements. The method compares the total on and off-street capacity with the actual loading berth needed and highlights the ability of a block or street to internalize their loading activities without having any spillover effects on the public domain. Since capacity itself is relative to the geography, the investigation was carried out at three different scales to have a more comprehensive understanding of issues surrounding freight management – from district level, to block/street level, and finally looking at buildings that generate large freight trips as special use cases within the urban fabric. Using primary datasets, on-site investigation and secondary desk-based research, capacity formulas were established that were then tested at the block level.

S.3 Findings and Initial Recommendations

S.3.1 Findings

- Existing regulations of off-street freight requirements have changed only minimally since 1952. Over the past 30 years, deliveries to commercial properties in NYC have risen 300 percent.[4]
- Regulations related to off- and on-street loading have a significant bearing on freight delivery and congestion, as well as the viability of retail and the vibrancy of sidewalk life. For example, the frequency of loading docks and curb cuts can detract from continuous retail storefronts while truck movement can interrupt pedestrian flow.
- Based on site observations, the efficacy of loading docks is not clear. Many loading docks were observed to be used for car parking and large garbage containers.
- Much of NYC was built before zoning regulations were created, and as a result many of the City's buildings have no off-street loading requirements associated with them. A basic analysis of buildings in our case study areas shows that roughly 15 percent of these areas were built since zoning regulations were established. This low percentage indicates that the ability of new zoning regulation to solve the City's freight capacity issues in the short-term is limited.
- There is a significant amount of on-street loading space designated by the City. However, there is currently no alignment between the designation of the existing on-street loading zones and the existing off-street berths. Also, current on-street space is frequently occupied by non-loading vehicles, which curbs the efficiency of these spaces.

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[4] Morris, Anne. (2009). *Developing Efficient Freight Operations for Manhattan's Buildings.* Retrieved June 1, 2015. https://www.baruch.cuny.edu/realestate/pdf/thelastmile.pdf

- Based on calculations developed for this report, there are "hot spots" where the combined capacity of off-street and on-street loading space is highly constrained. These hot spots, in combination with temporarily constrained areas such as construction sites, may be responsible for a significant amount of an area's congestion.

S.3.2 Recommendations

- **Integrated on- and off-street capacity approach:** Existing zoning provisions, such as curb-side delivery planning can be expanded upon. In addition, current projections of daily freight volumes state a need for millions of square feet of space to be dedicated to deliveries.[5] These estimates, while potentially true, are nearly impossible to deliver on. Another approach would be to address freight deliveries and the congestion they cause through a CompStat-like approach to addressing hot spots where there is a documented lack of combined on- and off-street loading capacity. This report provides an initial formula for calculating this combined capacity, which could be further refined. Once these hot spots are identified and mapped by identifying parameters such as temporary lane shutdowns, pre-zoning buildings that generate a lot of freight without loading berth provisions, and intensity of traffic tickets issued, a combination of delivery strategies can be applied to address congestion issues. Special congestion district overlays, similar to Special Transit Land Use District overlays, may be considered as an enforcement tool for adequate provision of on and/or off-street loading berth around identified hot spots.
- **Enforcing on-street capacity:** A significant portion of on-street loading areas were observed to be occupied by non-loading vehicles. Enforcement of these spaces would play a critical role in increasing the amount of on-street capacity.
- **Reassess off-street loading requirements:** This report highlights an integrated approach that considers on- and off-street capacity as a logical way to address congestion caused by freight deliveries. However, there is still a need to review and consider revision of the current zoning code that largely dates back to 1952, with few later amendments, and does not account for today's freight generation rates. New approaches to calculating freight generation, such as those taken by academics at Rensselear Polytechnic Institute, which utilize employment densities as a multiplier for freight generation, should be explored further. Our work concludes that this exploration would necessarily involve correlating employment densities to use classes, which could then be integrated with the zoning code to determine loading requirements.
- **Incentivize alternative loading strategies:** Certain areas and buildings are limited in their ability to internalize freight management. In such cases, alternative strategies such as night time deliveries or a dedicated freight fund for developments that cannot meet the loading berth standards can be a potential solution. An effective alternative can be the provision of large consolidation centers and/or shared loading facilities at the neighborhood level.

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[5] Jaller et al. (2015). Large urban freight traffic generators: Opportunities for city logistics initiatives. JTLU 8(1). Retrieved Jan 1, 2015 https://www.jtlu.org/index.php/jtlu/article/view/406/526

- **Efficacy of loading infrastructure:** Given the changing nature of both deliveries (e.g., the increase in just-in-time package drop-offs) and delivery vehicles (e.g., the increase in use of delivery vans), there should be an in-depth study of how loading docks are being used and what kinds of off-street space is optimal from functional, financial, and urban design perspectives.
- **Future Tech**: Lack of sufficient data surrounding freight management has precluded deployment of effective and tech-enabled strategies. From an enforcement perspective, it is recommended that a dynamic dataset similar to Automated Vehicle Location be generated for commercial loading vehicles or at least for large fleet companies that pay the highest share of annual traffic violations. Alternatively, strategic monitoring infrastructure, such as wall mounted cameras that can distinguish between vehicle size and lanes, may also be an effective enforcement tool. In addition, NYC can promote commercial electric vehicles by providing the much needed EVSE (Electric Vehicle Supply Equipment) for large trucks along major throughputs and using novel strategies such as green loading zones in dense urban areas.
- **Regulatory Processes**: Aligning freight calculation methods across various frameworks, such as CEQR and zoning, can not only provide a comprehensive assessment, but also a better estimation of environmental impacts. Moreover, incentivizing commercial EV ownership through policy initiatives could be beneficial. Existing incentives, such as the State's $2,000 and $7,500 federal tax incentive, may need to expand in order to promote commercial EV ownership. Another way to incentivize EV fleet adoption is to create a "Green Apple" certification program for companies that conduct best practices for freight delivery – to make the program more attractive, the certification could be bundled with lower vehicle insurance, for example.

1 Introduction

On Wednesday, September 4, 1946, the New York Times reported on a truck driver strike that had made for an unusual set of conditions on the normally congested thoroughfares of Manhattan: "Only two instances of double parking were noted […]from Canal Street north to Forty-sixth Street."[6] Drivers reported the conditions to be "just like a holiday," as motoring became "almost a pleasure" for the city's taxicabs. Notwithstanding this temporary respite, the public's growing frustration with truck traffic led NYC to require some new buildings to include loading docks, shifting some truck deliveries off of the street. Then as now, trucks remain both a nuisance and a necessity on NYC streets. Of products in the 10-county NYMTC region (the Bronx, Kings, Nassau, Putnam, Queens, Richmond, Rockland, Suffolk, and Westchester counties), 91 to 98 percent move on trucks.[7] Manhattan alone generates 180,000 truck trips per day by 37,000 freight-related businesses,[8] and a single small business can generate upwards of 60 delivery trips per week.[9]

1.1 Problem Statement

Trucks play an essential role in transporting goods and services throughout NYC, they also represent a nuisance for many of the city's densest neighborhoods, pitting the convenience of routine deliveries against the flow of traffic, the health of street life, and the quiet of residential streets. Freight vehicles, including trucks and vans, are almost three times as likely as any other vehicle to be involved in a pedestrian fatality, especially in Manhattan where the rate is far higher (25 percent) than in any other borough (12 percent for all NYC).[10]

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6 Truck Strike Cuts City Traffic Jam. (September 4, 1946). *New York Times.*

7 New York Metropolitan Transportation Commission. (2014) NYMTC Regional Freight Plan Update 2015–2040. Interim Plan. Commodity Flow Analysis tech memo. Retrieved Feb 3 2016, http://www.nymtc.org/files/RTP_PLAN_2040_docs/Public%20Review%20Drafts/Freight%20Modal%20Reports/TM2-1-1_NYMTC_Highway%20Network_FINAL.pdf,

8 NCFRP Report 33, 146

9 NCFRP Report 33, 155

10 NYCDOT, Urban Freight Initiatives. (2015)

Commercial firms bear a majority of the $550 million dollars paid in parking tickets every year, with some businesses paying in excess of $4 million dollars in fines.[11] The noise, environmental pollution, time lost to businesses due to traffic congestion, and pedestrian and bicycle safety concerns generated by freight represents a daily reality in areas like the Garment District and the Lower East Side.

Recently, NYC's conception of its streets have experienced a profound and unprecedented transformation. Since 2007, the city has laid the groundwork for a far-reaching bike and bus lane network, a citywide bike share system, and an aggressive public realm and pedestrian safety program. These initiatives have actively sought to manage congestion by elevating the attractiveness of the public realm and alternative modes of transportation. Simultaneously, the rise of smartphone-enabled mobility firms such as Uber and Lyft, the explosion of food trucks, and the escalating pressures of same-day delivery services such as Amazon Prime Now and Google Express,[12] have strained city streets in new and unforeseen ways. These combined pressures are indicative of a new era in transportation policy, traffic management, and changing consumers' expectation of freight and delivery. Together, these demand create regulatory approaches to how cities manage the delivery of goods and services. In the context of growing demand and saturated street capacity, city, state, and regional agencies throughout metropolitan areas must reevaluate the codes and regulations that govern the NYC's off-street delivery infrastructure for trucks.

A comprehensive review of the policies and zoning regulations that govern off-street deliveries in NYC is timely, with existing regulation having changed minimally since 1952.[13] Over the past 30 years alone, deliveries to commercial properties in NYC have risen 300 percent.[14] There is an opportunity to address this increase in deliveries and their negative impacts through changing approaches to both on- and off-street loading, through physical design, zoning, and delivery management plans.

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11 NCFRP Report 33, 150.

12 Bensinger, Greg and Chelsey Dulaney. (2014). Amazon Unveils One-Hour Delivery Service. *Wall Street Journal* 18 Dec 2014. Retrieved 24 Jun. 2015 <http://www.wsj.com/articles/amazon-com-launches-superfast-delivery-in-nyc-1418903192>

13 These regulations are based on proposed square footage thresholds contained within the Harrison, Ballard, and Allen *Plan for Rezoning the City of New 7York*.

14 Morris,Anne. (2009). *Developing Efficient Freight Operations for Manhattan's Buildings*. Retrieved June 1, 2015. https://www.baruch.cuny.edu/realestate/pdf/thelastmile.pdf

1.2 Objectives

In keeping with these tenets, this report has three critical objectives:

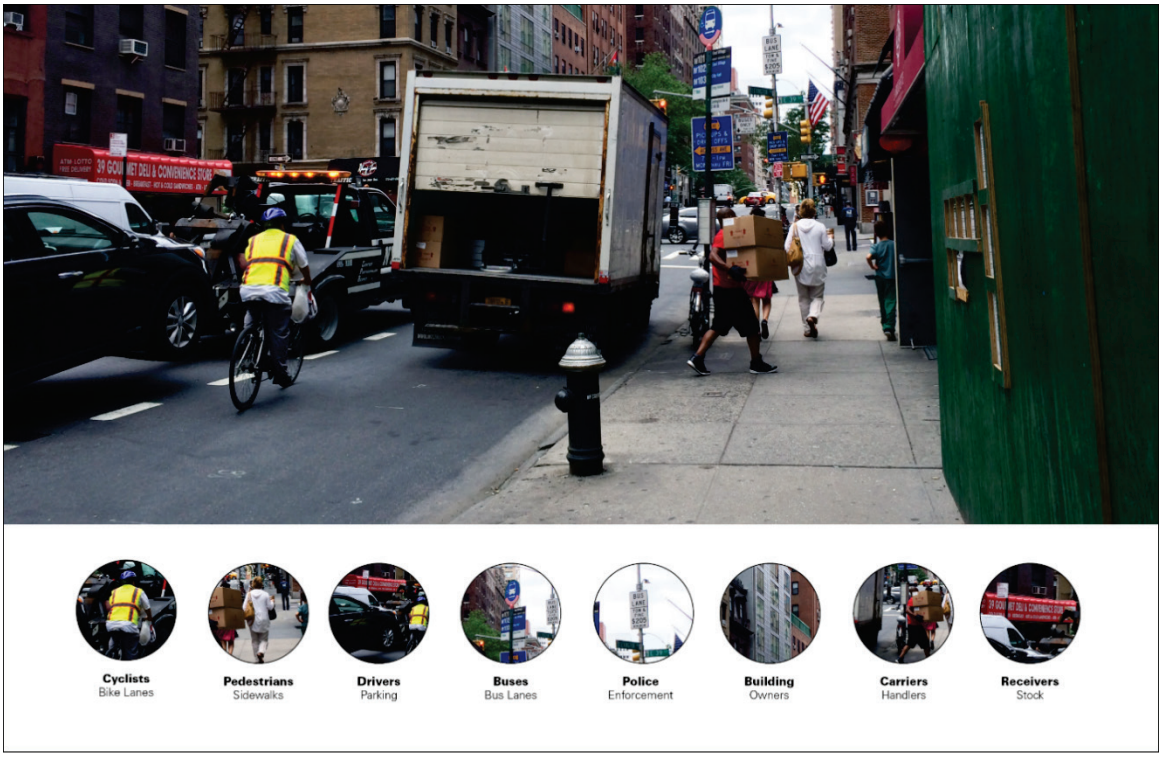
- Highlight the changing nature of freight deliveries even as zoning policy for off-street loading has changed little over the last 65 years.
- Consider policy and physical approaches to addressing the increasing number of freight deliveries, based on best practices, that take into account the range of issues including off-street and on-street constraints, differing densities and contexts and urban design concerns relative to retail and sidewalk use.
- Develop a quantitative approach to projecting freight demand that will aid in future zoning considerations.

2 Freight in New York City

NYC Streets are characterized by competing demands for limited space. Bicyclists, buses, pedestrians, drivers, taxis, and trucks vie for their own dedicated lanes, curbside space, delivery hours, and priority traffic signals. Street ownership has been redefined from auto-oriented traffic policies towards bike, transit, and pedestrian friendly streets. In this process, freight has been consistently overlooked and underemphasized as part of this equation.

Figure 1. Freight in New York City is characterized by competing motivations, agents, and incentives

The result of these competing demands has, more often than not, been unchecked congestion and conflict. Balancing these actors through policy that responds to each of their motivations is the primary challenge. (Source: WXY Studio)



Freight in this report is defined as the commercial transportation of goods, here specifically concerning trucks on NYC streets. From an economic perspective, curbside loading, double parking, and other conditions created by loading and unloading can be framed as a failure by private actors to account for the negative externalities of their goods delivery. This failure, in the absence of strong regulations or enforcement, has created conditions in which buildings simply push these costs onto society, exacerbating congestion and eroding street life.

Off-street loading berths[15] represent one means of nudging private actors to internalize these costs. Yet loading berths themselves have their own negative externalities. Valuable retail frontage and street life may be sacrificed in the interest of efficiency. Streets with delivery portals, blank street walls and staging areas are viewed as out of character with NYC's streets.

The following report aims to depict, analyze, and unpack the present conditions of freight in NYC. The goal of this section is to understand the trade-offs and motivations of various actors involved in freight planning and logistics, with an eye towards constructing a model that can set the stage for enhanced zoning, regulations, delivery planning and design guidelines for off-street loading.

Figure 2: Loading Berths, also referred to as Loading Bays or Docks, are required by New York City Zoning for buildings of a certain size and use

Source: WXY Studio

2.1 Distribution Models

2.1.1 Last Mile Freight Operations and Characteristics

This report focuses primarily on "last mile" freight movements in NYC. The "last mile" is a phrase used in transportation planning to describe the portion of transit from the final delivery center to its destination at a store, business, or home. Research shows that this portion of the supply chain accounts for the

[15] The term berth may be used interchangeably with bay or dock in this context. Since "loading berth" is used in the zoning text, it will be the common term used in this report.

majority of a shipment's cost and complexity.[16] It represents a crucial part of the overall business and transactional experience between a shipper, their freight carrier and the customer or receiver of the goods, since this is the stage where the transfer of ownership of the goods typically takes place.

Different organizations have unique supply chains that impact the characteristics of their last mile activities. Some of these variables are outlined below:

- Business type, industry sector or resident.
- Logistics configuration.
- Stock levels.
- Supplier choice and agreements.
- Delivery volume.
- Supplier/ Freight operator activities.

2.1.1.1 Business Type/Industry Sector

Industry sector plays a significant role in shaping a building's delivery characteristics. However, there are significant differences in the pattern and frequency of deliveries based on the type of business – while a commercial office building may receive deliveries of packages and documents once a day, a restaurant will likely receive multiple food and beverage deliveries during the day.

Business types also determine the general timing of delivery activities. Stores selling fresh food typically receive their deliveries early in the morning so they can have product on the shelves available for staff to process and prepare for lunchtime orders. Offices tend not to dictate a specific delivery time, leaving precise timing to their supplier's needs.

In addition, the recent increase in internet home shopping has generated an unprecedented volume of delivery activity associated with residential land uses that previously saw limited freight traffic. Home deliveries for online retail, whose sales recently surpassed 300 billion per year (more than a fourfold increase since 2004), is plagued by parcel services that deliver from 9 a.m. to 5 p.m. [17]

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16 Walsh III, Francis (2006). *Last Mile Logistics, Inbound Logistics*. Retrieved July 7, 2015. http://www.inboundlogistics.com/cms/article/last-mile-logistics-key-to-competing-in-the-retail-race/

17 Enright, Allison. (February 17, 2015). U.S. annual e-retail sales surpass $300 billion for the first time. Retrieved September 2015. https://www.internetretailer.com/2015/02/17/us-annual-e-retail-sales-surpass-300-billion-first-ti

Table 1. Freight and Delivery Activity by Business Type

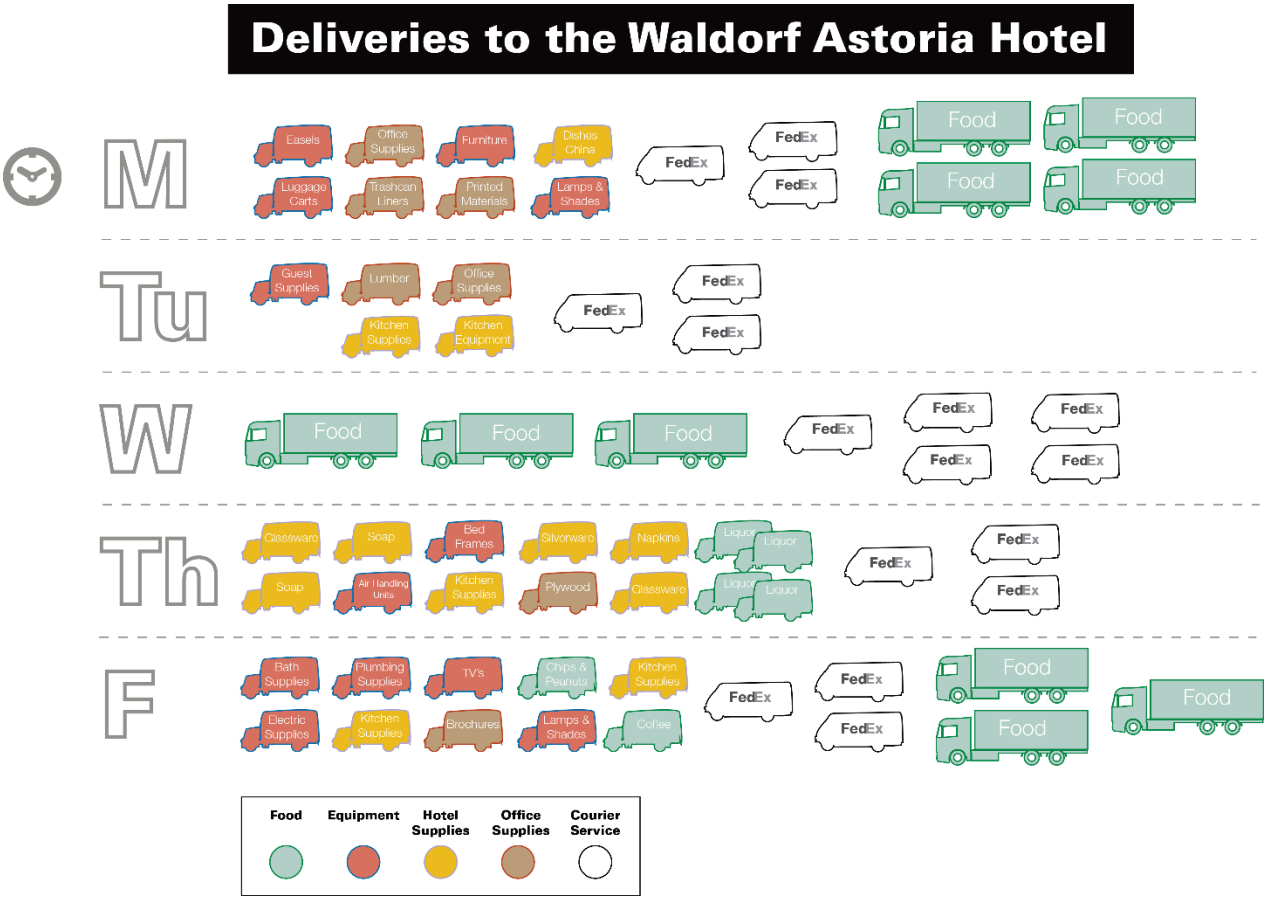
Business/Receiver Type	Freight Types Received/Produced	Influence over Time of Delivery	Timing	Consolidation
Commercial Office	Packages Documents Food (if cafeteria is present)	Low	Determined by suppliers	N/A
Restaurant	Food Beverage Linen (sometimes)	High	Morning deliveries, Throughout the day	No
Restaurant (Chain)	Food Beverage	High	Nighttime or morning deliveries	Yes
Retail (Chain)	Clothing, Stock Items	High	Throughout the day	Yes
Fashion Design	Clothing Samples	Varies	Throughout the day	N/A
Hotel	Food Linens	High	Throughout the day	N/A
Grocery Store (Chain)	Produce Foodstuffs	High	Morning deliveries	Yes
Convenience Store (Bodega)	Produce Foodstuffs	Varies	Morning deliveries, Throughout the day	No
Residence	Packages Mail	Low	9 a.m. to 5 p.m.	N/A

To truly understand freight demands and dynamics at a building use level, it is critical to document the general freight requirements through a 24-hour delivery pattern study. By documenting this 24-hour cycle, both on- and off-street, as well as other parameters such as dwell time, cargo type, and others, policymakers can better understand the needs of particular business types and models. The table below represents a fraction of business and their general freight characteristics.

Documenting a 24-hour cycle for every building is an enormous task. However, a detailed study of large freight generators (LTGs) in regions that attract high freight, can help inform many policy and urban design guidelines.

Figure 3. Waldorf Astoria Hotel Weekly Delivery Schedule

Source: NYC DOT



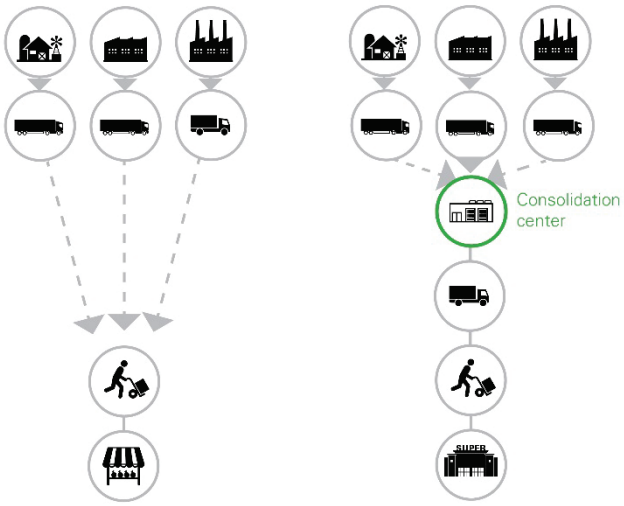
2.1.1.2 Logistics Configuration

Based on the specific needs, every company or organization has a different approach towards managing their deliveries and logistics activity. The majority of commercial organizations, especially those in the commercial office sector, are unlikely to have a structured approach to logistics and delivery activity. They order products from suppliers and generally leave it to the suppliers to deliver that product. How the product gets to them is not of primary concern, as long as it is delivered on time, in the right condition and at the right price.

Organizations with a high degree of control over their supply chain, including the last mile operations, perform with more efficiency. These are often retail organizations with multiple locations that have similar needs. The ability to manage the last mile plays a critical role in a retailer's ability to compete.[18] These organizations design, plan, optimize, and control the flow of goods into their own outlets and adopt a consolidated delivery operation, in which different suppliers deliver to one or more regional warehouses. This allows them to buy goods in bulk volumes from suppliers, reduce costs by delivering to one distribution center rather than a network of stores, and reap operational benefits by reducing the number of vehicles delivering to the store.

Figure 4. Many large retail and food chains have consolidation with their own supply chains.

Left: Unconsolidated deliveries are much more common for NYC and are a hallmark of bodegas and other small businesses around the city (Source: WXY Studio)



Examples of consolidated delivery operations in NYC include many fast food chain restaurants and Whole Foods. However, not all companies pursue a 100 percent consolidated delivery protocol. For some suppliers, "Direct to Store" delivery is a key marketing tactic and provides added value service with the driver delivering and merchandising the product on the store shelves. Some products, such as locally produced goods, are more likely to be delivered direct by the supplier, bypassing the regional distribution center.

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18 Walsh III, Francis.(2006). *Last Mile Logistics, Inbound Logistics*. Retrieved July 7, 2015. http://www.inboundlogistics.com/cms/article/last-mile-logistics-key-to-competing-in-the-retail-race/

By contrast, many smaller independent businesses, such as convenience stores, may receive multiple deliveries from suppliers with varying degrees of consolidation throughout the day. This increases the total traffic going to a single location, even if the duration of these individual stops may be less.

2.1.1.3 Stock Levels

The amount of stock an organization can hold or store has a direct relationship to its total volume of delivery activity. The cost of land, particularly in high value locations, means that retailers must assign as much space as possible to saleable space, thereby reducing their stock holding capacity. For instance, Toys "R" Us at Times Square has a ground floor rent of $2,500 per square foot per year with the second floor and basement rents at $350 per foot and $150 per foot respectively.[19] In the majority of retail stores today, the stock on the shelves and hanging on racks, is the only stock available. This means that the store's supply chain has to be quick in restocking the product once it has been sold, often resulting in a daily delivery model.

