“Last-Mile” Deliveries in High-Density Urban Residential Areas of Manhattan

A Thesis Presented to the Faculty of Architecture, Planning and Preservation
COLUMBIA UNIVERSITY

In Partial Fulfillment of the Requirements for the Degree
Master of Science in Urban Planning

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May 15, 2013
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**TOPIC:** Urban Freight Movement (“Last-Mile” Deliveries) in Manhattan

**KEY WORDS:** Transportation, Goods Movement, Logistics, Urban Freight, Curbside Delivery, “Last-Mile” Delivery
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ABSTRACT

The goal of this research project is to identify if “last-mile” deliveries to high-density residential buildings in Manhattan have an observable effect upon the streetscape as well as the buildings themselves. This paper focuses on two important components of “last-mile” deliveries – the occurrence of double-parking on the street and storage room capacity for delivery packages in residential buildings. General observations concerning “quality-of-life” are also explored based on the presence of observable safety issues associated with delivery vehicles.

Although by no means comprehensive, this is an exploratory research project meant to begin the conversation concerning the larger issue of “last-mile” deliveries in high-density residential areas and examine whether or not the negative externalities associated with goods movement (pollution, excess VMT, noise, safety, congestion) will become more noticeable in these locations.
KEY FINDINGS

This study found that double-parked delivery vehicles in residential areas contribute to a significant amount of lost road space for protracted periods of time. In the study areas, the average time of occupancy for parked delivery vehicles was 21.5 minutes and two thirds (2/3) of these vehicles double-parked. In addition, based on interviews with doormen and building management companies, there is a possibility that the growth in online shopping has created a need for larger storage rooms within these types of residential buildings. Although this is merely speculative and by no means causal, the annual growth rate in online sales indicates that this scenario could be highly possible.

Overall, these findings indicate that there is a large amount of “last-mile” delivery activity taking place in the dense residential areas of Manhattan, and if these trends continue, there could be increasingly significant negative externalities generated in these locations.
INTRODUCTION

1) **The Importance of Freight**

“No urban area could exist without a massive, sustained and reliable flow of goods to, from, and within it” (Ogden 1992).

Freight transportation, also known as goods movement, is essential to urban and rural society. Urban areas consist of large populations of people that are typically removed from agricultural food sources and raw materials for industry. In addition, it is imperative that urbanized areas find regions outside of the immediate vicinity to dispose of their wastes. In order to accomplish these herculean tasks, urban communities require intricate systems of transportation that allow for the movement of every kind of good/material imaginable.

The world of goods movement has varying degrees of scale, which produce very different transportation scenarios. At one end of the spectrum there are massive cargo ships, which traverse the seas carrying large volumes of raw materials and finished goods to and from ports. At the other end of the spectrum we have small, localized “last-mile” delivery trucks that are able to deliver packages right to your doorstep. And of course there is everything in between. Although curiously neglected in public policy and planning, all of the steps within the goods movement
chain help to drive the economies of nations from the largest crude oil tanker to the smallest delivery truck.

Even though goods movement is a crucial component of modern society, there are significant negative externalities caused by the delivery of goods - especially in dense urban areas. These include, but are not limited to, street and curbside congestion, pollution, safety concerns, and noise generation. There is no easy solution to remedy the side effects of goods movement, but cities need to address these problems in a competent and reasonable fashion in order to balance economic interests with the “quality-of-life” for its inhabitants.

2) **General Neglect/Lack of Information**

Within the field of transportation there has been a greater emphasis placed on the movement of people rather than the movement of goods. For example, in late nineteenth century New York City, there was great interest in figuring out a way to move people across the Hudson River into Manhattan by some other method than boat. Simultaneously it was also understood that there must be a component to allow for freight to move in a similar fashion. Even though the powerful Port Authority of New York and New Jersey was created to remedy the freight transportation issue to Manhattan, the problem was never resolved (Doig 2001). Our fascination and preoccupation with personal and public transportation (which is also an extremely necessary component of urban civilization and the economy at
large) has allowed us to place goods movement in a rank of importance far behind that of the movement of people. Thus, like many unglamorous services, goods movement becomes hidden in plain sight. We are now accustomed to ordering commodities online without the slightest concern for how it will arrive on our doorstep, but merely when it will arrive.