Stock holding capacity also influences deliveries to office and commercial buildings. A commercial office may have a stationery stock room, while another may purchase supplies on an as-needed basis and use next day delivery services.

2.1.1.4 Product Type

For perishable products such as chilled produce, dairy, meat, or fish, the quality and shelf life depends on how it is processed, stored, and packaged. Some businesses demand high quality, fresh products that necessitate daily deliveries. Frozen foods or other items that have a longer shelf life may be delivered less frequently.

2.1.1.5 Delivery Volume

The amount of freight received by an establishment also determines the size of the delivery vehicles servicing that location. A store like Whole Foods may require numerous tractor trailer sized trucks to deliver the volume of products that it sells. On the other hand, a fast food restaurant may only require three to four deliveries per week and not necessarily a full truck load. In this case, a supplier may undertake a multi-drop delivery route, delivering products to a number of stores with multiple

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[19] Flagship Toys "R" Us store in Times Square is closing. (March 18, 2015). CNN Money. Retrieved November 28, 2015, http://money.cnn.com/2015/03/18/news/companies/toys-r-us-times-square-store-flagship/

deliveries on one truck determined by the space and weight payload configuration of the truck. Multi-drop deliveries are typically used in the food service sector, since the volume of products required by restaurants and catering establishments are relatively low. Commercial offices rarely generate regular large delivery volumes that require full truck loads, unless they receive furniture or are undergoing a relocation.

2.1.2 Supplier/Freight Operator Activities

The characteristics of suppliers and delivery companies heavily influences the last mile activities that we see on the streets. Delivery volumes today can generate many small-sized trucks associated with the same company, resulting in, for instance, streets with multiple FedEx or UPS trucks. Economies of scale seemingly suggests that using a larger truck would be more cost effective in these particular locations, but these companies have actively decided that smaller trucks provide more flexibility in the narrow and constrained streets of NYC. In addition, smaller trucks of 23-34 feet also work well with their depots and transfer facilities, which are often not optimally designed for the clear maneuvering of large trucks given the space constraints in NYC's industrial areas

Figure 5. Supplier / Freight Operator Activities in Midtown Manhattan

Source: WXY Studio

2.1.2.1 Carriers

Freight carriers are often blamed for congestion on urban streets. This may be unfair as carriers can have little to no control over the time of delivery and in fact might be characterized as the weakest agent in the equation. As Dr. Holguin-Veras states in his report on off-hours deliveries in NYC, "…in competitive markets, shippers and receivers are free to select the shipment size that minimizes their total logistics cost. Receivers decide when goods should be delivered and carriers are often constrained by these demands,

even in cases when the deliveries become more expensive and inefficient."[20] While ticketing and enforcement hypothetically puts pressure on both carriers and receivers to make deliveries without obstructing traffic, the escalating demand for goods in the inner city areas give less operational flexibility to carriers. As a result, many carriers simply build ticketing into their fees; assuming those fines as the cost of doing business.[21]

2.1.2.2 Vehicle Types & Mix

Carriers use a variety of different vehicle types catered towards different services and businesses. Certain types of vehicles are restricted from specific neighborhoods or areas of NYC – section 4-15 of the NYC Traffic Rules establishes the maximum dimensions of trucks that can operate in NYC. Vehicles, with the exception of school buses and fire trucks, are prohibited from being more than eight feet in width and 13.5 feet in height. Trucks carrying pallets from air cargo are exempt from this requirement when located within one mile of the airport on designated local truck routes. Single vehicles are required not to exceed 35 feet in length and semitrailers, which are a combination of vehicles, cannot exceed 55 feet in length.[22] These requirements are qualified by a number of travel restrictions according to local and through truck routes, limited truck zones, and other restrictions of a similar kind.

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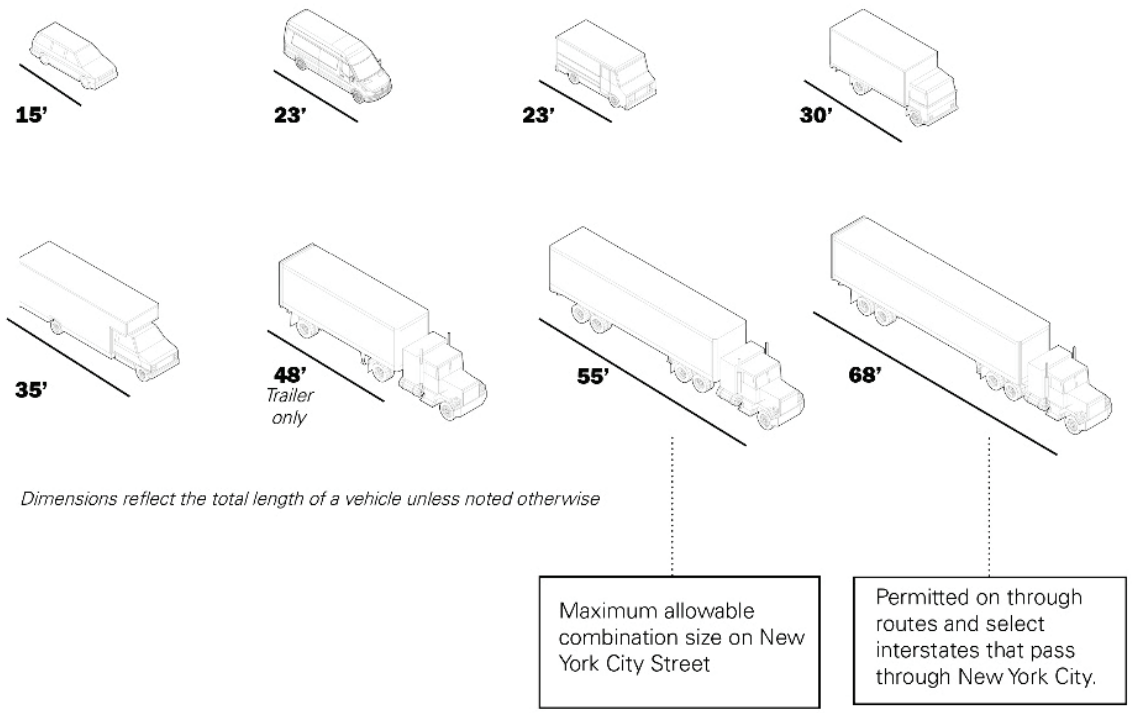
20 José Holguín-Veras et al. (2014) *Procedia - Social and Behavioral Sciences 125*. 36 – 48.

21 Hawkins, Andrew J. (May 26, 2013) Parking tickets: All in the cost of doing business. Retrieved July 2015 http://www.crainsnewyork.com/article/20130526/ECONOMY/305269980/parking-tickets-all-in-the-cost-of-doing-business

22 NYCDOT, Traffic Rules, (Section 4-15-b-4)

Figure 6. Of the common truck types allowed in NYC, 55 feet is the maximum allowable combination size while 68 feet trucks require special permits

Source: WXY Studio



While the precise percentage of different vehicle types in NYC is not known, several studies by NYC DOT have tracked the overall vehicle mix on-street in certain regions. A 2013 study of truck loading and unloading along Columbus Avenue on the Upper West Side found that 30 percent of the vehicles using freight delivery windows were single-unit trucks (>60 percent), followed by commercial vans (30 percent), and tractor-trailers (<10 percent).[23] Vehicle dimensions are a key component of the off-street delivery environment. If a vehicle is ill-suited to the configuration of a loading dock or street, or the configurations of a dock does not meet the specifications of the trucks delivering to that location, then the off-street infrastructure may be rendered useless.

23 NCFRP Report 33, 156.

While many of the vehicles in use today reflect standard industry types, new environmental friendly fleets could potentially play a large role in the future of freight activities. Policy regulations and incentives for low emissions freight vehicles are captured in the *NYSERDA Green Loading Zones* report (2013).

2.1.2.3 Loading Dock Types

The loading berths vary in both type and quality, and are often physically constrained by the configuration of building plot, street width, curb cut restrictions and pedestrian and traffic safety concerns.

Age and footprint of a building also play a considerable role in determining its off-street loading dock type. Buildings that pre-date the 1961 zoning have minimal to no provision of loading berths. [24] Certain old buildings, like the Rockefeller Center, did provide dedicated multiple-bay loading area, although it had the advantage of having a larger footprint. Buildings with larger footprints have significantly more space to design adequate loading facilities with a delivery plan, whereas smaller footprints or lots at complex intersections may not have the luxury of crafting a useful off-street logistics plan. Large or consolidated lots, such as Rockefeller Center, Time Warner Center, and future Hudson Yards, are easier to design than multiple lots with individual owners.

The table below summarizes the range of loading dock types commonly observed in NYC.

[24] It should be noted that certain older structures, in addition to Rockefeller Center, especially those in primarily manufacturing areas like Maspeth or the Brooklyn Navy Yard, are equipped with multiple-bay loading areas with elevated platforms. These types of loading docks are also common in converted, formerly industrial areas along the fringe of Manhattan, such as Tribeca and Chelsea. Other buildings have loading facilities that cut directly through the ground floor, allowing trucks to make head-in/head-out movements.

Table 2. New York City Loading Dock Typologies

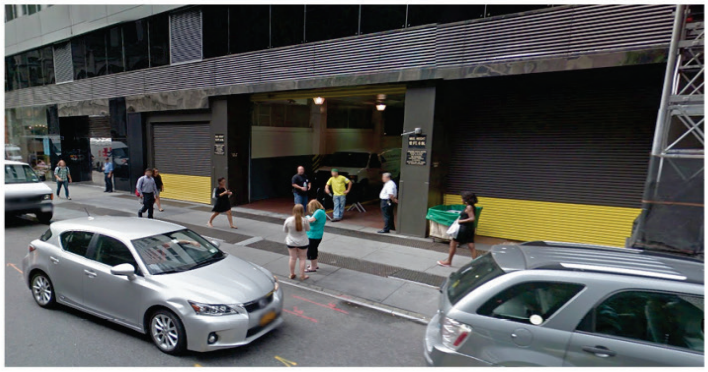
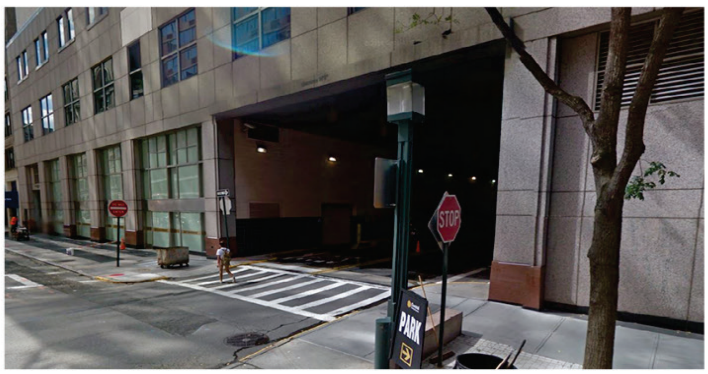
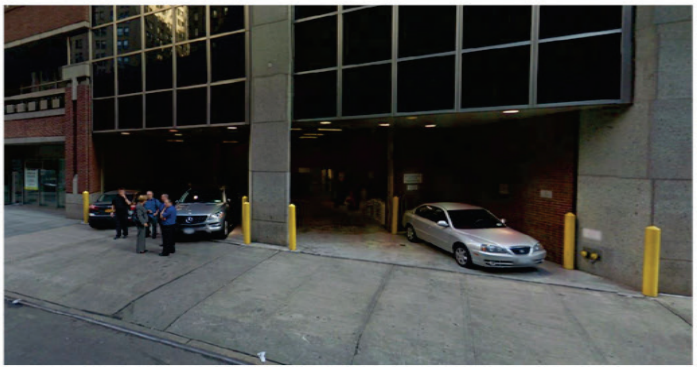
Types of Loading Docks Commonly Observed	
On street (strip) loading type (e.g. E 49 street)	
Multiple (e.g. 9 West 53 street)	
Rotating Table (e.g. 14 E 41 street)	
Through-Building Loading Dock (e.g. Metrotech Building, BK)	

Table 2. continued

Types of Loading Docks Commonly Observed	
Platform Loading Dock (e.g. Clinton Hill)	
Subsurface Loading Dock (descriptive image)	
Angled Loading Dock (e.g. 7 Hanover Building)	
Re-purposed Dock (descriptive image)	

2.2 Urban Street Design Typologies for Freight

Beyond the design of the loading berth itself, freight's interface with the City's objective of creating great public spaces and safe, multi-modal streets, deserves discussion. While preventing double-parking on crowded sidewalks represents one way to approach the problem, contextualizing any particular solutions within freight carrier's limitations can be a step in the right direction. To better understand freight in the context of NYC, it is useful to construct a typology of NYC street conditions that considers transportation and land use dynamics. The following street types reflect the dominant freight conditions of NYC.

2.2.1 Lower Manhattan Streets

Streets in Lower Manhattan present a unique set of challenges for the delivery of goods. In contrast to many other areas of the city, much of Lower Manhattan below Houston Street developed before the 1811 grid for which Manhattan has come to be known. This area, which includes the Financial District, has streets that are narrow and meandering hosting incredible densities, with many buildings exceeding 40 stories and generating hundreds of deliveries per day. This density, combined with a haphazard street pattern, make Lower Manhattan an ideal testing ground for non-traditional freight strategies such as micro-consolidation, freight tricycles, and other innovations that have been successful to various degrees in serving European city centers.

2.2.1.1 Narrow Service Streets or Alleys

Many of the deliveries in Lower Manhattan take place on narrow service streets and alleys. These streets, some of which have roadbeds under 12 feet, lack pedestrians and are often dark and constrained. Some, such as New Street serving 2 Broadway, lack sufficient width to provide entry or exit of any large trucks.

2.2.1.2 Narrow Commercial Streets

Narrow commercial streets, such as Nassau Street or William Street, are a challenge for freight vehicles to navigate. While some of these streets have designated loading zones for morning or midday deliveries, the high levels of pedestrian traffic on these streets, combined with the demand for deliveries, call for a different approach.

While current zoning provides a special waiver for streets where operational difficulties make the provision of a loading berth impractical, certain areas may present opportunities to test new concepts. Lower Manhattan, for example, presents an ideal context in which to test both cargo cycles and consolidation schemes.[25] Streets like Nassau Street, which was once pedestrianized, also provide a context to test concepts such as shared streets that might have operational flexibility, with certain times of day being open to loading and unloading and other times having pedestrian priority – such conditions are already in place in Boston's Financial District.

Table 3. Freight Conditions and Strategies by Street Type

Street Type	Freight Conditions	Potential Solutions	Location(s)	Example	Roadbed Width
Narrow Service Street (alley)	Temporary Obstruction. Shadows & Low Visibility. Operational constraints	Time-of-day restrictions. Temporary activation. Flush street treatments. Angled Loading Bays.	Lower Manhattan	New Street	12-28' (depending on parking)
Narrow Commercial Street	Temporary Obstruction of Street and Sidewalk. Parking on Sidewalk. Operational constraints	Flush street treatments. Off-hours delivery/Limited access. Curbside Delivery Planning.	Lower Manhattan	Doyers Street. Nassau Avenue.	12-28' (depending on parking)
Commercial Avenue (N-S)	Double Parking, obstruction of curbside bus lanes	Commercial Loading Zones, Delivery Windows, Off-hours deliveries	Midtown/Uptown	6th Avenue, 7th Avenue	50'
Commercial Crosstown Avenue (E-W)	Double Parking, obstruction of curbside bus lanes	Time-of-day restrictions, off-hours deliveries	Midtown/Uptown	14th, 23rd, 34th, 42nd, 57th, 72nd, 86th, 96th, 116th, 125th	54'
Commercial Service/Side Street	Double parking, obstruction of traffic and bike lanes. Operational constraints.	Time-of-day restrictions, commercial loading zones, graduated meters, off-hours deliveries	Midtown/Uptown	13th Street. 33rd Street,	30'
Commercial Boulevard	Double parking, obstruction of traffic lanes, bus lanes, bike lanes	Commercial Loading Zones, Delivery Windows, Off-hours deliveries	Midtown/Uptown	Broadway, Allen Street, Bowery	80-110'

25 The City of New York Zoning Resolution, Article IV: Manufacturing District Regulations, Chapter 4: Section 44-55. http://www.nyc.gov/html/dcp/pdf/zone/art04c04.pdf

Table 3. continued

Multi-way Boulevard	Double Parking in Service Lanes	Loading Zone on Service Street	Borough	Grand Concourse, Ocean Parkway, Queens Boulevard	100'-180'
Residential Boulevard	Double Parking	Loading Zone on service street Locker Box	Borough/ Upper Manhattan	Park Avenue (above 59th Street), Riverside Drive, Malcom X Boulevard	60-110'
Neighborhood Residential Side Street	Double Parking, Obstruction of Traffic	Locker Box Off-street Loading Commercial Loading Spot	Midtown/Uptown/ Borough	75th Street 88th Street, 113th Street	18-30'
Neighborhood Commercial Corridor	Double Parking, obstruction of bike lane, traffic. Cause vehicles to drive into oncoming traffic	Time-of-day restrictions, commercial loading zones, graduated meters, off-hours deliveries	Borough	Smith Street, Franklin Street, 5th Avenue (Park Slope), Ditmars Boulevard	30-60'
Mixed Use Thoroughfare	Double Parking,	Wide Parking lanes, commercial loading zones, off-hours deliveries	Borough	McGuiness Boulevard, Northern Boulevard, Coney island Parkway	60'-100'
Industrial Street	Parking on sidewalk, Double Parking, Operational Delays	Mountable curbs, loading bays, wide curb radii	Borough	1st Ave (Brooklyn), Vandervoort Avenue, Rust Street	Varies

2.2.2 Manhattan Grid Streets

The Manhattan grid runs primarily from Houston to 187th Street with minor variations. In terms of freight activity and conditions, the street grid is characterized by three primary typologies: Commercial Avenues, Commercial Service/Side Streets, and Neighborhood Residential Side Streets.

2.2.2.1 Commercial Avenue (N-S)

The north-south running commercial avenues of Manhattan, such as Ninth Avenue or Fifth Avenue, are characterized by a significant amount of freight activity, high traffic volumes, high demand by office, and commercial retail establishments, and restrictive off-street freight provisions. Avenues are largely prohibited from installing curb cuts for off-street loading bays and parking lots, meaning that most freight

deliveries to businesses along Avenues are made in commercial loading zones, with double parking, or on adjacent side streets.[26] High levels of double parking are prevalent, especially at receiver sites with multiple smaller and unconsolidated deliveries where freight needs to be at the curb close for efficiency.

2.2.2.2 Commercial Crosstown (E-W)

NYC's large crosstown avenues, including 14th, 23rd, 34th, and 42nd Streets run two-way and are noted by space constraints, competing demands, and significant commercial and retail activities. These streets support heavy crosstown bus traffic, which make curbside deliveries impractical despite the avenues being up to 900' in length. The result has been an increased focus on off-peak freight activity. In addition, the dedicated bus lanes recently installed makes these avenues impractical for intense freight activity. Most large crosstown streets have curb cut restrictions and therefore tend to receive their deliveries on parallel-running crosstown streets to the north and south. A case in particular are parallel streets north and south of 125th street that we will look at more detail in Section 4.

2.2.2.3 Commercial Service/Side Street

While streets running immediately parallel to major avenues tend to consolidate a lot of delivery activity, in certain areas of the city, most pointedly in Midtown, most commercial side streets serve some level of delivery and freight. Given curb cut restrictions along the primary avenues, off-street loading tends to cluster in these areas, even as they are continually being converted to retail, commercial, restaurants, and other uses. These conditions are documented in the on-site investigation (see Section 4.2.4).

2.2.2.4 Neighborhood Residential Side Street

The counterpart to the service/side street outside of the core, are neighborhoods with significant residential use. Examples of this are crosstown streets in the Upper West Side and East Side, as well as Harlem and other outer borough neighborhoods. These streets have high residential parking demand on two sides, as well as an increasing amount of parcel delivery traffic and residential food delivery. As a

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[26] While most of these streets were originally two-way, in the mid-1900s, the vast majority of these avenues were converted to one-way operation. Over the past decade, these streets have been the focus of significant redesign by the NYC DOT. The result of these changes to the streetscape has been the gradual repurposing of traffic lanes and curbside parking in favor of dedicated busways, bikeways, and loading space.

result, residential streets, especially in dense areas of Manhattan, experience frequent double parking and other constraints. These areas have not been the subject of significant attention and study in terms of freight.

2.2.3 Manhattan Special Typologies

2.2.3.1 Commercial Boulevard

Commercial Boulevards are one of two special typologies in Manhattan. Broadway, north of 59th Street, the Bowery and Allen Street on the Lower East Side represent examples of this typology. These streets typically carry high levels of crosstown or uptown traffic, have a planted or demarcated certain median, and have significant freight demand, similar to the crosstown avenues of the Manhattan Grid. This typology is marked by a similar condition to the commercial avenues, with much of the delivery activity pushed to the parallel side streets or commercial loading zones.

2.2.3.2 Residential Boulevard

Similar to the commercial boulevard, residential boulevards, have a planted central median and often flanked by high density residential buildings. Park Avenue north of 59th Street in Manhattan is the most famous of this type of street, along with Riverside Drive and Malcom X Boulevard in Manhattan. This type of street can have significant freight demand for residential deliveries, especially where the density is high.

2.2.4 Borough Typologies

2.2.4.1 Neighborhood Residential Streets

As with neighborhood side streets in Manhattan, neighborhood residential streets are characterized by a high level of parking demand, an increase in residential parcel deliveries, and grocery services like Fresh Direct. These streets, while a common part of the NYC landscape, have limited off-street loading capacity, except where the provision of driveways and parking bays are common.

2.2.4.2 Neighborhood Retail Corridor

Neighborhood commercial corridors, such as Smith Street in Carroll Gardens (Brooklyn), Bedford Avenue in Williamsburg (Brooklyn), Arthur Avenue in the Bronx, and Ditmars Boulevard in Queens are a recognizable NYC street type faced with significant competing demands and freight challenges. Neighborhood retail corridors have persistent double parking, bus and bike traffic, and are often more constrained than their Manhattan counterparts. These streets can be one- or two-way and often have no commercial service or side streets for freight deliveries, meaning that freight competes directly with residential parking demand. These areas are critical cases where off-hour deliveries or delivery windows are ideal, especially given the typical mixture of restaurants and small retail establishments.

2.2.4.3 Mixed-Use Thoroughfare

A mixed-use thoroughfare comprises a range of different street conditions and is less recognizable as a cohesive category than many other streets. Streets with some characteristics of a commercial boulevard or an avenue are often combined here with industrial uses or commercial retail with off-street parking. Many of these streets are critical traffic thoroughfares with multiple uses, and often have significant reserves of off-street parking and loading. As these streets undergo transitions, especially to residential development, the conventional loading activities that happen on-street will now compete with residential parking demand.

2.2.4.4 Industrial Street

The industrial street is a broad category that encompasses any street for which the primary user type is a truck. These streets typically suffer from sidewalk obstructions or deterioration, traffic backlogs resulting from large trucks coming off the interstate, or staging and other operations that impede access.

2.2.4.5 Multi-way Boulevard

A historic street typology, the multi-way boulevard is a notable type of street in the outer boroughs. Multi-way boulevards in NYC tend to be residential, but they can be commercial, as with Queens Boulevard, or mixed use, as with Grand Concourse. The multi-way boulevards often have buses running along the service road, meaning that traditional loading/unloading activities cannot double

park in these areas. Residential multi-way boulevards, such as Ocean Parkway or Eastern Parkway, can suffer from obstructions in the service road due to deliveries, while commercial multi-way boulevards suffer from conflicts between trucks and transit in those areas. Due to typically lower densities and, in turn, often lower parking or freight demand on these streets, they tend not to be a focus for freight logistics.

2.3 New York City's Freight Policy Context

Before delving into the freight policy context, it is important to briefly understand the network of truck routes on which the freights move. Established in 1981, with minimal changes since, these routes regulate where trucks can and cannot travel through the city.

While truck routing has been an effective means of controlling the negative externalities of freight, the lack of available routes, which covers only about 10 percent of city streets, in addition to the competing demands of other users, such as bikes and buses, have created an increasingly difficult situation for many carriers as well as elevated levels of truck congestion and concentrated pollution along heavily used segments of the network. Furthermore, trucks are permitted to leave the network only when accessing their final destination, thus adding to the already constrained freight mobility.

Different types of truck routes include:

- Local Truck Routes.
- Through Truck Routes: Trucks that do not have an origin or destination within that borough must restrict themselves to Through Truck Routes.
    - Through Truck Routes on Expressways.
    - Through Truck Routes in Tunnels.
- Through Truck Routes with an exception for allowing 53 feet trailers (68 feet trucks).

Figure 7. New York City designated truck routes

Source: WXY Studio

2.3.1 On-Street Loading Strategies

Comprehensive freight management demands a balance between on- and off-street management approaches, especially in contexts where building types and requirements vary with age, land use and other parameters. While this report focuses on regulations and built typologies related to off-street deliveries, it is nevertheless important to review some of the current strategies used by agencies around NYC to manage on-street loading and unloading activity.

Through its Office of Freight Mobility, established in 2007 and working in concert with the NYC Police Department, NYC DOT has the most direct responsibility for managing the day-to-day operations and impacts of freight activity at the last mile.[27] The department has been able to pioneer a number of forward-looking solutions to freight management and to a degree, to integrate freight into their routine street design and traffic management practices.

2.3.1.1 On-Street Loading Zones

NYC has a variety of on-street regulations for freight and commercial vehicles operating in the city. While it is not critical to review all of these regulations here, it is important to note that the city has strict guidelines against the parking of tractor-trailers and semi-trailers, and places a variety of restrictions on commercial vehicles at both certain times of day and within specific "limited truck" zones.[28] The city also maintains two special zones, the Lower Manhattan Blue Zone, which restricts all parking Mondays through Fridays, 7 a.m. to 7 p.m. and in the Garment District,[29] (from 35th to 41st Streets between Avenues of the Americas and Eighth Avenue). Blue Zones provide dedicated curb space for loading/unloading vehicles with commercial plates making deliveries from 7 a.m. to 7 p.m. Monday through Friday. Hourly rates for commercial parking apply in the Midtown Core area (from 23rd to 59th streets from Second Avenue to Ninth Avenue and on Canal Street on both sides between Bowery and West Broadway).[30]

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27 NCFRP Report 33, 145

28 New York City Department of Transportation. Commercial Vehicle Parking Regulations. http://www.nyc.gov/html/dot/html/motorist/parktruck.shtml

29 New York City Department of Transportation. Parking a truck or commercial vehicle. http://www.nyc.gov/html/dot/html/motorist/parktruck.shtml

30 New York City Truck Map 2015. http://www.nyc.gov/html/dot/downloads/pdf/2015-06-08-truck-map-front.pdf

Designated on-street loading zones have been applied consistently to areas with high loading/unloading activity. The city establishes a maximum time limit for "standing" (occupying the loading zone) of three hours, though these regulations vary by district. Existing traffic regulations also tolerate some degree of double parking, allowing double parking in cases where there is no open curb space for 100 feet on either side of the vehicle's destination.[31] This may not match actual enforcement. While the establishment of dedicated loading areas for commercial vehicles has proven successful in alleviating the congestion impacts caused by double-parked freight vehicles, these designated loading zones, especially at peak times, may be insufficient for the total level of freight demand for large buildings. In addition to commercial loading zones, the city has a series of "limited truck zones" in which no operator with an overall length exceeding 33 feet is permitted to operate. These areas include the Financial District and the Midtown Core. The city maintains three zones that forbid commercial vehicle standing at all, including sections of Chelsea, Chinatown, Greenwich Village, Little Italy, the Lower East Side, and the Garment District.[32]

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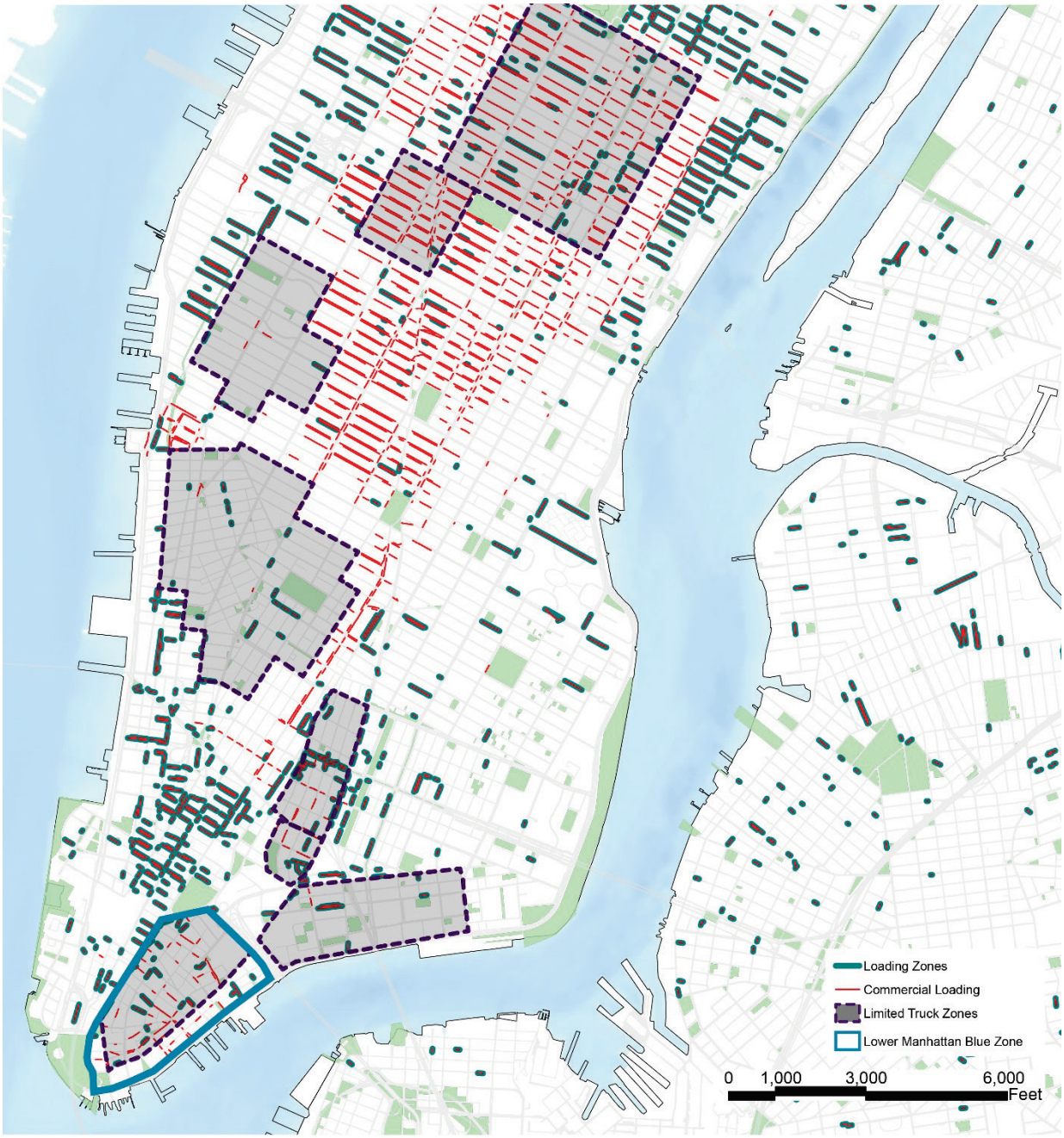
31 New York City Department of Transportation Traffic Rules. http://www.nyc.gov/html/dot/downloads/pdf/trafrule.pdf, Section 4-08. Page 27.

32 New York City Department of Transportation Traffic Rules. http://www.nyc.gov/html/dot/downloads/pdf/trafrule.pdf#section4-08, Section 4-08. Page 32.

Figure 8. Limited truck and on-street loading zones

Source: WXY Studio

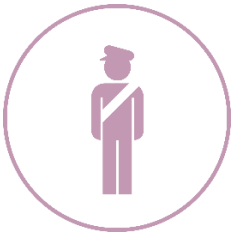


2.3.1.2 Delivery Windows

Delivery windows are specific timeframes in which deliveries are scheduled to take place. They can provide an effective solution for loading and unloading along constricted commercial corridors. Delivery windows have been implemented on some of the city's most congested corridors, including Church Avenue in Brooklyn, where the city was able to increase travel speeds along the corridor as part of a street improvement project.[33] According to NYC DOT, delivery windows "make curb space available for delivery trucks and thus reduce double parking and traffic congestion, and support the city's economy by improving the efficiency of truck deliveries."[34]

Delivery windows have been consistently implemented as part of other programs administered by the NYC DOT that will impact access to the curbside, including bikeways, bus lanes, and new parking regulations.

2.3.1.3 Enforcement (Cameras and Ticketing)



Traffic is a constant issue on high-volumes routes and is compounded and complicated by the amount of construction that takes places on the street in NYC. While an imperfectly implemented solution, enforcement remains a critical part of how trucks are managed in the city. Truck enforcement is primarily carried out by the NYC Police Department. Ticketing has become such a commonplace occurrence for freight carriers that those regularly operating in Manhattan build violation fees into their cost of doing business. UPS alone paid $18.8 million dollars in fines in fiscal year 2005, to the point that they were actually provided with direct billing.[35] While these fines have gone down in recent times, carriers still pay an average fine of $500 to $1,000 per truck per month for deliveries made during business hours.[36]

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33 NCFRP Report 33, 152.

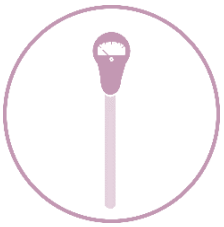
34 NYC DOT Urban Freight Initiatives. 2015

35 Conway, Alison, et al. *Freight Tricycle Operations in New York City*. No. C-11-11. 2014, 6.

36 Conway, Alison, et al. "Urban micro-consolidation and last mile goods delivery by freight-tricycle in Manhattan: Opportunities and challenges." *Conference proceedings, Transportation Research Board 91st Annual Meeting 2012*. 2011, 2.

In addition to police ticketing, the city's CCTV cameras are capable of identifying trucks traveling in non-designated truck routes. While there is no provision to send tickets to directly offenders yet, it may be possibility in the future.[37]

2.3.1.4 Pricing: Graduated Commercial Meter Rates



As part of a series of integrated strategies to better manage freight activity in the urban core, NYC DOT has also experimented with a graduated rate structure for meters to encourage turnover in certain high demand areas. Beginning in 2000, the city began installing commercial meters with graduated rates increasing by one dollar per hour and four to six dollars over a three-hour period. Study results saw reductions in average parking time from 160 to 45 minutes.[38]

2.3.1.5 Off-hour Deliveries

In 2010, NYC DOT published the results of a pilot program to encourage freight carriers and receiving businesses to experiment with off-hour deliveries between 7 p.m. and 6 a.m. This pilot aimed to demonstrate that a widespread shift to off-peak deliveries could have resounding, positive implications for both the freight industry and the quality of life of ordinary New Yorkers. The pilot, which worked with eight delivery companies and 25 businesses, showed a 75 percent reduction intravel times – from the truck depot to the first delivery destination – as compared to rush-hour deliveries.[39] The pilot also demonstrated that trucks companies spent significantly less time making curbside deliveries, from 100 minutes to 30 minutes on average and a monthly reduction in parking tickets of $1,000 with an average time savings of 48 minutes per delivery.[40]

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37 NYC DOT Urban Freight Initiatives 2015. http://www.nyc.gov/html/dot/downloads/pdf/2015-07-20-urban-freight-initiatives.pdf, Page 15.

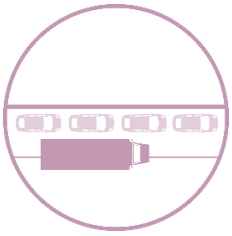
38 Zalewski, A., Buckley, S., and Weinberger, R. 2011. Regulating Curb Space: Developing a framework to understand and improve curbside management. Transportation Research Board, Washington, D.C. http://libraryarchives.metro.net/DPGTL/studies/2011-regulating-curb-space.pdf

39 New York City Department of Transportation. "NYC DOT Pilot Program Finds Economic Savings, Efficiencies for Truck Deliveries Made During Off-hours," 1 Jul 2010. Web 26 Jun 2015. http://www.nyc.gov/html/dot/html/pr2010/pr10_028.shtml

40 Giuliano, Genevieve. Synthesis of freight research in urban transportation planning. Vol. 23. Transportation Research Board, 2013, Page 27.

Since the conclusion of the pilot, NYC DOT has continued to expand, advertise, and foster the program. They estimate that 40-50 daily delivery trips have switched to off-hour deliveries as a result of these efforts.[41] Research suggests, however, that many businesses will only shift to off-hour deliveries if given a substantial financial incentive. According to research by Dr. Jose Holguin-Veras, a "$10,000 tax deduction to restaurants accepting off-street deliveries would lead to 20 percent of them switching to off-peak deliveries" and a total cost to taxpayers of $13 million.

2.3.1.6 Wide Parking Lanes



In addition to loading zone regulations, the NYC DOT uses a number of different engineering strategies to improve freight loading and unloading conditions throughout the city. On streets with significant double parking problems, but with limited or no dedicated curbside loading space, the city has recently begun striping extra-wide parking lanes of 13-15 feet. These parking lanes better define the anticipated double parking areas in the absence of parking restrictions or time-based loading regulations. While this is not an ideal operational strategy for every situation, the design adapts to consistent, if problematic behavior.

In addition, during the course of this study, additional on-street loading strategies were investigated and are described in the Appendix 1.

2.3.2 Freight in the Environmental Review Process

City Environmental Quality Review (CEQR): While the zoning regulations administered by the Department of City Planning are one way of influencing practices and policies for freight across NYC, the City Environmental Quality Review (CEQR) process marks a second opportunity to shape freight policy and design, in the case of new projects such as large-scale plans and developments.[42]

As part of the CEQR process a Travel Demand Forecast (TDF) is conducted. This forecast uses trip generation rates for trucks segmented into local retail, office, and residential. CEQR guidelines state that developers should "determine the number of truck and van deliveries generated by a proposed project separately from the trip generation/modal split analyses." CEQR recommends that developers

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41 NYC DOT Urban Freight Initiatives, 2015. http://www.nyc.gov/html/dot/downloads/pdf/2015-07-20-urban-freight-initiatives.pdf, Page 10.

42 A new project needs to be reviewed under CEQR if the project need discretionary approvals or permits from any city agency, requires city funding, or is being undertaken directly by the City agency. http://www.nyc.gov/html/oec/html/ceqr/basics.shtml)

conduct "original surveys of a similar existing facility," but in the absence of such survey, permits the use of "truck trip generation rates cited in the 1969 Wilbur Smith and Associates' Motor Trucks in the Metropolis and the Federal Highway Administration's 1981 *Curbside Pick-up and Delivery Operations and Arterial Traffic Impacts*." However, these numbers are not recommended "due to the staleness of the information."[43]

In addition to the prescribed truck trip generation rates, the CEQR guidelines define Passenger Car Equivalents (PCEs) for truck traffic generated. These regulations adjust vehicle trips based on the overall size of the vehicles using the road, a regulation not typically reflected in typical Average Daily Traffic (ADT) counts, and can provide a method of estimating the impact of increased freight.[44]

At present, the CEQR Manual lacks any standard means of calculating the impact of idling or double-parked freight vehicles on the overall congestion of the traffic network. The CEQR manual does, however, include mitigation provisions that note the importance of internal access and circulation as well as physical site changes to ease the operation of trucks at a given location. Truck traffic is also well reflected in the city's noise and air quality monitoring process, which separates vehicle types including "light-duty" trucks, heavy-duty gasoline powered trucks and buses, and heavy duty diesel powered trucks and buses.

In regard to off-street loading, CEQR states that the "relocation of a project's loading docks, or their reconfiguration, could also have similar benefits in moving the goods delivery function to a location that does not significantly impact traffic or pedestrian flow. Reconfiguration of a proposed loading dock from a back-in operation to one in which the trucks may pull directly into the delivery area would also relieve pressure on traffic and pedestrian movements. It should also be noted that NYC DOT has indicated a strong preference for front-in and front-out truck operation."[45]

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43 "Transportation" City Environmental Quality Review Technical Manual. March 2014 Edition. 16-5.

44 "Transportation" City Environmental Quality Review Technical Manual. March 2014 Edition. 16-11.

45 "Transportation" City Environmental Quality Review Technical Manual. March 2014 Edition. 16-80.

The CEQR guidelines, while not the specific focus of this report, provide insight into how zoning could better account for freight – for instance, conduct a survey of a similar building in order to gain a more accurate trip generation estimate. Where off-street freight implementations are infeasible or undesirable, zoning could prescribe mitigation measures or provide innovative approaches.[46]

2.3.3 Freight in OneNYC

OneNYC, the city's newly adopted policy agenda under Mayor Bill de Blasio, includes multiple efforts related to optimizing and improving freight mobility.[47] The report highlights the "significant challenges" facing NYC's freight system, mainly stressing the fact that almost all of the 400 million tons of cargo that enter, leave, or pass through NYC each year are transported by truck rather than using ports or rail infrastructure.[48] According to NYC DOT's freight initiatives, solutions include "the use of alternative fuels, clean technologies, off-hour deliveries, mobile applications, a Smart Fleet Rating System, and the facilitation of delivery of construction-related cargo by water."[49] These efforts complement the city's ongoing efforts around Vision Zero, which have aimed to reach zero fatalities from traffic crashes. These efforts, considered in tandem, place some degree of focus on the trucks themselves, which are overrepresented in accidents, including pedestrian and bicycle fatalities.

2.4 Off-Street Freight Management Strategies

In addition to on-street loading strategies, requirements for off-street deliveries in the existing zoning could be improved to account for the challenges facing freight in the 21st century, including complexity of deliveries, necessary requirements of vehicles in use today, and the practical challenges of freight on a day-to-day basis.

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46 For instance, Zoning could make changes with regards to head-in movements for trucks, which are currently limited to a specific Special District.

47 "OneNYC: The Plan for a Strong and Just City." The City of New York, Mayor's Office of Sustainability. 2015. http://www.nyc.gov/html/onenyc/downloads/pdf/publications/OneNYC.pdf

48 "OneNYC: The Plan for a Strong and Just City." The City of New York, Mayor's Office of Sustainability. 2015. http://www.nyc.gov/html/onenyc/downloads/pdf/publications/OneNYC.pdf, Page 85.

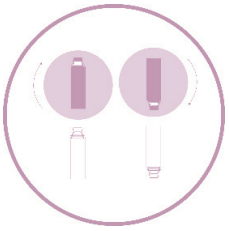
49 NYC DOT Urban Freight Initiatives 2015. http://www.nyc.gov/html/dot/downloads/pdf/2015-07-20-urban-freight-initiatives.pdf, Page 12.

While the NYC DOT has focused on the on-street freight environment, off-street requirements and design strategies for freight deliveries have not been comprehensively reviewed since the 1950s and, as this study suggests, could be updated to reflect a changing transportation environment. In addition, the lack of data on off-street berths and their level of usage further exacerbates the issue. As noted, there has been a reliance on the flexibility of on-street space to accommodate freight needs.

2.4.1 Loading Berths

The most prevalent strategy to handle off-street freight deliveries is the provision of a loading berth. The objective of a loading berth is to move a truck that would otherwise be using the curbside within the building envelope or lot line itself. Many loading berths in Manhattan consist of only one or two loading docks, in contrast to the loading berths or bays of a large suburban department store, for example, which might have ten or more. Loading berths in NYC are typically on side streets, enclosed within the building, and accessed through a curb cut crossing a sidewalk. For a list of observed loading berth typologies in NYC, please refer to Section 2.1.2.3. As mentioned earlier, the lack of a comprehensive, accessible data, on the current inventory of off-street loading berth compounds the problem of provision and utilization of loading berths.[50]

2.4.2 Turntables: Head-in, Head-out



Through-building, head-in, head-out operation avoids the requirement of trucks backing into loading facilities on narrow streets with queuing traffic, bikes, and pedestrians. In crowded environments such as Midtown Manhattan, these maneuvers can be complex, time-consuming and difficult to manage. Design solutions, such as turntables, similarly allow trucks to enter into a loading facility head-in and leave a facility head-out. Both head-in and head-out turntables have large space requirements and may be impractical except for the larger building footprints in NYC.

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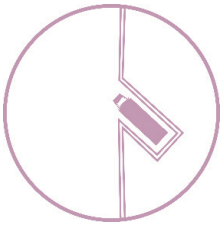
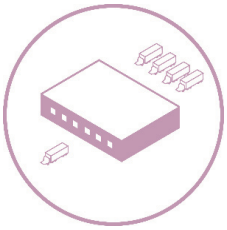
50 Additionally, in many instances during on-site analysis, it was observed that the loading docks were occupied by parked cars.

2.4.3 Angled Loading Bays



Angled loading bays, a frequent design strategy used in Europe and elsewhere, provide another alternative that may help freight vehicles better manage the delivery process. These are especially useful on streets without sufficient curb radii to handle the turning movement of a large truck, or sufficiently busy that such movements would be impractical. While angled loading bays are an effective solution in this respect, their biggest challenge may be suboptimal or non-traditional building arrangement, and potentially the loss of retail space.

2.4.4 Freight Consolidation



Consolidation of freight at a centralized receiving station, occurring at either a regional consolidation center or a small, urban micro-consolidation center, has the potential to greatly reduce freight traffic on city streets, ensure that large trucks are not making multiple deliveries to the curb during the day, and provide a streamlined freight delivery network for the entire city. While public sector-driven consolidation centers have not been implemented in the United States to date, the private sector has led their own consolidation programs to ensure efficient deliveries into the central business districts – some examples in Manhattan being Whole Foods and Fresh Direct. Consolidation theoretically provides a practicable solution to many of freight's negative externalities, however, its actual implementation is frustrated by the challenge of coordination among many small receivers and building owners, the lack of a mechanism to compel carriers to participate in consolidation, and the need for public subsidies to sustain and manage these programs. A successful freight consolidation program adopted by Transport for London on Regent Street has been discussed in Appendix 2.[51]

From a policy perspective, the current zoning code does provide an overarching precedent. In commercial districts, a clause in the zoning code says that the required loading berths may be designed to jointly serve two adjoining buildings (36-67). This option allows multiple buildings to create a consolidated loading/unloading area and offers the option of streamlining freight deliveries. While this clause remains

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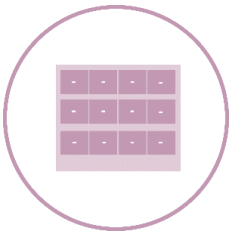
51 Another similar example includes Le Petit Reine in Paris.

relatively buried within the code, it has the potential to serve as a precedent for shared or consolidated loading facilities. This type of consolidation would be valuable for multiple reasons, including an overall reduction in the number of curb cuts on a block, as well as the opportunity to build a coordinated, streamlined delivery system that serves multiple lots and buildings.

While there are structural and institutional barriers that need to be considered, the zoning code could be amended to encourage the development of shared or joint loading berths or consolidation zones in certain contexts, potentially even offering a bonus for facilities serving an entire block or district.

2.4.5 Lockers and Residential Receiving



In 2011, Amazon launched a locker box delivery program intended to provide customers not home during the day with a space to pick-up deliveries at their convenience. The practice has reduced the need for delivery vehicles to provide door-to-door service and made on-demand, same-day delivery more practical. Parcel, a new service launched in NYC in 2014, has tried to resolve the same dilemma by providing apartment-dwelling New Yorkers with an alternative to missed home deliveries during the day.

Parcel signals the advent of private-sector led consolidation, which, with some measure of public incentive, might be able to scale and thrive as an alternative to traditional logistics.

2.4.6 Delivery Booking Management

Larger buildings, such as the Time Warner Center and Rockefeller Plaza, have sophisticated delivery booking and management systems that their tenants participate in. Arguably, these work well because they fall under the auspices of a single land owner and/or building management company. These buildings maintain delivery booking systems for security and liability reasons, but the systems also have the potential to feed into a common data source that could help individual cities and districts better manage their freight operations.

3 Current Zoning

The zoning regulations that govern off-street loading and unloading, while not heavily enforceable beyond the development review stage, can play an important role in mitigating some of the conflicts surrounding last mile freight deliveries. A brief overview of history shows us that these regulations have not been comprehensively reviewed or updated since the mid-1950s. For a detailed synopsis of 1940 and 1952 zoning resolution, please see Appendix 3.

The following section will deconstruct the parameters that govern off-street loading provision within the current zoning framework, and compare NYC's zoning codes to those of other U.S. and international cities.

Figure 9. 1952 zoning regulations focused on the auto throughput, which inadvertently created more conflicts with other modes of movement as freight demand increased

3.1 Zoning Analysis

Off-street loading regulations emerged as a pressing concern for NYC's regulators and merchants associations beginning in the late 1920s and culminating in the passage of comprehensive off-street loading regulations in 1952. These regulations reacted to the increasing "traffic strangulation" witnessed on the city streets at the time, especially those in the Garment District and other congested light manufacturing and retail areas in Manhattan. While the policies from 1940 zoning resolution tied the number of designated loading berths to increments of floor space by various use types, the 1952 revisions sought to have a more nuanced approach that removed these 'flat' requirements and added a broader range of use types.[52] It should be noted that much of the actual data governing the 1952 numbers was collected in the 1940s or earlier and was intended to solve congestion, which while in many ways similar to those we face today, were rooted in a different set of assumptions.

The primary goal of this initial code was to get as much loading activity off the streets and into the buildings as possible. The urban design or architectural consequences of these actions was acknowledged at the time, but in large part, played a secondary role in importance to adequate vehicle throughput in an era of burgeoning automobile ownership. The three parameters that defined the initial loading berth requirements were: Use, District (low bulk vs. high bulk), and Square footage.

Use: Based on the use classes and categories set forth in the NYC Zoning Resolution.

District: The specific zoning district in which a property falls.

Size: Based on building square footage according to individual uses.

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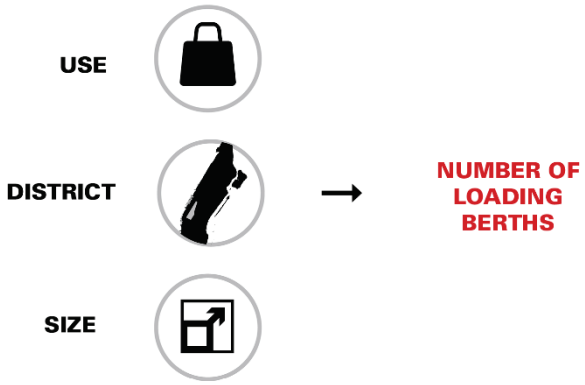
[52] Based on use types and district designations, loading berth requirement were set on a sliding scale, rooted in the observation that each additional loading berth could serve a larger area of an individual building and that flat requirement was too burdensome.

Figure 10. Loading Birth Calculation Model

In order to calculate how many loading berths would be required as part of new construction, a developer has to assess the square footage devoted to individual uses (residential vs. retail vs. manufacturing) in the building and then to cross-reference these with the required thresholds of their individual zoning district

Source: WXY Studio



Changes to the zoning code since that time have dealt tangentially with off-street loading and never comprehensively. For instance, several changes were passed for the Special Midtown District in the 1980s, but these were primarily concerned with restricting curb cuts and loading berths in the interest of preserving a continuous street wall for retail activity[53] (Zoning resolution, Article VIII, 81-42, 44). The more recent changes to the code, made in 2011 and 2012, dealt with waivers and consolidated loading bays respectively that addressed sites with physical constraints. It should be noted that similar site specific studies have been carried out in the past, such as the Williamsburg-Greenpoint rezoning, with strategies for sites with high freight demand. However, it has not changed the existing zoning code.

From a zoning and regulation perspective, research points to the following caveats that need to be addressed in order to develop a comprehensive solution towards loading berth requirements:

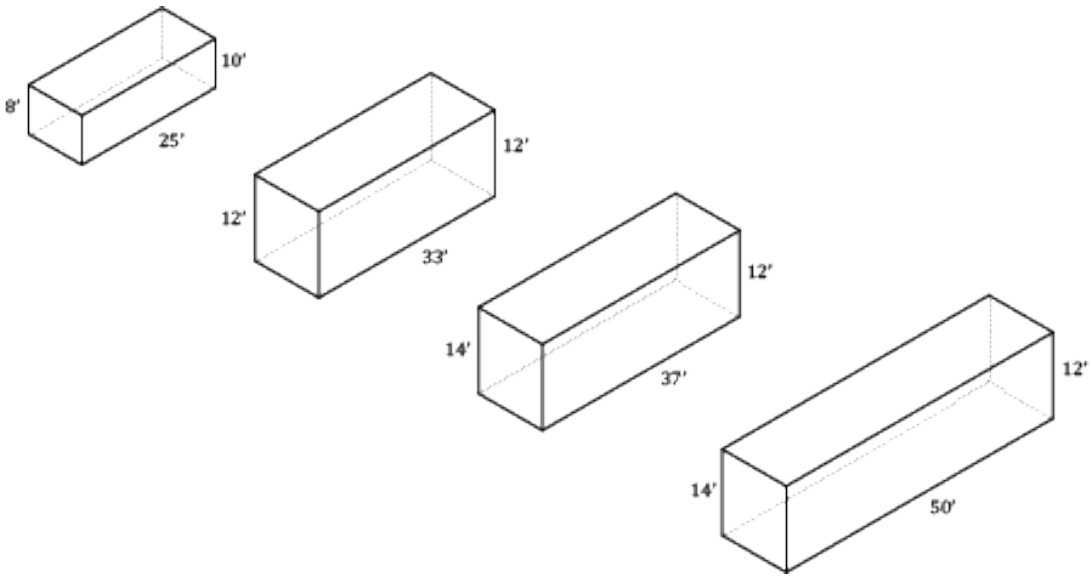
1. **Size of loading berth:** Loading berth dimensions are often misaligned with the current size of freight vehicles and their operational needs.
2. **Use classification:** Current regulations distinguish between limited uses. For instance, residential uses require no off-street loading facilities even though they generate an increasing amount of freight movement.

53 Loading Berth Key to New City Zoning, New York Times. June 18, 1951.

3. **Loading Infrastructure Context:** The zoning code does not account for the interplay between on- and off-street regulations.
4. **Limited Data:** Limited availability of data on loading berth inventory and utilization further precludes solutions that reduce double parking, congestion, and other pertinent last mile freight issues.

Figure 11. Minimum dimensions for required accessory off-street loading berths, NYC Zoning Code Section 36-281

Source: WXY Studio



3.1.1 Size: Loading Berth Dimensions

Current zoning regulations require loading berths to follow basic minimum dimensional requirements, as organized by use.[54] In the 1940 zoning code, loading berths had a minimum dimension of 25 feet by 10 feet. In the early 1950s, this minimum was increased to 33 feet in depth and 12 feet in width, with a required clearance of 14 feet, based on the increasing size of trucks at that time. Interestingly, these clearance requirements were amended in 1954 down to 12 feet as they were viewed as too stringent at the time.[55] New regulations (Section 13 of the NYC Zoning Code) for the Manhattan Core were passed in 2013 and provide updated loading regulations. These specify a new loading berth minimum depth of 37 feet (Section 13-31). Given that many offices and commercial uses are now serviced by trucks of 55 feet or greater, these regulations remain unsatisfactory from an operational standpoint.

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54 NYC Zoning Code Section 36-681.

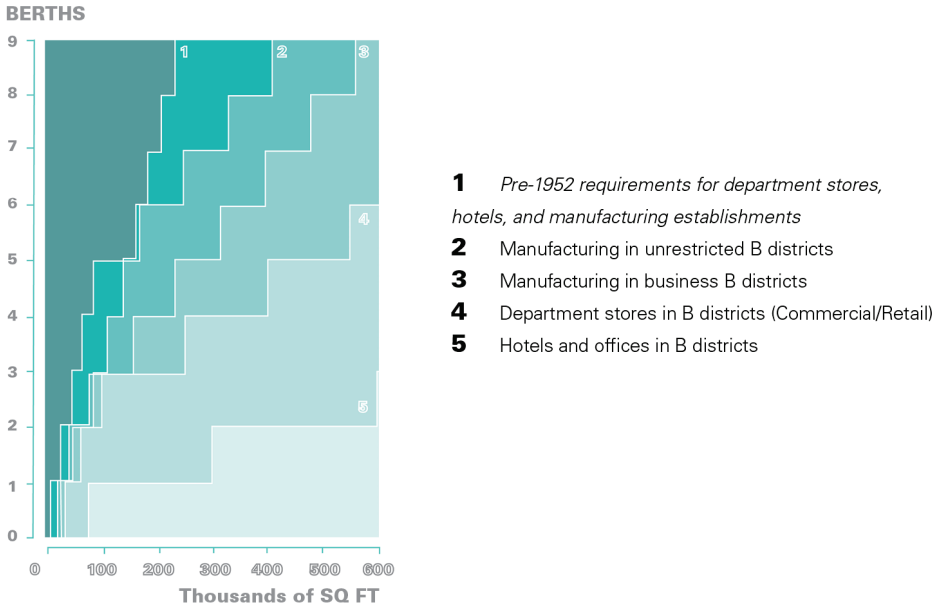
55 CP 19540519, 550.

3.1.2 Use

In contrast to many city zoning ordinances and other sections of the code itself, NYC's loading berth requirements govern only a limited number of use categories and do not fully account for the nuances of various uses. For instance, hospitals and prisons have the same square footage thresholds; hotels, offices, and court houses have the same requirements as well, despite having far different activities and use parameters otherwise. Many uses that would seem to have specific loading/unloading needs, like supermarkets, are not specifically called out, even though parking requirements in the zoning code has segmented this usage class and afforded it special characteristics.

Figure 12. 1952 Sliding scale for determining loading berth requirements

Source: WXY Studio



In both the original 1961 zoning resolution as well as the current zoning, the use, district and size of a building is set along a sliding scale (as opposed to a flat requirement), which accounts for the increasing utility of each additional, individual loading berth as the size of a building increase. This sliding scale sets more stringent requirements according to use types. For instance, hotels and offices are assumed to generate less freight than manufacturing uses or retail and thus require fewer berths overall.

In addition, the zoning resolution sets different berth requirements for low- and high-bulk districts. This provision is reflective of two realities; first, that it would be very difficult to meet higher loading requirements in extremely dense, core areas and second, low-bulk districts were assumed to be more automobile dependent and might have more space in which to meet their loading requirements. Current use classes are oversimplified in part because they fail to distinguish between different business models or types within particular industries. These shortcomings stand in contrast to other city zoning codes, such as those recently passed in Washington D.C. Whereas NYC's code specifically calls out only 14 use categories, the D.C. code has special requirements for both loading berths and service/delivery spaces across almost 30 different uses.[56] The following diagrams delineate the loading berth required between low- and high-bulk districts between the various use groups.

[56] DC Office of Zoning. Subtitle C, General Zoning Rules. http://dcoz.dc.gov/zrr/Subtitles/Subtitle%20c%20-%20proposed.pdf 901.1

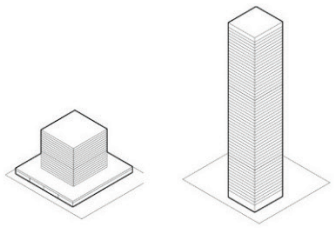
Figure 13. Loading Berth Requirements by Zoning Class

OFFICE / HOTELS

Districts: C1[1] C1-6 C1-7 C1-8 C1-9 C2 C2-6 C2-7 C2-8 C4-4 C4-5 C4-6 C4-7 C5 C6 C8-3 C8-4

0 to 100,000 sq. ft. of floor area	**0**
100,000-300,000 sq. ft.	**1**

*Each additional 300,000 sq. ft. of floor area or fraction thereof +1 required berth

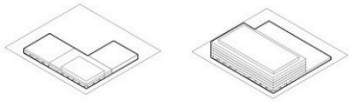


C4-4 3.4 FAR | C5-3 15.0 FAR

Districts: C1[2] C2 C3 C4-1 C4-2 C4-3 C8-1 C8-2

0 to 25,000 sq. ft. of floor area	**0**
25,000-100,000 sq. ft.	**1**
100,000-300,000	**2**

*Each additional 300,000 sq. ft. of floor area or fraction thereof +1 required berth



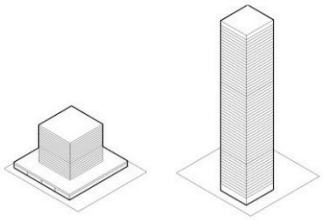
C4-1 1.0 FAR | C2-4 2.0 FAR

COMMERCIAL / RETAIL

Districts: C1[1] C1-6 C1-7 C1-8 C1-9 C2 C2-6 C2-7 C2-8 C4-4 C4-5 C4-6 C4-7 C5 C6 C8-3 C8-4

0 to 25,000 sq. ft. of floor area	**0**
25,000-40,000	**1**
40,000-100,000	**2**

*Each additional 150,000 sq. ft. of floor area or fraction thereof +1 required berth

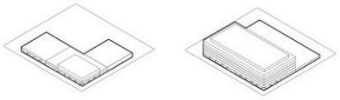


C4-4 3.4 FAR | C5-3 15.0 FAR

Districts: C1[2] C2 C3 C4-1 C4-2 C4-3 C7 C8-1 C8-2

0 to 8,000 sq. ft. of floor area	**0**
8,000-25,000 sq. ft.	**1**
25,000-40,000	**2**
40,000-60,000	**3**
60,000-100,000	**4**

*Each additional 150,000 sq. ft. of floor area or fraction thereof +1 required berth



C4-1 1.0 FAR | C2-4 2.0 FAR

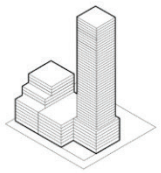
Figure 13 continued

SERVICE WHOLESALE, MANUFACTURING OR STORAGE

Districts: M1-3 M1-5 M1-6 M2-2 M2-4

0 to 15,000 sq. ft. of floor area	**0**
15,000-40,000 sq. ft.	**1**
40,000-80,000	**2**

*Each additional 80,000 sq. ft. of floor area or fraction thereof +1 required berth

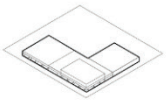


M1-6
10.0 FAR

Districts: M1-1 M1-2 M1-4 M2-1 M2-3 M3-1 M3-2

0 to 8,000 sq. ft. of floor area	**0**
8,000-25,000 sq. ft.	**1**
25,000-40,000	**2**
40,000-60,000	
3	

*Each additional 80,000 sq. ft. of floor area or fraction thereof



M1
1.0 FAR

Couple of key observation emerged from this zoning overview:

- Residential districts have no off-street loading provisions. With changes in delivery patterns, including services like Fresh Direct, Amazon PrimeNow, and others, residential properties attract freight deliveries that need to be accounted for. For loading docks within a residential district, zoning outlines screening requirements include a six foot above grade wall or a fence or a strip that is at least four feet wide with densely planted shrubs or trees.
- Hotels and offices have similar loading dock requirements, even though large offices without ground floor retail component may receive far fewer deliveries per day than a hotel.
- The high threshold for commercial / retail loading berth may be a reaction to the cost of l ost retail frontage. Special Midtown District provides an ideal precedent – it stresses on preserving a street wall by building berths below grade if the count exceeds three.
- Loading docks in manufacturing districts have a minimum depth of 50 feet rather than 37 feet to accommodate large freight vehicles.

3.1.3 Context

To develop a comprehensive solution towards freight management, the interplay between on- and off-street loading infrastructure in the NYC context needs to be studied further. Square footage requirements for off-street loading berths provide some basic thresholds intended to relieve traffic congestion. However, the present requirements do not ask either building developers or managers to fully consider the day-to-day impacts of the trucks that will be arriving at their buildings and whether or not they will actually be capable of handling their freight.

In contrast, the San Francisco County Transportation Impact Analysis Guidelines (2002), while more aligned with NYC's CEQR Manual as a document, provides a precedent for how to think about freight considerations as part of new development.

> Off-street truck loading requirements should be specified according to the Planning Code. The analysis should include a description of the frequency of the service deliveries and the estimated mix in the types of vehicles that will be utilized in the freight loading activities for the project. If it is expected that the project will attract a high level of courier and other service deliveries, the report should discuss how these will be accommodated. The analysis of the project should compare the amount of loading space provided by the project (supply) with truck loading demand generated by the project and with the off-street freight loading requirements in the Planning Code.[57]

The SFCTA guidelines provide an example of a comprehensive solution that considers the possible impacts of freight on streets and even require developers to conduct an occupancy and turnover analysis in cases where they will be relying on curbside loading zones. It should be noted that the NYC zoning code has made special provisions and drafted incentives for businesses and buildings that are physically constrained, and may serve as a base for more comprehensive solutions.

3.1.3.1 Curbside Delivery Planning

One of the interesting details embedded in the present zoning text is a waiver clause within the Special Downtown Manhattan District that provides a curbside delivery plan in cases where the loading dock requirements cannot be met due to operational requirements for freight vehicles.

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[57] http://www.sf-planning.org/Modules/ShowDocument.aspx?documentid=6753. San Francisco County Transportation Impact Analysis Guidelines, 15-16.

Figure 14. Century 21 department store

Source: WXY Studio

In 2011, Century 21 submitted a request for a zoning amendment[58] to the Department of City Planning stating that the requirement for five loading bays on 25 feet wide Dey Street, as part of a planned expansion of the department store, could not be met due to the operational constraints of the street and the mismatch between the street width, existing loading berth dimensions, and truck sizes servicing the department store. Additionally, the store noted that the provision of freight elevators was actually a more critical component of the delivery process, well beyond the necessity of a single loading berth.

Following the zoning amendment request, a waiver clause was drafted that could serve as precedent for a more comprehensive regulatory approach to loading. As an alternative to cumbersome loading dock requirements, these include the adoption of a curbside delivery plan based on a traffic study acceptable to NYC DOT, as well as a requirement for a freight elevator and storage/staging space for loading and deliveries. Current zoning largely overlooks the importance of these ancillary facilities, even though they play a critical role in decreasing the total dwell time of delivery vehicles. The detailed waiver clause can be found in Appendix 4.

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58 Zoning Amendment N 110307 ZRM. City Planning Commission. August 10, 2011. http://archive.citylaw.org/cpc/2011/08.16.11/N-110307-ZRM.pdf, Page 1.

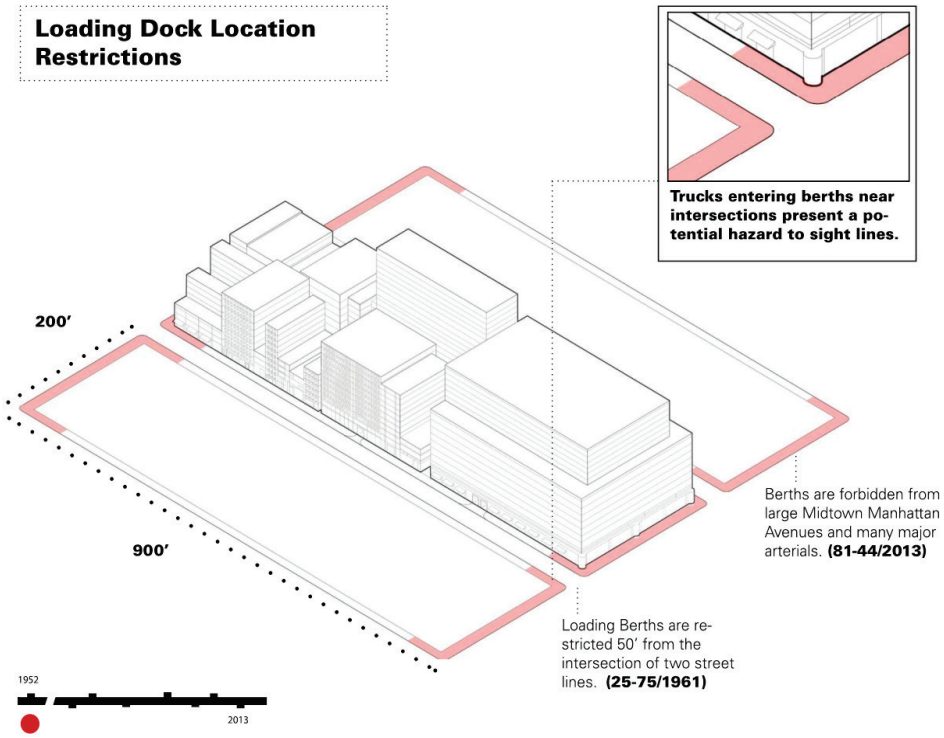
3.1.3.2 Street Type and Width

Another specific instance in the zoning code deals with is the width and type of streets that freight vehicles can move on. In the Midtown Special District, curb cuts and loading berths are restricted on the avenues, or so-called "wide streets" (81-84). Curbside space is often dedicated to other uses, such as peak-hour bus-only lanes.

Further, regulations also specify that "no entrance or exit to an accessory off-street loading berth shall be located on a street with a roadbed width less than 20 feet, as measured curb to curb" (13-34). The 20-foot minimum roadbed width means that, unless parking is absent on the street, larger trucks will struggle to find sufficient space to make a complete turn into the loading bay.

Figure 15. Loading dock location restriction as delineated in the zoning

Source: WXY Studio



In addition to these street width requirements, the zoning code also requires that no loading berths "be located less than 50 feet from the intersection of any two street lines" (25-75), unless otherwise approved by the Commissioner of Buildings and determined not to be hazardous to traffic safety. This regulation is primarily intended to preserve sightlines in the interest of traffic safety for turning and oncoming vehicles and to ensure that freight vehicles backing into a berth do not prevent the free flow of traffic near an intersection. The regulations make further provisions for the size, placement, and width of curb cuts. In the Midtown Special District, for instance, curb cuts exceeding 15 feet are prohibited on one-way streets (25 feet on two-way streets) (81-624).

The current zoning requirements suggest that loading is only to occur on local streets approved for freight traffic. As an avenue for potential code enhancement, the existing zoning code can incorporate the NYSDOT's road classification that delineates roads and street types based on the character of service they provide and the intended flow of traffic as it relates to the larger transportation network of the city and region. Such an approach can perhaps help integrate freight policy and traffic flow at a broader scale or at least point towards a comprehensive solution.

3.1.3.3 Freight Elevators and Staging Areas

While the bulk of the zoning text related to freight centers around loading berth requirements, for buildings adjacent to the High Line, the city created a High Line Improvement Bonus (98-25) that provides an "exclusive easement" for High Line support space in the cellar level of adjacent building, including a dedicated freight elevator with access to a shared loading facility. The presence of this text, which is intended to provide a utility to both building owners and the city, recognizes the importance of the freight elevator and staging areas in the delivery process and sets a strong precedent for the incorporation of language of this type in future zoning changes. It also provides a strong precedent for a developer receiving a bonus for adding space for loading and logistics.

This bonus, while clearly intended for the High Line's unique site conditions, could arguably provide a precedent for bonuses being given to developers who create space or storage for communal loading or consolidation facilities in certain key areas. This brings to light the importance strategic design elements that, from an urban design perspective, are complementary to the loading and unloading process.

3.1.3.4 Head-in/Head-out Truck Movements

As with the High Line Improvement Bonus and Century 21 Curbside Delivery Planning model, the current zoning code provides a curb cut prohibition for the Special Downtown District except where "there are no alternative means of access," or where the department approves a berth "adjacent to a fully enclosed maneuvering area…at least equal in size to the loading berth…and [where] there is adequate size to permit head-in and head-out movements" (91-52). Zoning text provides clear knowledge of, and a precedent for, embedding certain operational enhancements for freight in certain contexts. By providing a more comprehensive set of regulations that apply this toolkit of strategies to specific uses and districts, the code could more effectively combat how freight moves in and through the city.

3.1.3.5 Screening and Urban Design Requirements

NYC's current zoning regulations for loading berths have strict requirements related to the screening and visibility of on-street loading docks, especially in cases where they stand adjacent to or within the vicinity of residential districts.

For residential districts, the zoning text reads:

> In all districts, as indicated, all permitted or required open off-street loading berths shall be screened from all adjoining zoning lots, including such zoning lots situated across a street by either:
>
> (a) a strip at least four feet wide, densely planted with shrubs or trees that are at least four feet high at the time of planting and that are of a type which may be expected to form a year-round dense screen at least six feet high within three years; or
>
> (b) a wall or barrier or uniformly painted fence or fire resistant material, at least six feet but not more than eight feet above finished grade. Such wall, barrier or fence may be opaque or perforated, provided that not more than 50 percent of the face is open. (25-77)

While these screening requirements acknowledge the potential for contextual disharmony associated with conventional loading docks and the desirability of locating this "incompatible use" away from residential districts, there could be a more comprehensive approach to integrating loading docks into the streetscape. The screening requirements set an interesting precedent for defining the loading berth within the street and building façade, as both an integral and useful part of the built landscape.

3.1.4 Data

NYC's current zoning regulations for freight rely on data that is not up to date. Since the original approval of the zoning resolution, NYC DOT and City Planning have not yet undertaken a comprehensive survey of existing buildings' freight generation with the explicit purpose of reevaluating the original zoning code requirements. Though significant research on land use and freight trip generation has been conducted within that time period,[59] most studies largely rely on theoretical statistical modeling as opposed to comprehensive truck trip survey data.

One small, yet significant, study of off-street loading facilities was conducted by Anne G. Morris in 2004.[60] Morris' study conducted time and motion deliveries for 82 buildings, mostly constructed between 1950 and 1985 in the city's Central Business District. Morris' data is unique in that it looks specifically at whether or not an individual truck was utilizing a loading dock while making a delivery. The results, however, vary widely and it is difficult to conclude anything specific from it.[61] For more information, please look at Appendix 5 for a brief summary of Morris's 2004 study results.

Outside of these isolated studies and surveys, freight trip generation surveys are not conducted on a regular basis or required as part of ongoing development review processes.

3.2 Zoning and Land Use Case Studies

A 2004 study found that NYC, incidentally, has lower loading berth requirement per million square foot when compared to its peer cities. [62] Many European cities use even lower thresholds than NYC, of around

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59 See Freight Trip Generation and Land Use http://onlinepubs.trb.org/onlinepubs/ncfrp/ncfrp_rpt_019.pdf

60 Morris, Anne G. "The impact of inadequate off-loading facilities in commercial office buildings. Upon freight efficiency and security in urban areas." 2004.

61 Morris, Anne G. "The impact of inadequate off-loading facilities in commercial office buildings. Upon freight efficiency and security in urban areas." 2004. 91.

62 Morris' 2004 research compared the number of loading berths required per square feet to other cities around the U.S., finding that New York City has lower requirements than many of its peer cities. Her research also unveiled the lack of any specific requirements by the Department of City Planning or the Department of Buildings for freight elevators, which "are an integral component in supporting efficient goods movement within COBs." Few cities require a specific number of freight elevators in their zoning and building codes, though New York City requires one elevator for commercial buildings more than four stories.

Morris, Anne G. "The impact of inadequate off-loading facilities in commercial office buildings. Upon freight efficiency and security in urban areas." (2004), 90.

400-1,000 square meters, though enforcement is poor.[63] Described below are the special highlights from the zoning text of select European and American cities, as it pertains to the off-street freight regulations:

- **Paris:** The Paris Local Land Use Plan of 2006 requires that major freight generators such as supermarkets, warehouses, hotels and large offices, "integrate delivery areas within their premises proportional to the freight volume they generate."[64]
- **Barcelona:** Barcelona's 1999 Ordenança Municipal de Previsió d'espais per a càrrega i descàrrega als edificis (municipal ordinance for off-street loading/unloading spaces), like New York, has precise loading bay requirements based on floor area. The Barcelona code, however, also has a specific provision for "shared delivery bays" in adjacent buildings and an innovative requirement that new bars and restaurants have minimum storage areas of five square meters to reduce the number of daily deliveries, measures that have proven effective in reducing overall freight demand, according to local officials.[65]
- **Washington D.C.:** Washington D.C.'s zoning code provides perhaps the most relevant and applicable example for NYC's, even though the Washington D.C. is less dense than NYC. D.C.'s code requires that "any building permit application for new construction or addition to an existing building…be accompanied by a detailed loading plan demonstrating full compliance" with zoning regulations.[66] These regulations are owned jointly by the Planning Agency and the District Department of Transportation, which is responsible for reviewing and amending the detailed loading plan prior to its approval. The D.C. code, in contrast to NYC's zoning, requires loading docks for residential buildings of a certain size. In terms of depth, while the code sets a minimum of 30 feet (less than the current New York code), the building is required to have a platform of at least 100 square feet and eight feet in width (905.4) for loading berths of less than 55 feet. The code makes specific reference to the need for maneuvering space, access aisles, and driveways.

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63 Giuliano, Genevieve. Synthesis of freight research in urban transportation planning. Vol. 23. Transportation Research Board, 2013. 30-31.

64 The Paris code requires "accommodation of adequate zones required to ensure common loading or unloading tasks" (article UG12-2 of the Paris Local Land Use Plan, version of October 4, 2012).

65 Giuliano, G., O'Brian, T., Dablanc, L. Holliday, K. Synthesis of freight research in urban transportation planning. Vol. 23. Transportation Research Board, 2013. http://onlinepubs.trb.org/onlinepubs/ncfrp/ncfrp_rpt_023.pdf, Page 31.

66 DC Office of Zoning. Subtitle C, General Zoning Rules. http://dcoz.dc.gov/zrr/Subtitles/Subtitle%20c%20-%20proposed.pdf, C-66.

- **Seattle:** Other cities provide instructive examples for potential ways to improve NYC's current approach to off-street loading. Seattle, for instance, segments uses into three categories: high, medium, and low demand, and has a different set of thresholds and requirements for loading berths depending on the demand category.[67] Width requirements are segmented according to demand and the largest weekly delivery provider. Maneuvering space is explicitly required for loading berth access on principal or minor arterial streets.
- **London:** Transport for London (TfL) provides several precedents worth looking at for management of off-street deliveries. TfL manages a program of Delivery Servicing Plans (DSPs) for new businesses, relocations, and construction.[68] The DSPs differ from U.S. requirements in that they specifically target businesses as opposed to buildings. More instructive, however, is that the city itself has a coordinated Freight Plan[69] and strategy that dovetails with its larger goals and objectives, due in part to a larger staff capacity and attention to issues of freight.
- **Los Angeles:** In Los Angeles, regulation has been very comprehensive and resulted in shipping companies filing lawsuits. In 2012, the Supreme Court of the United States took on the case *American Truck Associates, Inc. v. City of Los Angeles, California, et al.* In 2007, in response to community concern over the impact of port freight transportation on traffic, the environment, and safety at marine ports, the city implemented a Clean Truck Program. Drayage companies are required to affix a placard on each truck with a phone number for reporting concerns as well as submit a plan listing off-street parking locations for each truck when not in service (other requirements relate to a drayage company's financial capacity, its maintenance of trucks, and its employment of drivers). The Supreme Court decision held that the Port of Los Angeles (a division of the City of LA) is allowed to implement this "tariff."[70] Loading spaces are dependent on whether a lot is zoned residential, commercial, or manufacturing with a few exceptions in each category. Loading spaces are required based on type of zoning class: for residential, zones designated RAS3, R4, RAS4, and R5 zones; for commercial, hospitals, hotels, institutions, and every building were the lots abuts an alley; and for manufacturing, institutions, and every building where the lot abuts an alley. In general, minimum loading space is 400 sq. feet, with additional space requirements for buildings greater than 50,000 sq. feet. Specific dimensions and number of spaces vary and can be found in L.A. Summary of Zoning Regulations.[71]

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67 Seattle, Washington. Municipal Code. https://www.municode.com/library/wa/seattle/codes/municipal_code?searchRequest=%7B%22searchText%22:%22SMC%2022.206.200%22,%22pageNum%22:1,%22resultsPerPage%22:25,%22booleanSearch%22:false,%22stemming%22:true,%22fuzzy%22:false,%22synonym%22:false,%22contentTypes%22:%5B%22CODES%22%5D,%22productIds%22:%5B%5D%7D&nodeId=TIT23LAUSCO_SUBTITLE_IIILAUSRE_DIV2AUUSDEST_CH23.54QUDESTACOREPASOWAST_23.54.035LOBERESPST

68 A Pilot Delivery Servicing Plan for TfL's Palestra Offices in Southwark: A Case Study. Transport for London. September 21, 2009. https://tfl.gov.uk/cdn/static/cms/documents/dsp-palestra-case-study.pdf

69 London Freight Plan. https://tfl.gov.uk/info-for/freight/planning/london-freight-plan

70 American Trucking Associations, Inc. v. City of Los Angeles, California, et al. Supreme Court of the United States. October 2012. http://www.supremecourt.gov/opinions/12pdf/11-798_anbf.pdf

71 Generalized Summary of Zoning Regulations. City of Los Angeles. http://cityplanning.lacity.org/Forms_Procedures/7150.pdf

- **San Francisco**: The schedule of requirements in San Francisco is separated by uses for: a) retail stores, wholesaling, manufacturing, live/work units in newly constructed areas and all other uses primarily engaged in the handling of goods; and b) offices, hotels, apartments, and all other live/work units not included in the first group. The first group requires no parking spaces for structures less than 10,000 square feet, one spot for spaces 10,001-60,000, two spaces for 60,001-100,000, and three, plus one for each additional 80,000 square feet, for buildings over 100,000 square feet.
  The second group requires no off-street parking spaces for buildings under 100,000 sq. feet, one space for buildings 100,001-200,000 square feet, two spaces for 200,001-500,000 square feet, and three, plus one for each additional 400,000 square feet, for buildings over 500,000 square feet. There are certain exceptions in areas with limited space (notably those zoned C-3).[72] Required off-street loading spaces must have a minimum length of 35 feet, minimum width of 12 feet, minimum vertical clearance including entry, and exit of 14 feet. These measurements are exclusive of platforms, driveways, and maneuvering areas except that the minimum vertical clearance must be maintained to accommodate variable truck height due to driveway grade.[73] Because of limited space in areas zoned C-3 or South of Market District, off-street parking may be located in a parking garage for the structure or other location separate from freight loading spaces.[74]
- **Chicago:** Like many other cities, Chicago also separates off-street loading space requirements by use. Uses are categorized into multi-unit residential, lodging, group living, and all uses in public and public and civic use group, industrial, retail, entertainment and spectator sports, commercial (uses in commercial use for which loading standards is not otherwise specified in this schedule), and funeral services. Specific requirements can be found on chicagocode.org, section 17.10.11.[75] In general, requirements for spaces start at one for buildings over 25,000 square feet with spots 10 x 25 feet in size, and 10 x 50 feet for buildings over 50,000 square feet. These thresholds are very high compared to other U.S. cities, and especially high when compared to European requirements.

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72 Off-Street Parking and Loading: Section 152. City of San Francisco Planning Code. http://planning.sanfranciscocode.org/1.5/152/

73 Off-Street Parking and Loading: Section 154. City of San Francisco Planning Code. http://planning.sanfranciscocode.org/1.5/154/

74 Off-Street Parking and Loading: Section 155. City of San Francisco Planning Code. http://planning.sanfranciscocode.org/1.5/155/

75 Parking and Loading: Off Street Loading. Chicago Zoning Ordinance. http://chicagocode.org/17-10-1100/

- **Toronto:** Uses in Toronto are separated into buildings containing dwelling units; retail stores, eating establishments or personal service shops; grocery stores/supermarket; offices; hotels; manufacturing or warehouse uses; and other "selected" uses. In building with dwelling units, spaces are required after a threshold of 30 dwelling units. In most other uses, spaces are required at a threshold of 500 square meters (with some exceptions including a manufacturing threshold at 100 sq. meters). These thresholds are lower than most U.S. thresholds (including NYC's). Dimensions of specific spaces are separated into four types that the above uses each fall into and range from six to 17 meters in length, 3.5 to four meters in width, and three to 6.1 meters in vertical clearance. Specific requirements can be find in Chapter 220 of Toronto Zoning By-Law.[76]
- **Vancouver:** Loading space regulations are separated by building classifications and are different for each: dwelling use, hotel, community care facility, office use, artist studio, mini-storage warehouse, and live-work uses, among many others. Thresholds for off-street freight requirements start as low as 100 square meters for community, institutional, and recreational type uses. For dwelling units, requirement thresholds start at 100 dwelling units. Specifics can be found in Section 5 of Vancouver's Parking Bylaw 6059.[77] Space dimensions are not specified, but must be able to accommodate vehicles for each class listed (not including any driving or maneuvering aisles or means of emergency egress): A (automobiles, vans, or other smaller vehicles greater than 5.5 meters but less than 8.5 m), B (single-unit trucks and other medium sized vehicles of overall length greater than 8.5 m but less than 17 m), and C (semi-trailers or other vehicles of overall length equal to or greater than 17 m used for delivery activities).[78]

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76 Chapter 220: Loading Space Regulations. City of Toronto Zoning By-Law. http://www.toronto.ca/zoning/bylaw_amendments/ZBL_NewProvision_Chapter220.htm

77 Section 5: Off-Street Loading Space Regulations. City of Vancouver By-Laws. http://former.vancouver.ca/commsvcs/BYLAWS/parking/sec05.pdf

78 Section 2: Parking. City of Vancouver By-Laws. http://former.vancouver.ca/commsvcs/BYLAWS/parking/sec02.pdf

4 Investigation

4.1 Introduction

Following a comprehensive review of the zoning code, an investigation was undertaken into three distinct areas of NYC:[79]

- Central Business District: Midtown/Penn Station Area.
- High Density Residential: Upper East Side.
- Neighborhood Commercial/Mixed Use Areas: 125th Corridor, Harlem.

The analysis explored in this section provides a window into a potential process for reassessing the loading needs by integrating o-n and off-street capacity.

4.2 Methodology

Rather than a solution, the investigation provides a method that looks at three decreasing scales to assess their freight managing capacity – beginning with a broader district level study followed by analysis of select blocks that are characteristic of the entire district, and finally looking at buildings that generate large freight trips as special use cases within the urban fabric.[80] Given the complexity surrounding freight management, freight assessment at different scales might help make a better strategic decision about where to intervene with what land use or transportation tool. It should be noted that analysis was performed where a reliable source of data was available.

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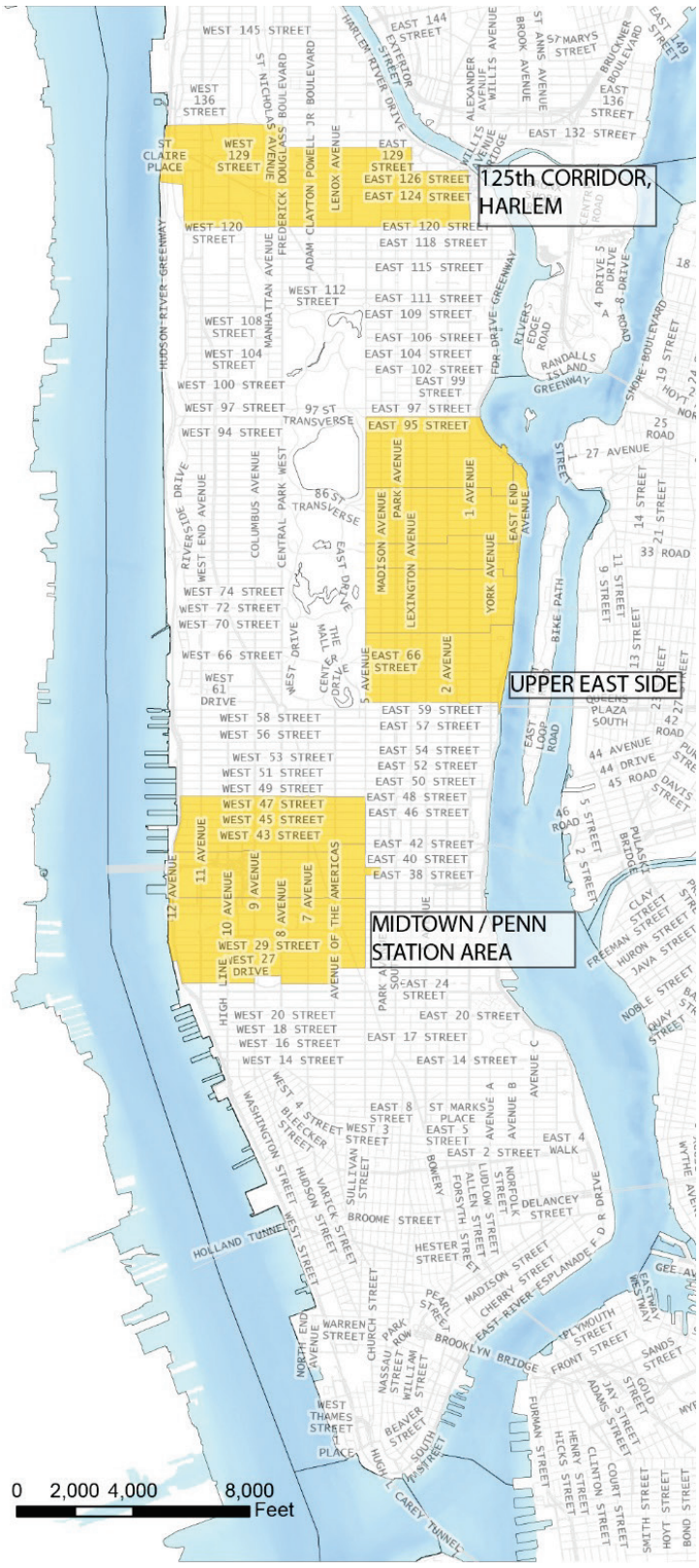
79 These study areas were selected in concert with the Department of City Planning and Department of Transportation due to certain generalizable characteristics considered representative of New York City (or at least Manhattan) more broadly.

80 For the purpose of this study and due to limited data availability, building level analysis was done only for the Midtown case study.

Figure 16. Select case studies

Source: WXY Studio



Three broad questions direct this analysis:

1. Loading berth required under current zoning.
2. Loading berth need based on freight trip generation model at building level.[81]
3. The total on and off street capacity to manage the incoming freight.

While loading berth required under current zoning can be easily derived from an existing conditions analysis, custom formulas had to be developed to calculate the total loading capacity – i.e., look at loading berths needed and the total on and off street capacity. The formulas, while not absolute, are a first step towards a comprehensive freight management modeling.

Table 4. Case Study Parameters

	Midtown / Penn Station Area	125 Corridor Harlem	Upper East Side
District Level	✓	✓	✓
Cluster Level	✓	✓	N/A
Large Freight Generators	✓	N/A	N/A
On-site investigation	✓	N/A	N/A

4.2.1 District Level Analysis: Assessing Broader Context

At the district level, the study areas were analyzed using the following parameters to better understand the context and to identify areas for block and building level analysis:

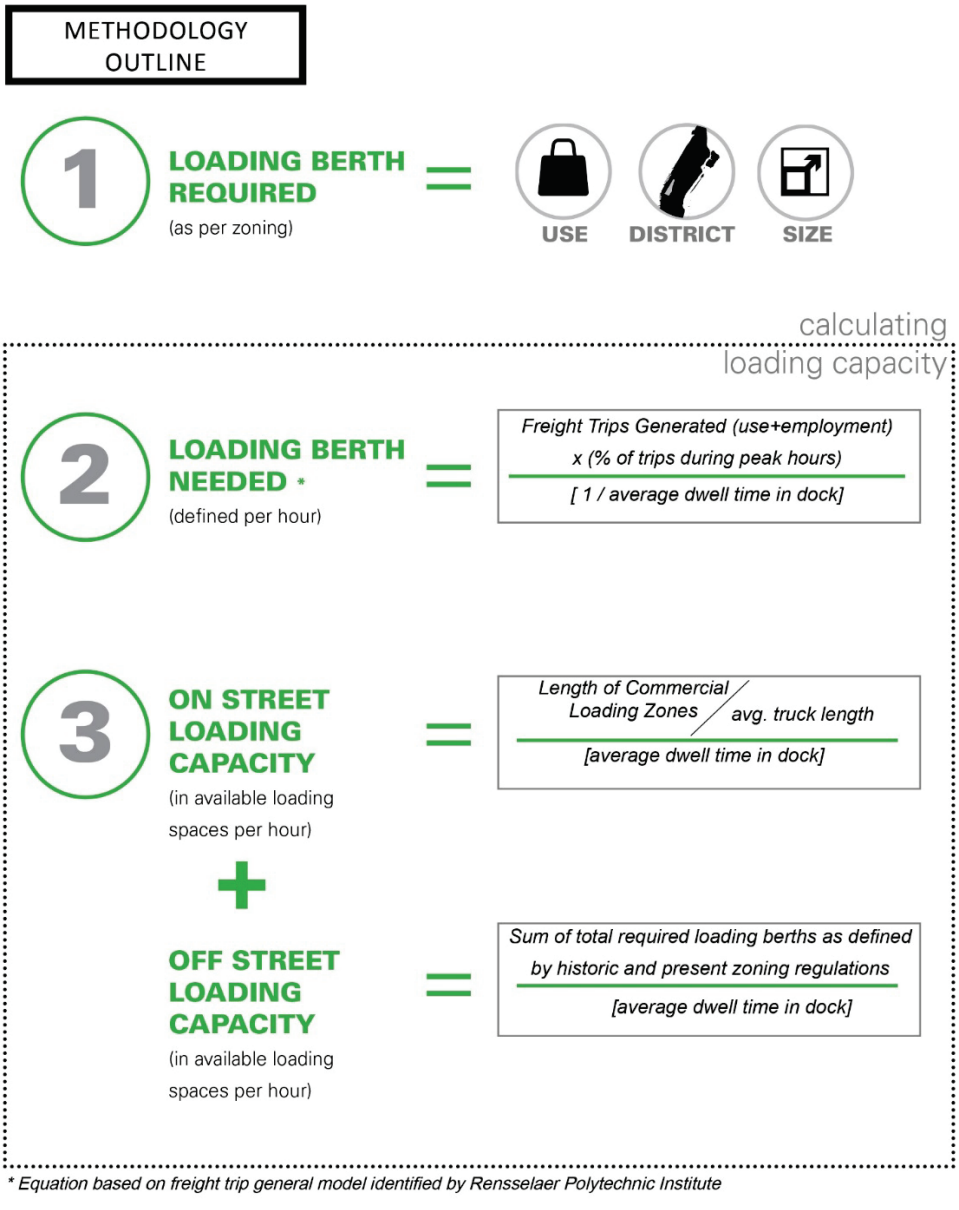
- Age: Buildings constructed, enlarged, or remodeled before 1952 were culled into separate categories to indicate the overall age of the study area as it relates to the loading berth regulations at the time of construction.
- Area: Buildings within the study area were further assessed by breaking down their various use categories as residential, retail and office space – the major trip generators. Since there is no provision for loading berth requirements for residential uses under the current zoning, the study only accounts for the office and retail square feet.
- Off Street Loading: Lastly, the total loading berth requirements, as outlined under the current zoning code, were identified within the study area.

[81] The research builds on the freight trip generation model identified by Renssealaer Polytechnic Institute. Businesses were identified using Reference USA dataset, which while has its limitation, was the only publically available source at the time of this research.

4.2.2 Cluster Level Analysis

Once the broader freight movement was understood at the district level, a more micro level analysis at the cluster level was carried out to assess its capacity. For the purpose of this analysis, select blocks in the midtown/penn station area and 125 corridor were chosen as a case. This model can be applied to other streets, or at least streets that are congestion 'pinch points' where on- and off-street capacity assessment would prove beneficial.

Figure 17. Cluster Analysis Methodology Description



** Equation based on freight trip general model identified by Rensselaer Polytechnic Institute*

Avg dwell time = 40 mins (based on on-site investigation of midtown Manhattan)

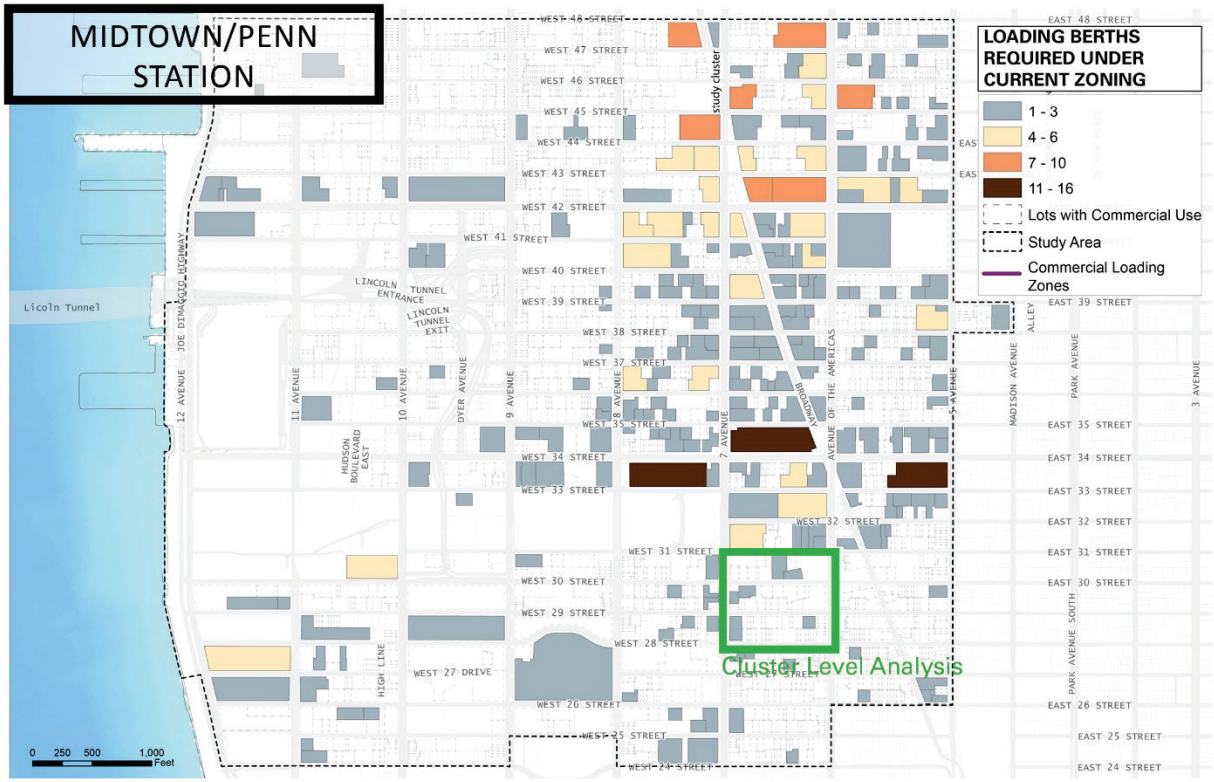
Avg truck length = 45 ft.

4.2.3 Large Freight Generators

Large traffic generators are specific facilities housing businesses that individually or collectively attract a large number of daily trips.[82] While LTGs are not typical of every block within the city, they can generate substantive freight, which in turn can impact off-street loading capacity of its constituent block. For the purpose of this study, a sample LTG from Midtown study area has been used to assess the broader impact of LTGs. The current analysis builds upon the methodology used by Jaller et al., in their 2015 paper "Large urban traffic generators: Opportunities for city logistics initiatives"[83] and uses the total freight trip generated to determine a theoretical loading berth need for a particular LTG.

Figure 18. Midtown/Penn Station district level analysis

Source: WXY Studio



82 Jose Holguin-Veras. "Large Urban Freight Traffic Generators: Opportunities for city logistics initiatives" 2015, 2. http://trid.trb.org/view.aspx?id=1356197

83 Ibid

4.3 Findings

4.3.1 District Level

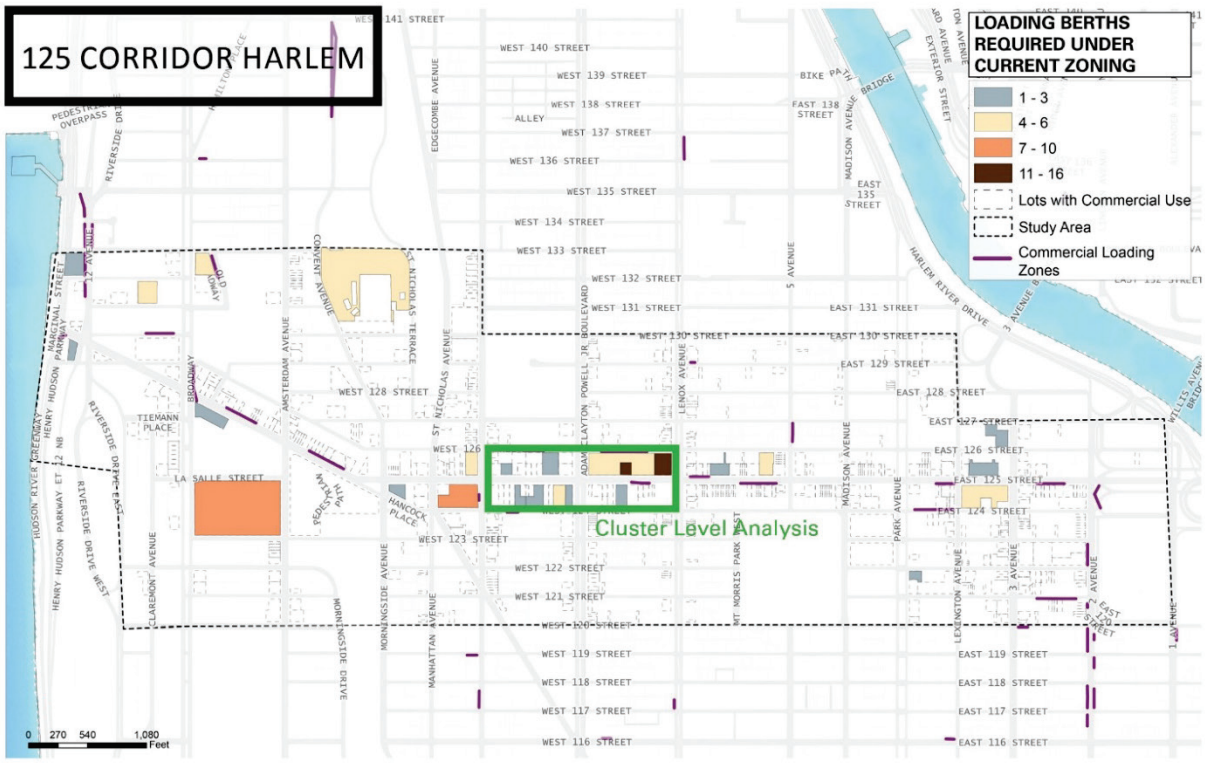
An analysis of buildings in the study area shows that approximately 15 percent of the buildings were built since zoning regulations were established. This low percentage indicates that the ability of new zoning regulation to solve city's freight capacity issues in the short-term is limited.

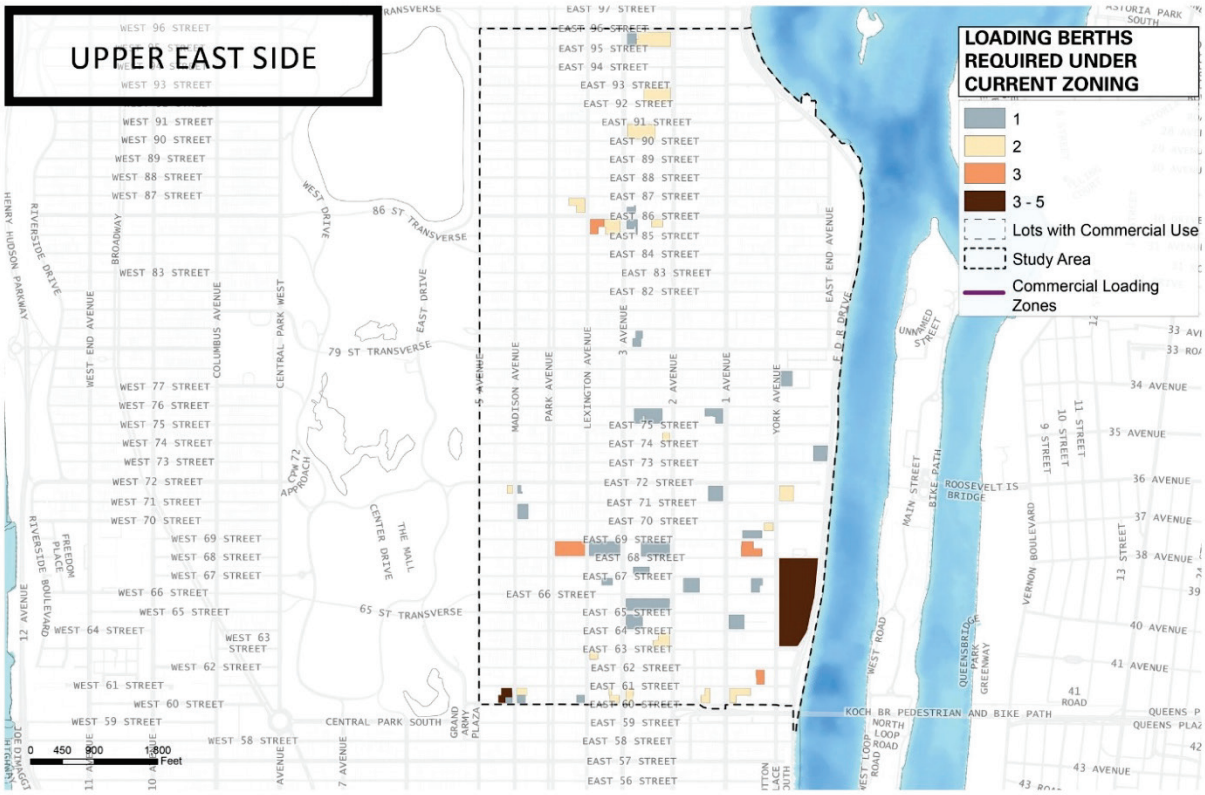
Additionally, smaller commercial areas still generate freight and when aggregated, can have substantial impact at the block level. Any future amendments or revisions to the zoning text will have to factor this in.

Below are district level maps. Please refer to Appendix 6 for detailed maps.

Figure 19. 125 Harlem and Upper East Side district level analysis

Source: WXY Studio





4.3.2 At Cluster Level

As previously mentioned, due to limitation on data availability, cluster level analysis was not performed on Upper East Side case study. Also, it should be noted that most of the Upper East Side properties are residential and are not required to have loading berth under the current zoning provisions. With rapid changes to consumer behavior, especially with increasing models of delivery shopping, residential properties do end up attracting a lot of freight, which eventually puts pressure on the sidewalks and roads. This brings us to an important premise of this study – current zoning code for loading berth determination does not fully account for all the use types.

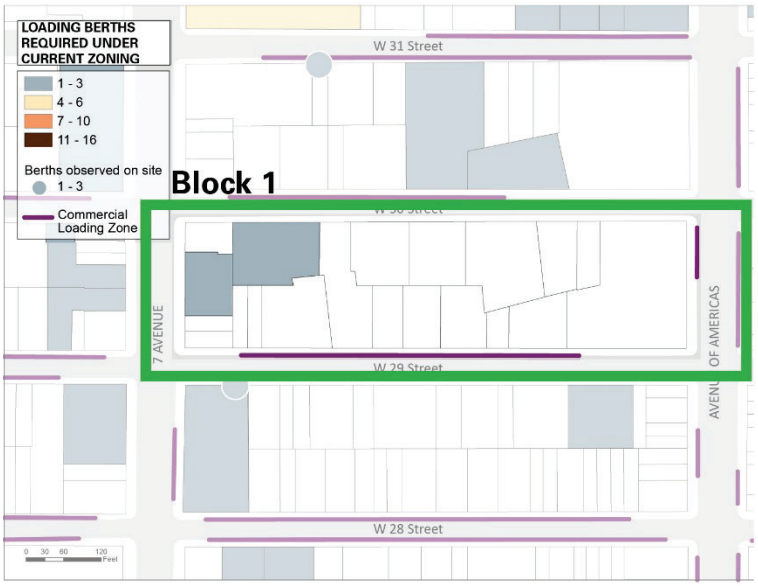
Cluster level analysis points to certain high-stress blocks (e.g., block 2 in midtown/penn station area) that may warrant additional on and off-street provisions. For low-stress blocks (e.g., block 3 in midtown/penn station area), an integrated approach towards on- and off-street can potentially help absorb additional freight demand.

Lastly, this analysis assumes that on-street parking is always available, which is not always the case. As a result, enforcement of on-street regulation becomes an important aspect of any integrated freight management strategy.

The following maps are based on the methodology and formula described earlier in this section.

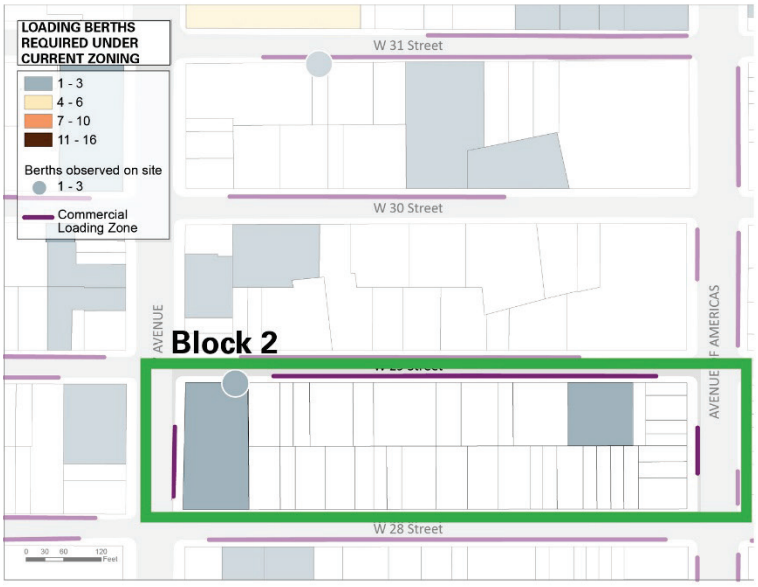
Figure 20. Midtown/Penn Station Cluster-Level Findings

MIDTOWN/PENN STATION



Block 1 requires 34 loading berths per hour to service the incoming freight, but there are only 24 on and off-street spots available*

On + Off Street Capacity		Loading Berth Needed		
24	-	34	=	-10



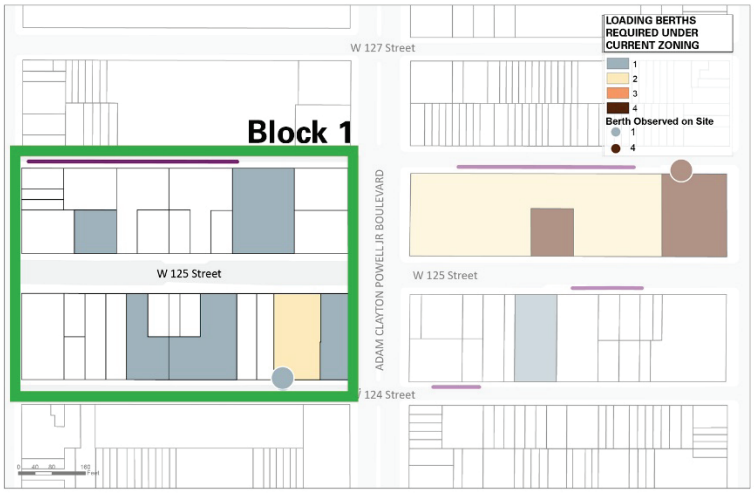
Block 2 requires 41 loading berths per hour to service the incoming freight, and has 46 on and off-street spots available

On + Off Street Capacity		Loading Berth Needed		
46	-	41	=	+5

* On street spots = Commercial & hotel loading zones (assuming all spots are available)
Off street spots = Loading berths prescribed under current zoning (assuming zoning regulations are properly enforced)

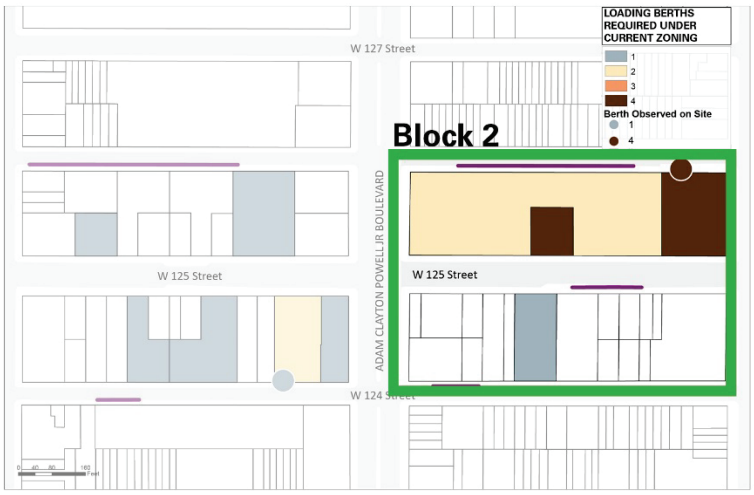
Figure 21. 125 Corridor Harlem Cluster-Level Findings

125 CORRIDOR HARLEM



Block 1 requires 16 loading berths per hour to service the incoming freight, but there are only 14 on and off-street spots available*

On + Off Street Capacity		Loading Berth Needed		
14	-	16	=	-2



Block 2 requires 18 loading berths per hour to service the incoming freight, but there are only 17 on and off-street spots available*

On + Off Street Capacity		Loading Berth Needed		
17	-	18	=	-1

* On street spots = Commercial & hotel loading zones (assuming all spots are available)
Off street spots = Loading berths prescribed under current zoning (assuming zoning regulations are properly enforced)

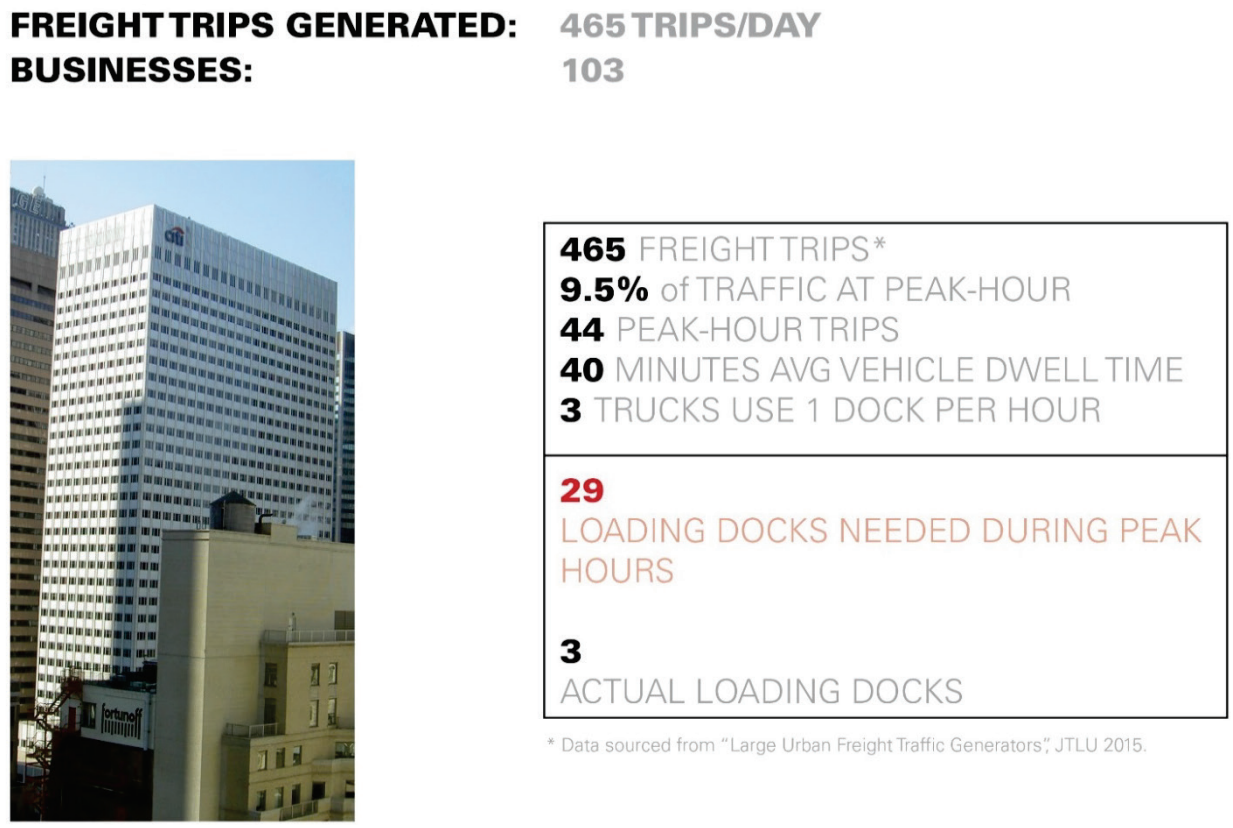
4.3.3 Large Freight Generator (LTG) level

Within the midtown region, the impacts of freight generation were assessed for 666 Fifth Avenue, a commercial building located in the heart of special midtown district. LTGs have their own zip code, allowing researchers to obtain access to important data for projecting freight activity.

Research estimates that the building, with its 1,250 gross square feet area, generates about 465 freight trips per day.[84] Using the 'loading berth needed' formula established under section 4.2, it is clear that there is a considerable difference between loading berth needed and those provided under the current zoning.

Figure 22. Loading berths needed for 666 Fifth Ave

Source: WXY Studio



84 Jose Holguin-Veras. "Large Urban Freight Traffic Generators: Opportunities for city logistics initiatives" 2015, 60. http://trid.trb.org/view.aspx?id=1356197

Given the limited data, documenting actual berths available on-site (or at least on sites that generate substantial freight trips) and any spillover effect on the on-street loading zones can be a significant area for further research. Additionally, identifying businesses within the LTG that generate the most freight trips can be helpful in outlining any immediate strategies.

4.3.4 On-site Investigation: Midtown / Penn Station

While it was outside of the scope of this study to undertake a full-scale district off-street and on-street loading analysis, a brief on-site investigation was undertaken to check the predictions of the model and further draw some general conclusions. Two blocks in the heart of NYC Midtown/Penn Plaza area, 29th and 31st streets between the Avenue of the Americas and Seventh Avenue, were selected and analyzed at peak-hour (10:30 a.m. -11:30 a.m.) on a Friday morning in July 2015. This area was chosen for several reasons. First, the area has a significant mixture of land use types, including small retail businesses, light manufacturing, office space, and hotels. Second, the area has recently experienced significant construction, including a series of new developments of over 30 stories. Third, this area is characterized by traffic conditions that plague many NYC streets, including loading/unloading, sidewalk obstruction, double parking, and other competing street demands.

The analysis looked at the following factors, inclusive of both on- and off-street loading, in increments of 15 minutes over the course of one hour (in order to measure dwell time):

- Truck size.
- Cargo type.
- Dwell time.
- Delivery range estimation.
- Curbside regulations.
- Double parking.
- Enforcement presence.
- Off-street loading infrastructure.
    - Freight elevators/Freight entrances.
    - Loading berths.

The on-site investigation led to the following observations:

- **Vehicles:** Passenger vehicles, commercial vans and small trucks were the most frequent users of the observed streets. Commercial vans accounted for 27 percent of all vehicles observed, while box trucks accounted for 12 percent of the vehicles observed. Conventional vehicles of various types comprised roughly half of all parked vehicles, in spite of the loading regulations for peak-hour deliveries.
- **Dwell Time:** The average dwell time was between 24 and 39 minutes long for all vehicles parked on these blocks.
- **Cargo:** Cargo type was highly variable, ranging from service calls to delivery vehicles, parcel trucks, police vehicles, and taxi/livery staging.
- **Enforcement:** Commercial loading regulations were not consistently followed. Police vehicles and taxis as well as some personal cars, regularly used commercial loading areas, both on the side streets and the avenues.
- **Double parking on the avenues:** Avenues experienced severe double parking, in spite of commercial loading regulations along the curbside. This double parking was a product of both competing uses as well as overwhelming overall demand. Trucks loading on the avenues appeared, on average, to be large than those loading and unloading on the side streets.
- **Loading berth utilization:** Off-street loading berths were either closed or not in use for the entire study period. Of those that were partly open validated that loading dock are being used for other secondary uses that preempt the full utilization of loading dock.
- **Parcel delivery:** Parcel delivery trucks spent long amounts of time in spaces, but delivered to multiple buildings throughout the area, making use of an extended delivery range.
- **Sidewalk obstruction:** Sidewalks and curbsides were consistently used as staging areas, obstructing pedestrian flows and limiting the overall curbside space available.

Figure 23. Due to lack of enforcement, vehicles were occasionally found to be parked in loading zones

Source: WXY Studio

Figure 24. Loading dock in midtown being used as dumpster area

Source: WXY Studio

Figure 25. Loading / unloading activities obstructing sidewalk activities

Source: WXY Studio

These observations present several potential avenues for future research:

- **Loading dock utilization:** Loading dock utilization is a critical area of concern. If the city requires a significant off-street loading space for loading berths, then it is imperative that there be further study as to their actual utilization and factors impeding their usage. At the peak period for loading and unloading, loading berths appeared to be unattended and unused, in spite of significant curbside loading and unloading activity, both on the avenues and the side streets.
- **Avenue vs. side street loading:** The relationship between trucks loading on the avenues and those loading on side streets should be further studied, especially in terms of size, type, and point of delivery. Loading regulations and enforcement on major avenues presented clear problems to both through traffic and safety.
- **Delivery range:** Delivery range may represent a more important factor in the loading/unloading process than previously considered. The range of any individual delivery truck, especially parcel deliveries, can point towards the longevity of a truck's stay, as well as internal parcel consolidation process.

5 Options

In the following section, this study attempts to set forth a set of recommendations based on contemporary and future needs of the freight industry, emerging technologies, as well as new logistic strategies.

The following range of options can potentially provide a road map for city agencies and other stakeholders to comprehend the benefits of an integrated freight management, as well as to provide a baseline for their eventual development based on existing precedents and practices in NYC.

Table 5. Recommendation Matrix

	STRATEGY	IMPLEMENTATION TIME	INTERVENTION GEOGRAPHY: STREET / BUILDING	INTERVENTION GEOGRAPHY: BLOCK	INTERVENTION GEOGRAPHY: CITY-WIDE	AGENCY ACTION
1	Expand on existing zoning provisions such as curbside delivery planning amongst others	●	✓	✓		DOT
	Require businesses that generate a large amount of freight to document 24 hour delivery cycle	◑	✓	✓		DOB
	Establish a dynamic CompStat approach to identify congestion 'hot spots'	●			✓	DOT | DOB
	Special Congestion District overlay, similar to *Special Transit Land Use Districts* overlay, that enforce on and/or off-street loading berths around identified 'hot spots'	●		✓	✓	DCP
2	Add trip generation and business size (employment) to off-street zoning regulations	●			✓	DCP
3	Create incentives for consolidation centers	◑		✓	✓	DOT | DCP
	Incentivize off hour delivery and shared loading facilities	◑	✓			DOT | DCP
	Establish a dedicated fund for freight to be paid into by developments that cannot meet off-street loading requirements	◑		✓	✓	DCP | DOB
4	Define screening requirements	●	✓			DCP
	Enforce proper utilization of loading berths	●		✓	✓	DOB
5	Create Automated Vehicle Location (AVL) dataset	◑			✓	DOT
	Monitoring infrastructure such as dedicated cameras along violation hotspots	◑	✓	✓		DOT
	Infrastructure to promote commercial EV fleet	●			✓	DEP | DOT
6	Implement a consistent method for calculating freight generation across various regulatory frameworks such as CEQR and zoning	●			✓	DOT
	Address New York State rebate and federal tax credits to incentivize commercial EV ownership	●			✓	NYSERDA | DEC
	Create a "Green Apple" certification program for companies that conduct best practices for freight delivery	◑			✓	DOT | NYSERDA

● Long Term ◑ Short Term

5.1 Integrated On- and Off-Street Capacity Approach

5.1.1 Expand on Existing Zoning Provisions

Require NYC DOT approval of curbside delivery plans and in-store transport systems for new building permits. Define a standard template for curbside delivery planning.

Figure 26. Century 21 department store

The 2011 zoning appeal of the Century 21 department store and the subsequent zoning amendment resulting from it provides a key precedent for curbside delivery planning within the existing zoning. While this exception was tailored specifically to Lower Manhattan, born out of the mismatch between truck sizes today and the historic narrow streets downtown, the language nevertheless incorporates several significant recommendations for how to assess and analyze freight conditions for a particular building.

This report recommends that the existing zoning language in section 91-53 be adopted as a universal provision for off-street loading.[85] This could be shaped to reflect the intent of both the Washington D.C. loading requirements and the San Francisco County Transportation Authority language discussed previously.

[85] Detailed zoning text of Century 21 Curbside Delivery Plan can be found in Appendix 4

In addition, the text can also be drafted to require new buildings and enlargements to submit detailed delivery and servicing plans, similar to those coordinated by Transport for London,[86] to NYC DOT. These plans, in turn, may be integrated into comprehensive curbside management programs, impact assessments, and in some cases, potential fees or other mitigations. This language could be modeled after or similar to that of Washington D.C.

D.C. Loading Requirements, 2014:

- 900.1 Any building permit application for new construction or addition to an existing building shall be accompanied by a detailed loading plan demonstrating full compliance with this chapter.
- 900.2 The Zoning Administrator may, at his or her discretion, request that DDOT review and make a recommendation regarding any item on the loading plan prior to approving the building permit application.
- 900.3 No certificate of occupancy shall be issued unless the loading facilities have been constructed in accordance with the approved loading plans.

This kind of zoning change would have two significant benefits. First, it would create a strong incentive for developers to actually account for the freight generated by their buildings. Second, it would provide the city with critical leverage to ensure that the real impacts of freight traffic and double parking are mitigated should developers be unable to meet these requirements.

In addition to the curbside delivery plan, the zoning resolution could insert key thresholds for freight generation and/or square footage that require the addition of a freight elevator and staging area. Freight elevators required for buildings of a certain size and type may lessen total dwell times for freight vehicles.[87]

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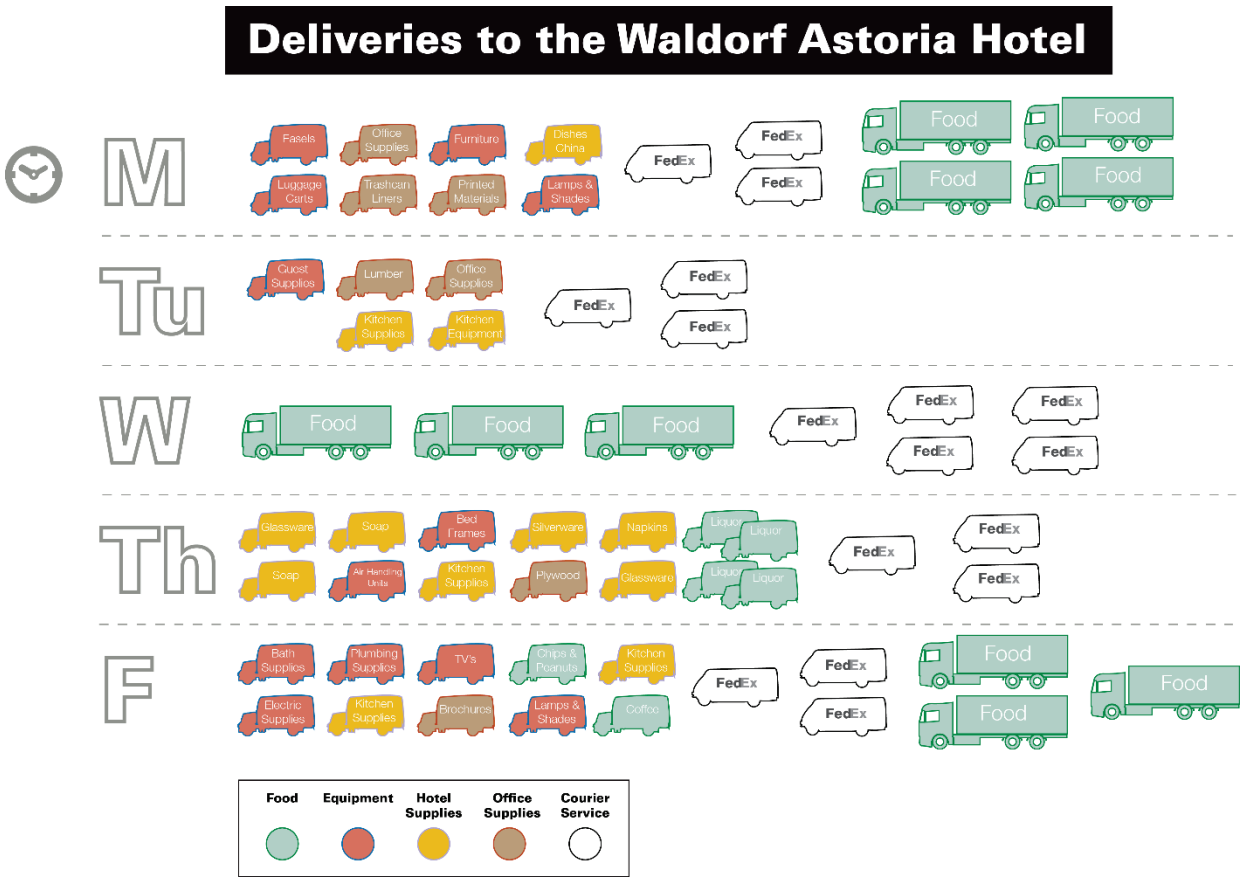
86 https://tfl.gov.uk/info-for/freight/planning/delivery-and-servicing-plans

87 Morris, Anne G. "The impact of inadequate off-loading facilities in commercial office buildings. Upon freight efficiency and security in urban areas." (2004), 91.

Figure 27. Delivery schedule to Waldorf Astoria Hotel provided by DOT

Source: WXY Studio



5.1.2 Data Collection

Conduct surveys that accurately representing existing conditions and challenges

A severe lack of comprehensive or coordinated data hinders the ability to reassess and refine some of the provisions for off-street loading in the current zoning resolution. Whether based on square footage, business size, or another variable, the city should conduct surveys of at least 50 buildings of various types in order to more fully comprehend modern delivery needs, timelines, and constraints. This study can also investigate the actual usage patterns of loading docks, with an eye toward better understanding key parameters that deter its usability.

Data collected should mirror and build upon the historic data and methodology that informed the initial regulations mid-century. This before-after comparison can provide the necessary understanding of the magnitude of changes that have happened since that time justifying the need for modifications or addendums to current regulations.

Figure 28. Dynamic modelling approach using building age and active construction sites as parameters

Source: WXY Studio

5.1.3 Dynamic CompStat Approach and Special Congestion District Overlay

Establish a dynamic CompStat approach to identify congestion 'hot spots' and Special Congestion District overlay to enforce on and off-street loading berths

CompStat is a dynamic approach that uses data and comparative statistics to assess a spike in an event. Currently used to reduce crime and improve quality of life, this method provides an opportunity to use data analysis as a tool for targeted improvements and strategy.

In the case of freight management, such an approach can identify existing and future freight related hot-spots or pinch-points that may cause severe congestion issues. Given this knowledge, the implementation of specific long- or short-term strategies is more realistic. Midtown, for instance, can greatly benefit from such a dynamic modeling approach.

For the purpose of this analysis, the two parameters that were assessed were:

- **Pre-zoning buildings** that will most likely not have any loading berth provisions,
- **Construction sites** that increase the congestion by taking away on-street loading spots. While this may be short-term, it decreases the 'total loading capacity' of a block.

In addition to these, assessing various other parameters is helpful in identifying hot-spots, such as ticketing intensity of commercial vehicles.

Mapping resulting hot-spots as *Special Congestion District Overlay,* similar to *Special Transit Land Use Districts*, which enforce on and/or off-street loading berth around the identified hot-spots. [88]

5.2 Reassess Off-Street Loading Requirements

5.2.1 Consider Trip Generation and Business Size

Add trip generation and business size (employment) to the off-street regulations for loading docks.

Existing thresholds for loading docks are based on total building square footage, usage, and zoning districts. While square footage is positively correlated with increased freight trip generation,[89] research to date suggests that area-based freight projections may not be the most accurate means of assessing loading capacity needs. A 2014 study by Jaller et al., suggests that employment-based models actually outperform area-based models, though the study recognizes that this conclusion only holds true for certain industries.[90]

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88 Special Transit Land Use Districts is mapped at locations on Second Avenue and requires builders of developments adjoining planned subway stations to reserve space in their projects, by providing easement, for public access to the subway or other subway-related issues.

89 Morris, Anne G. "The impact of inadequate off-loading facilities in commercial office buildings. Upon freight efficiency and security in urban areas." (2004), 88.

90 Jaller, Miguel, et al., "Area Based Freight Trip Generation Models." (2013).

Most cities base their requirements on building areas because when new construction does occur, the precise tenant mix may be undefined at the time of development. Nevertheless, as with the current CEQR freight mitigation requirements,[91] zoning regulations could require that new developments of a certain size base their anticipated freight trip generation on a survey of an existing building. These surveys could, in turn, serve as the foundation of a database to inform future standardized models for freight trip generation.

Due to the extreme age of the existing square footage requirements, there is a need to undertake a comprehensive survey of existing buildings to assess the extent to which off-street loading requirements need revision. This survey should assess several areas where data is currently lacking, including loading dock utilization, double parking, turnover, freight elevator presence, time-of-day restrictions, and more. Survey results should strive to emulate the kind of analysis done at the time of the initial zoning resolution, so that the requirements may be reassessed based on current needs and trends.

Though it is generally acknowledged that building owners and their tenants should be held responsible for their freight deliveries, accurate estimations of the actual freight that a building will generate, especially as businesses change over time, is challenging to articulate. These models tend to be based on industrial classifications such as NAICS codes, which are poorly aligned with the use classifications in most city zoning codes. As a result, most regulations, especially for new buildings, rely on square footage estimates for freight generation, many of which are dated and lack comprehensive follow-up analysis.[92]

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91 See CEQR Guidelines 16-6.

92 Existing freight trip generation models draw primarily from ZIP code level data rather than building level surveys, which are rarer and less universally applicable. The classification of carriers and receivers by different land use classes and industry classifications is discussed at length in *NCFRP Report 19: Freight Trip Generation and Land Use* and in *Modelling Freight Transport (51-63)*. Industries and businesses are classified in multiple ways. Econometric researchers use the North American Industry Classification System (NAICS), which can be easily aggregated and analyzed at the zip code level. Standardized land use classifications are reflected in the Land-based Classification System (LBCS), though most municipalities have their own use classes tailored to their specific context, such as the New York City Zoning Resolution. Since there is a lack of standardization among municipalities in this arena, projecting specific freight generation patterns and then applying these projections to land use is difficult and risks speculation.

5.3 Incentivize Alternative Loading Strategies

5.3.1 Create Incentives for Ancillary Facilities

Incentivize facilities such as consolidation centers and shared loading facilities, and programs such as off hour delivery

As discussed briefly in the previous section, the current zoning's High Line Improvement Bonus provides an important precedent for incentives that could spur the development of certain ancillary or independent facilities that support freight management. While the High Line provision was designed to leverage new development around a linear park for the city's basic maintenance and utility needs, its inclusion provides one example of how the city could offer a bonus related to freight needs in the public interest.

A similar provision could be crafted to incentivize the incorporation of consolidation facilities or shared loading docks capable of servicing multiple buildings' freight needs and requirements as part of new construction. For instance, consolidation centers in NYC could be incentivized through zoning and then administered through Business Improvement Districts that already operate on a dues-based model. Private operators, like the start-up Parcel, could come under contract to operate the center with cargo cycle or lightweight electric vehicles providing a primary means of distribution throughout the district.

Zoning for consolidation could be tailored specifically to apply to certain areas close to highway or arterial outlets that could reduce the overall vehicle miles traveled for large trucks on secondary truck routes and local access routes in the city. In turn, developers that provide these consolidated loading facilities could receive a Floor Area Ratio (FAR) exemption or an improvement bonus in exchange.

Such a consolidation model, once realized, could incentivize the growth of small businesses by giving them an opportunity to benefit from consolidated deliveries through an incentives-based policy similar to that carried out under the off-hour deliveries program. While participation in these off-street consolidation centers would not be compulsory, facilities might allow additional flexibility for retail establishments, allowing them to receive consolidated or off-hours deliveries to lessen their total on-street loading activity at peak hours. The city could pinpoint large, upcoming development sites for the construction of consolidation facilities or create a district overlay around major truck outlets for new construction of a certain size.

As a step in this direction, an amendment to the existing zoning language for joint loading berths can be drafted to properly define "consolidation." Loading facilities planned jointly between two adjoining

buildings are already permitted in the zoning code under section 36-67. While written in 1961 and meant for adjacent properties under development, the language in the existing code could be drafted or amended create both shared, accessible loading docks, as well as urban micro-consolidation centers for the entire block or adjacent area.

A few other ancillary facilities that can benefit from incentives through the zoning are:

- *Off-Hours Deliveries*: As with consolidation centers, the city could institute a policy that forces developments unable to meet loading berth requirements or seeking a waiver to enroll in the city's off-hours delivery program. While a program of this kind would definitely require enforcement and administration on the city's part, it could effectively expand and incentivize off-hours loading and unloading by leveraging the existing berth requirements.
- *Freight elevators* : Existing zoning text for NYC does not require freight elevators for new buildings and developments. Freight elevators help to streamline the process by obviating the need to use passenger elevators that are often ill-equipped for deliveries or lack the necessary space for large scale deliveries. The provision of freight elevators should be a required element for new buildings of a certain use and size.[93]

With the High Line Improvement Bonus, the city gives owners the option of offering the city "an addition High line Support Easement Volume" that provides "support space located in the cellar level in an aggregate area no less than 800 square feet…exclusive use of a dedicated freight elevator that shall provide access to the cellar level, to a shared loading facility at street level, to the level of the High Line bed and to the level of the High Line support space" (98-25). While the High Line support space reflects the unique conditions of that structure and the need for private developers to support the city's access and maintenance needs therein, the text does provide precedent for developments integrating dedicated space for loading and freight activities into buildings. Future zoning text could provide for similar 'support spaces' in areas with constrained loading space, critical congestion caused by freight activity, or other particular requirements necessitating private development's contribution to the betterment of the public realm.

To incentivize these ancillary spaces and other similar strategies, such as locker boxes or staging areas, the development could be granted FAR exemptions. One relevant model here is the FAR dumpster storage space exemption instituted in 2013. This provision offers a FAR exemption for buildings with a

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93 The present zoning text cites the importance of freight elevators in the delivery process in two locations. First, in the Downtown Manhattan District Overlay, the city requires, as part of the loading berth waiver, that developments include an additional freight elevator and at least 6,000 square feet as a staging area. Second, in the Special West Chelsea District, as part of the High Line Improvement Bonus, the city gives owners the option of offering the city "an additional High Line Support Easement Volume" that provides "support space located in the cellar level."

"total floor area in excess of 100,000 square feet, up to 300 square feet of floor space…where such building allocates a permanent space for dumpster storage, and such storage space has a minimum dimension of 12 feet by 25 feet…adjacent to a building's loading berth" (13-34). The FAR trash room exemption responded to the prevalent use of loading bays as trash storage areas. In turn, a similar provision could be made for ancillary spaces such as staging areas or lockers that provide similar support and geared towards enhancing the overall functionality of these spaces.

5.3.2 Establish Freight Fund Mechanism

Establish a dedicated fund for freight to be paid into by developments that cannot meet off-street loading requirements

Subsidies for consolidation centers and other freight management programs, such as off-hours deliveries or Low Emission Vehicle Programs, could be financed through a freight fund paid into by developments unable to meet their off-street loading requirements. The fund could be administered similar to what was envisioned for the proposed District Improvement Fund for the East Midtown subdistrict,[94] which would have been targeted for public realm improvements.

A freight fund could grant additional FAR for qualifying sites. FAR bonuses could be structured in multiple ways:

- As a flat bonus in exchange for contribution to the dedicated fund.
- A potentially higher FAR exemption or bonus than the first option for creating a micro-consolidation center within the planned building envelope.
- As an alternative to the construction of a loading dock.

94 http://www.nyc.gov/html/dcp/html/east_midtown/index.shtml

This last option would have to be carefully structured in order to avoid abuse. One possibility is for a developer to pay the assessed value of the recovered street frontage to utilize for a loading dock directly into the dedicated freight fund, along with the development of a comprehensive curbside delivery plan approved by NYC DOT. This proposed Frontage Value Transfer may prove especially useful in cases where loading docks are not the best means of streamlining deliveries or desirable within the neighborhood context (but, not restricted by zoning).

A business improvement district could administer these freight funds, especially those that coincide with an existing special district overlay (such as 125th Street) or zoning subdistrict. Funds could be used for a range of activities, including the development of a consolidation center, common freight storage and warehousing, clean vehicle program incentives, and freight operations planning funds.

5.4 Efficacy of loading infrastructure

5.4.1 Create Loading Dock Urban Design Guidelines

Define screening requirements for off-street loading berth

While the existing zoning text provides detailed provisions for walls that screen loading areas, there is much less specific language that governs the articulation of the loading berth façade, its interaction with other elements of the streetscape, or how it should appear when the dock is closed.

In certain districts, such as the Special Midtown District (Theater subdistrict core), at least 50 percent of the ground floor level must be glazed (81-731), with no more than 50 percent painted or obstructed by signage. Loading docks are exempt from this requirement.

Urban design requirements for loading docks could be articulated in the zoning text. For instance, building owners could be required to articulate the exterior of their loading bays with materials and/or glazing that is sensitive to its context and does not create inactive street frontages. Screening requirements could be applied to the metal screen of the dock after hours.

Beyond the zoning text, regulations could encourage the use of perforated screens to ensure streets remain well-lit and active after dark.[95] Additionally, the Department of City Planning, through its Urban Design Group, could work to create a series of urban design specifications for on-street loading docks, including updated screening provisions, off-hour lighting improvements, and internal circulation recommendations.

While off-street loading facilities help reduce the negative externalities of freight on-street, they also have the potential to erode the quality of pedestrian realm by introducing additional curb-cuts, blank façades, and working landscapes in the midst of pedestrian friendly districts. This tension represents a challenge inherent to the off-street loading requirement, as well as one that may be difficult for zoning alone to achieve.

Existing zoning regulations provide basic guidelines for screening loading facilities, curb cuts and setting a maximum number of loading docks at grade for certain districts. While these provide basic urban design parameters for loading docks, the existing regulations do not fully integrate loading docks into the overall design of the street façade.

Urban design guidelines for loading docks could recommend several provisions:

- Resonance between the architectural character of the district and the loading dock itself.
- Lighting specifications for loading docks after hours, such as well-lit or porous screens.
- Design requirements for loading dock screens or provisions to encourage closed screens to have glazing or reflective surfaces.
- Language that permits building owners to use loading screens for temporary/rotating advertisements in certain types of districts.

5.4.2 Loading Berth Design Specifications

While regulations for loading berths focus primarily on their quantity and dimensions, the actual design specifications used to design loading docks in buildings and the interface between carriers and receivers at the building face, has received far less attention. The following section attempts to provide a basic set of design recommendations to enhance the design and management of off-street deliveries, including single loading berths, locker boxes, micro-consolidation centers, and ancillary facilities.

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95 http://www.nyc.gov/html/dcp/pdf/sidewalk_experience/active_design.pdf, 90

The current loading berth dimensional requirements were updated in 2013 for the Manhattan Core (13-31). The new dimensions set a minimum berth depth of 37 feet, and maintained a minimum width of 12 feet and a clearance of 14 feet (or 12 depending on the use). A few areas of interventions can be:

- **Depth:** Since the largest truck capable of operating in the Manhattan Core is 55 feet in length total, the minimum depth requirements are technically insufficient for current truck sizes and container standards. Nonetheless, given the recent passage of this amendment, the 37-foot minimum may represent a compromise tailored to the most frequent truck sizes using these berths. This study recommends, at a minimum, amending the loading depth requirements to reflect the dimensional requirements of the most frequent user of a bay. The most frequent user may be ascertained through a survey of similar buildings and use, or by assigning frequent user types via NAICS codes and then adjusting based on the total square footage assigned to that use.
- **Width:** The minimum width of a loading berth in current zoning is 12 feet. While this matches the typical lane width for a road, the operational characteristics of a typical street in NYC may require that these dimensions be revisited. Specifically, wider loading docks provide additional flexibility for freight carriers on streets with parking or under conditions where adjacent uses and activities compromise the 12-foot entrance into the loading dock.
- **Height:** Loading dock clearance requirements should reflect the largest potential user of a dock space. Existing code requires a vertical clearance of only 12 feet for hospitals and prisons. Revision is necessary in future codes to match the minimum clearance requirements of other uses, such as hotel and commercial, which are 14 feet.
- **Head-in/Head-out Loading:** Head-in and head-out operation streamlines loading and unloading activity, potentially lessening the overall delivery time and ensuring that loading docks are actually utilized. Existing zoning provisions selectively encourage, but do not require head-in and head-out operation for loading vehicles, through the provision of turn tables or other strategies.

  Existing language in the Special Midtown and Downtown Manhattan Districts allows the City Planning Commission to authorize curb cuts where needed for loading berths. This provision, however, requires that these loading berths "be adjacent to a fully enclosed maneuvering area on the zoning lot at least equal to the area of the required loading berth and arranged so as to permit head-in and head-out truck movements…" (81-44, 91-52). This zoning regulation indicates the importance of designing loading berths with sufficient maneuverability, as well as the importance of providing berths that provide for head-in/head-out movements.

  While the feasibility of this provision is debatable, the Department of City Planning could amend the zoning code to require head-in/head-out operations based on a study of existing loading dock utilization and operation.

- **Ramps for Handcarts and Forklifts:** Ramps help streamline delivery operations for freight operators, decreasing the overall amount of time and stress in getting goods from a truck to a receiver. Curb ramps with truncated domes are required by the Americans with Disabilities Act (ADA) at all signalized crosswalks for wheelchair access and sight-impaired pedestrians.[96] While corner curb ramps also benefit those making deliveries, they represent a minor improvement in a multi-step process, from the curb to the building itself. Midblock curb ramps are rare and cities often have onerous restrictions for curb cuts and other improvements that are beneficial for freight, but potentially bad for the pedestrian realm. A number of cities use mountable curbs in areas with heavy freight traffic. While these are primarily intended for trucks to mount the sidewalk without destroying the curb, these types of curbs may have secondary benefits for freight handlers since they have a soft slope that accommodates wheels more easily.[97] The city could recommend, as part of its street design manual and engineering specifications, the inclusion of mountable curbs ramps in areas with heavy freight traffic to ease the freight operations of business deliveries.
- **Staging Areas:** The existing zoning code provides a number of references on the importance of staging areas in the delivery process, including a required 6,000 minimum square foot staging area for department stores in the downtown Manhattan District. A required staging area for freight handling may only be practicable for certain specific use-groups in the zoning code, such as department stores, entertainment facilities, and industries, but could potentially be justified as an alternative allocation of required loading dock space where specific operations demand such use.

  The code could specify that in cases where a business operations and delivery plan indicates curbside deliveries is of greater utility than an additional loading dock, an area required for an off-street loading berth is instead dedicated to the construction of a staging area for deliveries. However, while this provision may have operational benefits, enforcing the intended use of this space could prove extremely difficult.
- **Freight Elevators:** Like staging areas, freight elevators represent another ancillary facility that supports streamlined freight operations for both curbside deliveries and loading docks. Many buildings lack direct access to a freight elevator, meaning that passenger elevators are also used for deliveries. In these cases, heavy tenant traffic often extends delivery times. Modifying the code to require a freight elevator with direct access to loading facilities will ensure new buildings are designed with a well-thought out external and internal freight circulation plan. Many freight elevators are accessible to tenants and other passengers as well. For certain buildings, especially those with only one or two elevators in total, designing the elevator(s) for freight handling, as opposed to dedicated them for freight alone, could prove beneficial.

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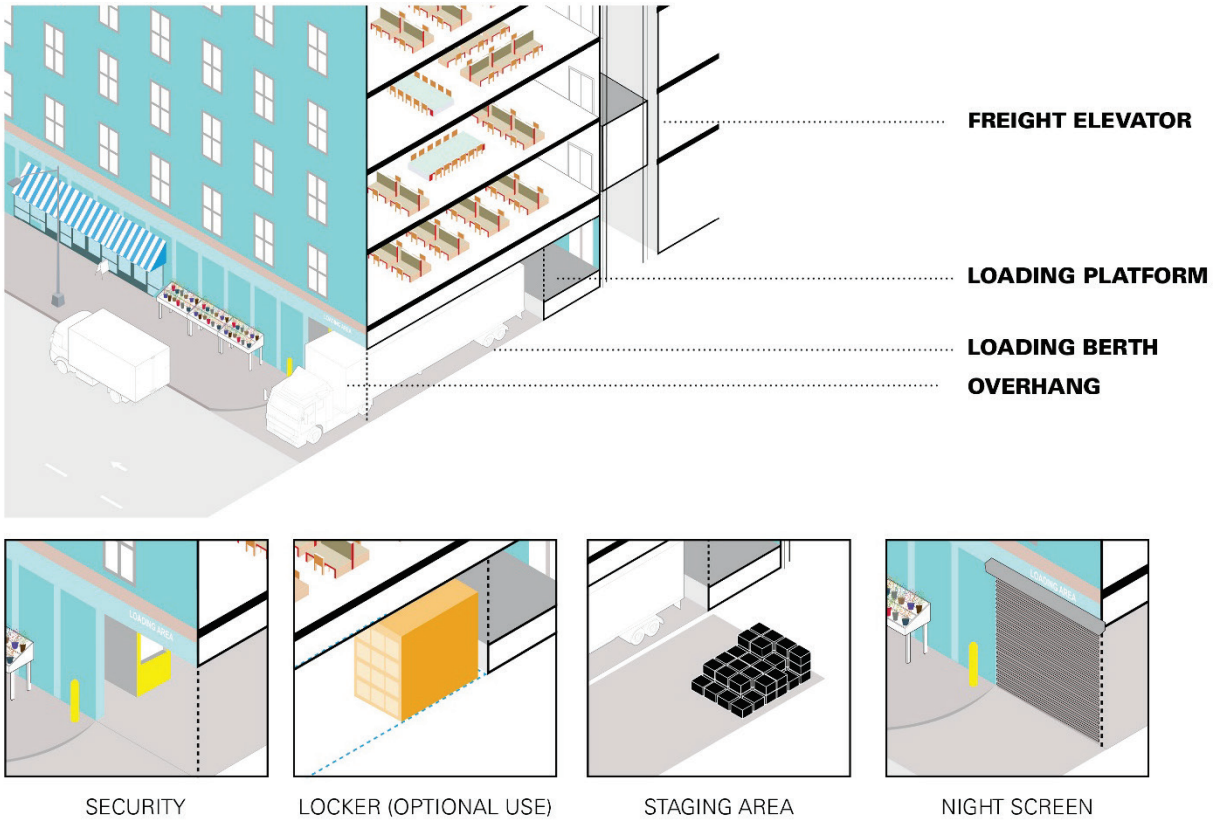
96 https://coe-sufs.org/wordpress/rhf/

97 Mountable curbs are 1.5’ and have a 4:1 slope edge.

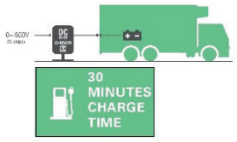
- **Back-in angled loading docks:** In addition to ancillary facilities such as elevators and loading docks, the design of the conventional loading dock may be altered for additional operational ease and flexibility. On narrow streets, angled loading docks may provide a better solution for loading/unloading trucks off-street. These docks provide trucks with an easier back-in loading maneuver that prevents them from having to mount the sidewalk or encroach unpredictably into the pedestrian realm. The text in the zoning code could permit or require the construction of angled loading docks on streets that either do not meet the minimum roadbed dimensions required by DCP or where the street width combined with higher traffic levels make a traditional dock impractical.

Figure 29. Ancillary Facilities such as freight elevator, loading platform, staging areas, can be useful strategies on constricted sites



5.5 Future Tech

Promote autonomous enforcement and incentivize commercial plug-in fleet via strategic EV infrastructure



Autonomous enforcement mechanism can be an effective way of making sure that on-street berths are available when necessary. For instance, an Automated Vehicle Location dataset that uses GPS to track commercial vehicles can help the NYC DOT and NYPD enforce on-street parking more efficiently. Similarly, use of strategic monitoring infrastructure in violation hotspots, such as monitoring cameras mounted on buildings, could prove useful.

An overlooked and important area of further research is a commercial plug-in fleet, which presents tremendous opportunities to address Green House Gas (GHG) emission issues. With the rapid growth of green technology, providing Electric Vehicle Supply Equipment's (EVSE) along major throughputs and promoting Green Loading Zones in dense urban areas is a step in the right direction.[98]

5.6 Regulatory Processes

Implement consistent method for freight calculation across various assessment frameworks and incentivize through 'green apple' certification program, rebates and tax incentives

Implementing a consistent method for calculating freight generation across regulatory frameworks, such as CEQR and zoning, can provide a comprehensive assessment that leads to better estimation of impacts.

Commercial EV ownership will require additional incentives as well as increasing those that already exist in the market such as New York State's $2,000 and $7,500 federal tax incentives. In addition, creating and offering a 'green apple' certification program for companies that conduct best practices for freight delivery could assist in achieving City and State green fleet sustainability goals.

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98 Got Green Loading Zone, please refer to https://www.nyserda.ny.gov/-/media/Files/Publications/Research/Transportation/New-York-City-Green-Loading-Zones-Study.pdf

6 Conclusion

The bulk of current loading dock requirements was implemented in 1952 and based on a report completed in 1950, which incorporated large-scale surveys between 1936 and 1946. With changing trends, such as the decline of manufacturing districts, rise of various deliveries to home and office, and expansion of the city's districts, freight and associated traffic patterns have shifted considerably. As shown through the course of this study, these trends have significantly changed NYC's urban landscape without sufficient inquiry into the effectiveness of the prevailing loading regulations. For instance, there are areas that do not require loading docks under current zoning because of dimensional or street access constraints, unregulated uses, or grandfathered construction. These areas generate and receive an increasing amount of freight, putting pressure on the public domain.

The existing off-street management strategies can be updated to better reflect this changing freight landscape. While consolidation of some kind could significantly benefit both carriers and receivers, the larger question has to do with the absence of a comprehensive freight planning and implementation platform that can impede many of the aforementioned strategies. Beyond the city's Metropolitan Planning Organization (NYMTC), the city and region have no coordinated forum or strategy for managing freight, and lack access to the critical data to support this kind of strategic decision-making and policy. A few of the important barriers are noted below:

- **Lack of updated freight study at the micro scale:** Consolidation, for instance, is a proven effective strategy. Although the city has undertaken a review of consolidation practices at the regional level, as part of a 2009 study conducted by NYMTC on the feasibility of regional "freight villages," which are outside of the urban core, no such parallel study has been conducted for consolidation in the core.[99] Conway et al., along with UTRC, published relevant reports on urban micro-consolidation with cargo cycles in 2011[100] as well as on freight tricycle operations in NYC in 2014, signaling a growing interest in consolidation centers and mode shift

[99] Boile. M., Theofanis, S., Strauss-Wieder, A. Description of How a Typical Freight village Works. Feasibility of Freight Villages in the NYMTC Region. Center for Advanced infrastructure and Transportation, Rutgers. 2008. http://www.nymtc.org/project/freight_planning/frtvillage/frtvillage_files/task_3_report_april_2009f2.pdf

[100] Conway, Alison. Urban Micro-Consolidation and Last Mile Goods Deliver by Freight-Tricycle in Manhattan: Opportunities and Challenges. 2011. http://docs.trb.org/prp/12-2682.pdf

within the delivery sector.[101] Nonetheless, these reports do not focus on the financial incentives or business models required to operate a successful urban micro-consolidation center in the city. Instead, they opted to use case studies of other cities to study broad economic, infrastructural, and regulatory challenges and solutions in an effort to inform policies in NYC.[102]

- **Lack of communication between shippers and receiving businesses**: Case in particular being the NYC DOT's off-hour delivery program that demonstrated significant operational benefits to both carriers and receivers. Freight consolidation, which is a proven effective strategy, has only been studied at the regional scale and the lack of study at core/borough level, given the high volume of freight generated, can be useful. Nonetheless, building management operations, staffing requirements, and lack of knowledge about the program have all proven barriers to widespread adoption and implementation. Without the necessary incentives to carriers, businesses, or macro level freight policy mandates, such programs may not grow beyond the pilot phase.
- **Limited outreach and advertisement of programs:** Growth is also limited by the capacity of the city itself to advertise these optional programs, which often requires door-to-door public outreach. While this kind of outreach might garner nonprofit support by active advocacy campaigns in sustainable transportation fields such as transit and street safety, biking and freight interests lack the necessary nonprofit or industry backing to bolster public sector initiatives and reach scale.

NYC has a considerable toolkit at its disposal to better manage freight, yet the city is only utilizing a selection of these potential strategies. The following section of this report will deliberate how enhanced zoning can create a better on- and off-street environment for freight.

This research has pointed out that the existing off-street management strategies can be updated to better reflect the changing freight landscape. As a potential method of reassessment, the study explored a model that looked at freight demands at varying scales and compared that to the zoning requirements, both on- and off-street. The freight trip generation (FTG) method incorporated in the model, although while certainly valuable, is limited as a data source in addressing the complexity of freight operations – FTG does not account for the varying dwell time per deliveries nor does it indicate the optimal method for

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101 Freight Tricycle Operations in New York City. October 2014. https://www.dot.ny.gov/divisions/engineering/technical-services/trans-r-and-d-repository/C-11-11%20Final%20Report_Oct%202014.pdf, Page 8.

102 Freight Tricycle Operations in New York City. October 2014. https://www.dot.ny.gov/divisions/engineering/technical-services/trans-r-and-d-repository/C-11-11%20Final%20Report_Oct%202014.pdf, Page 14

receiving those trips. Although various case studies suggest that loading dock needs constantly outgrow those provided under current zoning, the problem is compounded by the lack of supporting data. As discussed in section 5.1.2, a thorough survey and data collection on freight demand and movement can provide a better understanding of NYC's freight geography.[103]

The updated survey can emulate the original 1950 assessment to better understand the freight needs and demands. In addition, there are already provisions in the existing zoning text to either serve as a precedent or expand upon. For example, the Century 21 loading plan allowing for shared loading docks among buildings, midtown requirement for through building loading and underground facilities for over three required docks, and a highline bonus for constrained sites. Existing best practices discussed through the course of this research can also provide alternative strategies that account for a finer grain of use groups:

- London requires a robust loading plan for new development;
- Washington D.C. zoning code adopts to a finer grain of uses between various commercial uses. In addition, they require a loading plan for new developments that also utilized Commercial Vehicle Loading Zone Analysis Model to anticipate specific area freight demands;[104]
- Vancouver has different requirements for each freight vehicle type (van, box truck, tractor-trailer) and for different use types. More importantly, the code delineates loading requirements for residential uses as well.

Freight traffic is poised to increase as is the demand for a comprehensive loading/unloading strategy. This increase also imparts costs on society, particularly in dense urban environments such as NYC; pollution, congestion, accidents, noise, and visual impacts to name a few. Unfortunately, there are no easy solutions, to managing these impacts. It is certain, however, that the complexity of freight system demands a multi-pronged approach that transcends various disciplines, constituencies, and stakeholders.[105]

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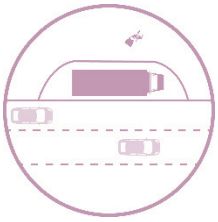
103 It is hard to identify how many freight trucks enter Manhattan every day (estimates range from 30,000 – 150,000) and this information can be integrated to develop a comprehensive solution towards zoning requirements.

104 http://cite.rpi.edu/images/Workshops/9-16-15%20S4%20Speaker%202-Cleckley.pdf

105 A comprehensive listing of optimizations for all aspects of freight network can be found here http://transp.rpi.edu/~InitiativeSelector/assessment.htm . While not comprehensive, this can serve a great base.

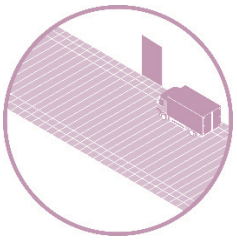
Appendix A: On Street Loading Strategies

A.1 Sidewalk Loading Areas



While not currently in use in NYC, many cities, including London, have implemented loading zones that are physically built into or demarcated on the sidewalk. These sidewalk loading areas permit trucks to load and unload on the sidewalk at certain times of day, rather than double parking or impeding traffic. Sidewalk loading zones may be a good use of space in certain parts of the city where there is no curbside parking, but could receive significant pushback from pedestrian advocates who may argue that the city's sidewalk's already suffer from significant obstruction by freight and other users, and should not be further compromised.

A.2 Pedestrian or At-Grade Street Pavers

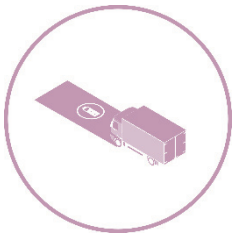


Narrow streets, especially those below 15-20 feet in roadbed width, depending on the presence of parking, may benefit from a flush paving treatment for easy loading and unloading of freight.[106] This is a common strategy in Europe and is currently in use for certain areas of Downtown Manhattan with flush, pedestrian friendly curb treatments. Flush pavement treatments (or shared streets, depending on their traffic regulations) allow freight vehicles in constricted areas to park adjacent to the buildings they are making deliveries to, rather than obstructing the sidewalk and posing a danger to pedestrians. In this case, freight vehicle needs can actually help justify street treatments to benefit other street users and public life more broadly. While these types of streets have obvious operational benefits for trucks and can improve the pedestrian realm, there are concerns about the cost, maintenance, and accessibility requirements associated with this type of streetscape.[107]

106 http://nacto.org/publication/urban-street-design-guide/streets/commercial-shared-street/

107 Commercial Shared Street. Urban Street Design Guide. http://nacto.org/publication/urban-street-design-guide/streets/commercial-shared-street/

A.3 Low Emissions Zones/Green Loading Zones



Green Loading Zones (GLZ) are a policy solution to incentivize further electric truck adoption with the creation of curbside loading zones that are available for zero-emission commercial vehicles either at a particular time of day or exclusively. The emergence of electric vehicle (EV) delivery trucks has enormous potential to benefit local health and environment of urban areas, especially denser cities, and promise to significantly reduce freight-related greenhouse gases (GHGs). The provision of GLZs can occur at minimal cost to the municipality and help fleets lower operating costs by reducing parking fines, providing time-based delivery assurances, and reducing trucks' need to circle. These loading zones can complement existing freight policies as pilots of better optimization of curbside space, including the concept of reservation windows. GLZs support long-term NYC DOT goals that seek to optimize freight traffic movement and throughput. In the short term, however, the GLZ concept may not readily align with components of that goal, namely reduced congestion, preservation of existing parking, and avoidance of creating many different potentially confusing and difficult to enforce space distinctions. GLZs have the opportunity to complement existing policy, including NYC DOT's Off-Hour Delivery Program. Business Improvement Districts are well-positioned to request GLZs, educate receivers, and promote enforcement.

Appendix B: Freight Consolidation Case Study: Regent Street London

Regent Street is a premier international retail and commercial office area in central London. Its street façade is recognizable around the world and hosts 7.5 million tourist visits per year. It has a street frontage of two kilometers and comprises 1.5 million square feet of flagship retail space with international retailers including Burberry, Coach and Apple. The street and immediate surrounding area is also home to many businesses and comprises 1 million square feet in office space. The street's freehold is owned by the Regent Street partnership consisting of The Crown Estate and Norges Bank Investment Management.

In 2007, The Crown Estate commenced a strategy to improve the public realm. The objectives of the strategy were to:

- Redress the balance between pedestrians and vehicles;
- Remove traffic clutter and barriers;
- Reduce traffic and carriageways;
- Renew street furniture;
- Improve signage and way finding; and
- Floodlight buildings.

This strategy was developed to ensure that investment in buildings was matched by improvements to the "bits in between the buildings" to maximize the attractiveness of the "overall offer" in terms of enhanced rental and capital value. As part of its strategy, Regent Street has sought to reduce traffic associated with delivery and servicing in the area. 21 percent of vehicles on Regent Street each day are related to deliveries. Of the 1,000 daily deliveries made to Regent Street, 19 percent were to shops, 39 percent to the hospitality sector, and 28 percent to offices. To reduce the impact of these delivery and servicing movements, the Crown Estate has developed and implemented three initiatives, an off-site consolidation center, reduction of office deliveries, and refuse/trash collections. Together with walking and cycling initiatives these schemes have reduced traffic volumes on Regent Street by nine percent. An additional initiative, partly driven by London's development regulations, is the provision of off-street loading facilities in new developments.

Appendix C: History of New York City's Off-Street Loading Regulations

Off-street loading regulations emerged as a pressing concern of NYC regulators and merchants associations beginning in the late 1920s and culminating in the passage of comprehensive off-street loading regulations in 1952. These regulations reacted to the increasing "traffic strangulation"[108] witnessed on city streets at the time, especially those in the Garment District and other congested light manufacturing and retail areas in Manhattan. Though businesses and politicians at the time supported a curbside environment open to the use and utility of private industry and businesses, the compounding effects of traffic and the resulting impacts on economic activity, inspired the city to act by instituting citywide off-street loading provisions. Though many larger building complexes, such as Rockefeller Center, had been smartly configured for off-street freight provisions, these isolated cases were far from the norm.

C.1 1940 Zoning Resolution

The first call for regulations that would create base off-street loading requirements emerged from the Merchants Association's committee on the control of street traffic in 1931.[109] The first proposed regulations called for off-street loading provisions for new and remodeled buildings "designed for the manufacture, storage or display of goods." These would have required one loading berth of 25 feet by 10 feet (in width) for each 25,000 square foot for buildings exceeding 5,000 square feet of floor space of the designated type. The numbers were based on an analysis of "23 representative office buildings, hotels and manufacturing buildings" at that time.[110] Off-street loading regulations were finally passed as part of the 1940 zoning resolution. The new requirements stipulated that "every building arranged, intended or designed to be used for manufacture, storage, or goods display, or for a department store,

108 Loading Berth key to new city zoning. New York Times. June 18, 1951.

109 "Merchants want new buildings of certain types equipped with interior facilities." New York Times. December 16, 1931.

110 "Merchants want new buildings of certain types equipped with interior facilities." New York Times. December 16, 1931.

hotel, or hospital, shall be provided with one truck loading or unloading berth of a minimum size of 25 feet by 10 feet for each 25,000 square feet and fraction thereof exceeding 5,000 square feet of aggregate gross floor area arranged, intended, or designed for such use."[111] These regulations were similar to the initial proposal in 1931, except with a few additional uses.

C.2 1952 Zoning Resolution

The 1940 regulations had multiple shortcomings that became apparent over the ensuing decade. Increasing traffic and trucking were perceived as negating the actual benefits of the new law.[112] Revisions to the law in 1952 sought to correct two shortcomings in the initial resolution. First, that each additional loading berth could actually serve a larger increment of floor space, meaning that the initial "flat" requirements were excessively burdensome for larger buildings. Second, the 1940 requirements were limited in the number of uses that they covered. They lacked requirements for retail stores (in addition to department stores), funeral parlors, office buildings, and schools. The amendment also acknowledged that the original loading provisions had grossly oversimplified the need based on usage, and wanted to provide more nuanced requirements that could distinguish between these different types. Differences in land values based on district-level nuances and increasing truck sizes were further considered in the new regulations.[113]

In the 1950 Harrison, Ballard, and Allen *Plan for Rezoning the City of New York*, which set the stage for the 1952 amendment, a thorough process was undertaken to reevaluate the requirements based on stakeholder dialogues, review of comparable city ordinances, and the field study of 64 buildings with off-street loading facilities.[114] The Plan recognized that "a great many buildings have adequate off-street loading facilities and where such facilities are in existence, there has been a remarkable alleviation of

111 Zoning Amendment No. 34, CP-8433A, 19-A

112 Zoning Amendment No. 34, CP-8433A, 19-A, 497.

113 Zoning Amendment No. 34, CP-8433A, 19-A, 497.

114 Harrison, Ballard & Allen Plan for Rezoning, 1950. 62

traffic congestion."[115] The Plan also recognized a need for different requirements governing the high- and low-bulk districts of the city. Their research included a survey of 16 buildings that had been retrofitted to include new loading provisions to great benefit. The resulting recommendations sought for existing buildings to be retrofitted to meet the new loading requirements within five years.[116]

These 1952 requirements called for several important changes to the original 1940 zoning:

- **Use:** The 1940 zoning had governed only a limited number of uses. Uses were expanded to include offices, retail, schools, funeral parlors and others.
- **High bulk vs. Low-bulk:** Requirements were segmented into low-bulk and high-bulk districts.
- **Loading Berths Required on Sliding Scale:** Based on use and district, loading berth requirements were set on a sliding scale, rooted in the observation that each additional loading berth could serve a larger area of an individual building and that a flat requirement was too burdensome on buildings in high density areas.
- **Retrofitting:** In addition to the requirements proposed for new and remodeled buildings, the city passed a series of extremely controversial provisions for existing buildings, which required that the new loading berth requirements become effective in 1957, five years after the passage of the resolution.

Requirements for retrofitting existing buildings with off-street loading berths were passed in 1952 with limited applications. These retrofitting provisions had a different set of specifications for a sliding square footage scale. The committee justified the retrofit provision based on "building owners [who] have installed berths in existing buildings on their own initiative in order to operate their business without the costly delays now resulting from the difficulty of obtaining a space for loading and unloading at the curb."[117] The requirements applied only to retail, wholesale, manufacturing, and storage and were considered "much less restrictive" than requirements for new buildings and enlargements. The requirement was only applicable to buildings with 75 feet of frontage along a side street and having no avenue frontage. It prevented "the location of a loading berth on any of the midtown avenues, where a berth might spoil the architectural character of the City's best retail frontage…"[118]

The retrofitting requirements were based upon a series of analyses conducted in the 1930s and 40s and published at the time of the amendment. These included truck stops by the Police Department, which

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115 Harrison, Ballard & Allen Plan for Rezoning, 1950. 62

116 Harrison, Ballard & Allen Plan for Rezoning, 1950. 62

117 Zoning Amendment No. 34, CP-8433A, 19-C, 507.

118 Zoning Amendment No. 34, CP-8433A, 19-C, Page 507.

looked at truck stops from 7 a.m. to 7 p.m. and at the midday peak (10 a.m. to 2 p.m.). The number of truck stops was compared to square footage in Midtown Manhattan's busiest precincts and then compiled into a series of ratios that became the basis for the overall requirements. The 1952 retrofitting requirements were heavily contested. Some even went so far as to call the proposed amendment "unreasonable, impractical and unconstitutional."[119] Others claimed that it would eliminate valuable space for selling goods. To these concerns, the commission responded that "property owners making prompt installations…would reap the immediate benefit of improvement of traffic conditions in the vicinity of their buildings and would quickly recoup the cost of their new loading berths…"[120] The requirements passed.

C.3 Changes since 1952

The 1952 requirements, including their usage, districts, and square footage parameters, have changed minimally since 1952. Several minor amendments and clarifications were passed in 1953 and 1954, before the loading regulations became part of the sweeping changes in the 1961 Zoning Resolution for which the Harrison, Brown, and Allen study had served as a precursor. Even shortly after its passage, the actual implementation of the code proved problematic. In one instance, in 1956, Robert Moses, then the City Construction Coordinator, tried to block the construction of a 19-story office building at Madison Avenue and 59th Street for failing to meet its off-street loading berth requirements. The building was granted a waiver on the condition they conduct their loading/unloading activities at night.[121] Changes to the zoning code since that time have dealt tangentially with off-street loading and never comprehensively. In the 1980s, several changes were passed for the Special Midtown District, but these were primarily concerned with restricting curb cuts and loading berths in the interest of preserving a continuous street wall for retail activity[122] (81-42, 44). Freight planning activities have been largely limited to individual planning studies in areas with high concentrations of freight traffic and/or freight-dependent businesses, such as the recent Williamsburg-Greenpoint Rezoning.[123] Two of the more recent changes to the code, made in 2011 and 2013 respectively, will be discussed further in the zoning analysis section of the report.

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119 "Loading Berths Plan Held 'Unreasonable'" New York Times. February 27, 1952.

120 Loading Berth Key to New City Zoning, New York Times. June 18, 1951.

121 Moses defeated on zoning permit. New York Tines. July 25, 1956.

122 Midtown Zoning. New York City Department of City Planning. 1980. http://www.nyc.gov/html/dcp/pdf/history_project/midtown_zoning.pdf

123 Greenpoint-Williamsburg: Planning Framework –Decline in Industrial Activity. http://www.nyc.gov/html/dcp/html/greenpointwill/greenplan3.shtml

Appendix D: Century 21 Curbside Delivery Plan

The department store described its loading conditions as:

Currently, trucks supplying Century 21 cannot utilize the existing loading berths on Dey Street because modern delivery vehicles are too long for the shallow loading docks on the narrow street. Instead, Century 21 loads and unloads its merchandise on Dey Street. Century 21 begins on-street deliveries at 5:00 a.m. and can extend until 4:30 p.m. Currently, the average loading time of each truck is approximately 90 minutes, and this is partly due to an inefficient loading system within 22 Cortlandt Street, which does not have existing freight elevators that access all the floors. Specifically, the freight elevator does not access the third floor, and goods must be carted through the second floor to a shared passenger elevator. In addition, on all floors, goods must be staged in the sales areas as there is no dedicated, separate staging area. The combination of the inability to use the existing loading berths and this cumbersome, time-consuming delivery procedure often results in merchandise obstructing the Dey Street sidewalk as goods are being delivered.[124] As a result of this zoning amendment request, the zoning code was amended with the following waiver clause:

D.1 (91-53)

(a) For zoning lots containing Use Group 10A department stores and Use Group 6B offices, where not more than 78,000 square feet of such office use is changed to department store use, the following modifications may be made provided that the Chairperson of the City Planning Commission certifies to the Department of Buildings that the conditions in paragraphs (b), (c), (d) and (e) of this Section have been met: (1) waiver of accessory off-street loading berths required for such department store use; (2) waiver of existing required accessory off-street loading berths when such waiver is necessary to provide an improved goods receiving and in-store transport system; and (3) exemption of existing loading berth floor space from the definition of floor area as set forth in Section 12-10 when such floor space will be used for such improved goods receiving and in-store transport system. (b) A plan for curb side deliveries shall have been approved by the Department of Transportation, as part of the improved goods receiving and in-store transport system for the department store use. Such plan shall be based upon a traffic study prepared by a qualified professional and a scope of work, both of which have been approved by the Department of Transportation, establishing that the plan for curbside deliveries shall not create or

[124] Zoning Amendment N 110307 ZRM. City Planning Commission. August 10, 2011. http://archive.citylaw.org/cpc/2011/08.16.11/N-110307-ZRM.pdf, Page 3.

contribute to serious traffic congestion or unduly inhibit vehicular or pedestrian movement and shall not interfere with the efficient functioning of nearby public transit facilities; (c) At least one additional freight elevator and an aggregate of at least 6,000 square feet of staging area for loading and deliveries, exclusive of the area occupied by elevators, shall be provided on the zoning lot to be used for the improved goods receiving and in-store transport system for such department store use, as depicted on a site plan; (d) In the event that any existing loading berth floor space is to be exempted from the definition of floor area as set forth in Section 12-10, such floor space shall be used for the improved goods receiving and in-store transport system; and (e) A Declaration of Restrictions shall have been executed, in a form acceptable to the Department of City Planning, binding upon the owners and its successors and assigns, and providing for maintenance and use of the staging areas and additional elevators for the improved goods receiving and in-store transport system, as well as continued compliance with the plan for curbside deliveries and the site plan. Such declaration shall be filed and recorded in the Office of the City Register of the City of New York against the lots comprising the zoning lot. Receipt of proof of recordation in a form acceptable to the Department shall be a precondition to the issuance of this certification, and the recording information shall be included on any temporary or final certificate of occupancy for any building or portion thereof, issued after the recording date.

Appendix E: Morris' 2004 Loading Dock Utilization Study Results

Morris 2004 loading dock utilization data:

Table 2: number of rentable floors, rentable space, and deliveries per day at six buildings.

			Deliveries Per Day				
		Rentable	In dock		On street		Total
Building	Floors	Space[a]	Number	%	Number	%	Number
1	45	632	14.6	61	9.5	39	24.1
2	25	717	6.6	24	21.0	76	27.6
3	54	1,744	35.5	87	5.5	13	41.0
4	41	1,365	56.0	79	14.6	21	70.6
5	29	2,164	66.3	67	32.0	33	98.2
6	50	1,000	27.6	46	32.5	54	60.1

[a] In 1,000s of square feet

Morris Delivery Time of Day

Table 3: number and percentage of total deliveries in morning and afternoon at six buildings.

	Deliveries per day				
	Morning[a]		Afternoon[b]		Total
Building	Number	%	Number	%	Number
1	14.6	60	9.6	40	24.1
2	17.3	63	10.4	37	27.7
3	25.7	63	15.3	37	41.0
4	42.8	61	27.8	39	70.6
5	59.7	61	38.6	39	98.2
6	34.0	58	26.2	42	60.1

[a] 8:00 a.m. to 12:30 p.m.
[b] 12:30 p.m. to 5:00 p.m.

Morris 2004 Dwell Time Data

Table 4: dwell times in dock and on street in morning and afternoon at six buildings

	Dwell Times (in minutes)					
	Morning[a]		Afternoon[b]		All Day	
Building	In Dock	On Street	In Dock	On Street	In Dock	On Street
1	24	23	21	25	22	24
2	47	27	51	19	48	26
3	51	15	35	10	45	14
4	34	20	32	16	33	19
5	24	15	19	17	22	16
6	40	38	30	35	36	36

[a] 8:00 a.m. to 12:30 p.m.
[b] 12:30 p.m. to 5:00 p.m.

Appendix F: Cost of Providing Loading Berth

Freight logistic involves multiple stakeholders and a series of strategic decision making processes, which vary from shippers to carriers to end users. The necessary physical infrastructure, such as availability of a loading dock or a loading spot, is often given a secondary preference in this process. As a result, when discussing the associated costs and benefits of off-street provision and right-sizing, costs and benefits to whom becomes important to delineate. Based on the findings of this research, the following section outlines a few of the pertinent costs and benefits within the public domain.

F.1 Public Domain:

- Truck congestion and circulation: Existing literature shows that lack of adequate loading berths results in commercial truck drivers circling around the block looking for an on-street loading space. There are multiple repercussions of this – first, the cost of lost time in trying to find a spot; second, obstruction to other vehicles on the road and the associated costs; and third, the resulting emissions from circling around the block and idling during loading/unloading activities.
- Obstruction to traffic and pedestrian movements: Inadequate loading docks can push the loading activities on the street and as evident in most midtown cross streets, results in double parking that 'reduces the capacity of the affected street by one lane of traffic.[125] Such an obstruction can also result in lost parking spots. In certain instances, carriers use sidewalks as a staging areas that obstruct pedestrian flow – this is prominently more prevalent in areas like Chinatown, East Harlem, and North Brooklyn. Lastly, with narrow sidewalks and inadequate depth of off-street loading berths, front hulls of the truck often encroach onto the sidewalk and compounds the problem.
- Environmental and health impacts: Congestion, redundant circulation, and idling inevitably increases particulate emissions. Research shows that freight trucks account for a majority of the particulate emissions that are associated with morbidity and mortality from asthma, lung cancer, and other respiratory diseases.[126] In addition, trucks are also the highest contributor the CO_2 emissions, a prominent greenhouse gas.[127]

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125 Urban Freight Case Studies: New York. USDOT 2009. Page 5. http://www.ops.fhwa.dot.gov/publications/fhwahop10019/fhwahop10019.pdf

126 Synthesis of freight research in urban transportation planning. NCFRP report 2013. Page 17. http://onlinepubs.trb.org/onlinepubs/ncfrp/ncfrp_rpt_023.pdf Page 17.

127 Freight and Climate Change, Cambridge Systematics, Inc. 2010. Page 2-3. https://www.oregon.gov/energy/GBLWRM/docs/FR1_ClimateChange.pdf

- Crashes and safety: As discussed in previous sections, truck maneuverability in the narrow, congested streets of NYC is a safety concern. Trucks turning at intersection and backing up to pull into a delivery loading zone create a major safety concerns for pedestrian, bicyclists, and other vehicles on the road.
- Building facades and streetscape: Loading activities on the sidewalk precludes the flow of people as well as necessary streetscape features that positively influence the level of pedestrian activity.[128] Further, the provision of off-street loading docks can create long blank walls that can compound the problem of inactive streets when combined with other incompatible uses – such spaces are located on north and south 125th street, as discussed in the investigation section of this report. Lastly, provision of loading dock can also reduce valuable retail frontage – depending on the context, this can be a cost to the public or the private owner.

End users: In addition to the public domain, there are certain associated costs that need to be discussed from the perspective of an end user, who bears the majority of costs related to loading berth provision. As previously discussed in Section 5, incentivizing loading berth provisions is a handy tool for reducing costs and maximizing benefits.

- Construction cost to the businesses: Cost of constructing a loading berth can vary depending on site conditions and whether it is below or above grade. Other available strategies, like round tables, angled loading docks can be effective depending on what is affordable to a business.
- Cost of operating: Loading docks, almost in all cases, require on-site support, which means hiring a building manager. In other cases, it requires robust technology to facilitate unsupervised delivery, which will add to the building maintenance cost. There will be additional costs if the facility has freight elevator and/or staging areas, which may also raise concerns for security. These docks however, can also be designed so as to accommodate other complimentary uses such as bike racks, overnight locker rooms to avoid ending up as inactive spaces when not in use.

[128] Although the success of a street does not solely depend on streetscape features, it does, however, present an interesting challenge as design and zoning standards continue to promote retail and commercial frontages. For further reading, please refer to http://docs.trb.org/prp/14-5420.pdf

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