Over the years, there have been plans enacted (or proposed) by cities that have attempted to address the side effects of goods movement: congestion, pollution, noise, and safety (Ogden 1992). However, as previously mentioned, planning agencies and city governments have typically focused on personal travel to a much greater extent than goods movement at a regional or local scale (Chatterjee 2004; Woudsma 2001; Lindholm 2010). Although there are many difficulties in trying to examine the movement of goods at all levels (micro and macro), it is necessary to understand the externalities that can be produced. Goods movement is not an isolated phenomenon - it interacts with every aspect of the built environment as well as other forms of transportation at the street level (pedestrians, bicyclists, cars, and public transit). In one form or another, streets need to accommodate delivery vehicles otherwise the flow of goods in and out of destinations could hinder the effective functioning of our urban transportation systems and the environments in which they operate. Goods movement has the ability to affect the city at many levels – the streets, buildings and the “quality-of-life” of its residents (Goldman and Gorham 2006; Litman and Burwell 2006).
3) “Last-Mile” Deliveries

Within the chaotic assembly of freight transportation/goods movement, the final link in the supply chain is commonly referred to as the “last-mile”. It is during this last portion of the goods movement journey in which packages are delivered to the end customer – either a consumer or a commercial institution/retail store. Deliveries during the “last-mile” typically consist of smaller delivery trucks, of varying weights, sizes and classifications. Although “last-mile” deliveries take place within the entire urban environment, the limited number of studies that have looked at this section of freight movement have all focused on the concentrations of movement in Central Business Districts (CBD’s) - as this is an area that typically has the highest rate of commercial/office buildings (Scott 2009; Allen 2011; Chatterjee 2004; Chatterjee et al. 2008; Jones 2009). Within the confines of Manhattan, studies based on “last-mile” deliveries have occurred in the heavily congested business districts in Lower and Midtown Manhattan, where congestion has been an issue for well over a hundred years (Morris 2009). But delivery vehicles are a common sight all over Manhattan, and with New York City having some of the highest concentrations and highest densities of residential development in the United States, “last-mile” deliveries are not entirely allocated to a small tip of Manhattan. With residential deliveries from grocery stores, online food services (FreshDirect), and the constantly growing Ecommerce industry (which allows for convenient retail sales delivered right to your door “free” from personal travel), there is some evidence to indicate that this increase in online sales has already affected the
natural environment, the built environment, and “quality-of-life” issues outside of Central Business Districts – specifically, in high-density residential areas.

4) Research Design

The overall goal of this research project is to observe the effects of “last-mile” deliveries based on the “internal movements” (intra-urban movements) of delivery vehicles in a localized area (Chatterjee 2004). Studies concerning “last-mile” deliveries have typically focused on goods movement to large retail stores or other commercial establishments (Holguin-Veras et al. 2011). Few (if any) studies have looked at curbside/“last-mile” deliveries to residential buildings. The purpose of this study is to look at package deliveries to high-density residential areas within Manhattan to identify if the “last-mile” delivery activity is significant enough to affect environmental and “quality-of-life” issues in those areas. This paper focuses on two important components of “last-mile” deliveries – the occurrence of double-parking on the street and the impact packages have on storage rooms in residential buildings. “Quality-of-life” in the research areas is also explored based on the presence of observable safety issues associated with delivery vehicles.
5) **Research Questions**

This exploratory study asks three research questions that attempt to identify if “last-mile” deliveries in high-density residential areas are increasingly having an effect upon the streetscape, the buildings, and the residents that reside there. The three questions are as follows:

1) What are the incidences of double-parking (by delivery vehicles) on high-density urban residential streets in New York City and how long are the average occupancies?

2) Is storage room capacity (for delivery packages) in residential buildings sufficient or are there indications to the contrary?

3) What “quality-of-life”/safety issues are created by “last mile” deliveries on high-density urban residential areas in New York City?
LITERATURE REVIEW

Freight movement, or goods movement, is a complex network of differing transportation modes working in tandem with the purpose of moving goods to and from specific destinations. On a global scale, goods movement is reliant upon many different types of transportation including: large-scale marine cargo ships, railroads, air carriers, and trucks (NYMTC 2004). It is through the interaction of these modes that the products we buy (and sell) end up at their eventual destinations. But regardless of the obvious importance of freight, an overwhelming majority of the literature on transportation studies comes to the conclusion that the attention given to commercial freight pales in comparison to the attention given to passenger transportation (Chatterjee 2004; Allen et al. 2012; Ambrosini and Routhier 2004; Ogden 1992).

The Federal Highway Administration estimates that by 2035 goods movement in the United States will increase dramatically:

- Freight tonnage hauled by trucks will increase by 80%
- Rail tonnage hauled will grow by 73%
- Water transportation tonnage will increase by 51%
- Intermodal tonnage will increase by 73%
- Air cargo tonnage will quadruple
Container shipments alone in the last decade saw an 81% increase in the United States (NEJAC 2009, p. 3). With a growth in goods movement activity there can be a number of associated positive economic gains. However, growth in this sector also brings with it a number of less desirable consequences such as air pollution, traffic congestion, noise, and safety issues (Lindholm 2010; Litman and Burwell 2006; Scott 2009). These are problematic issues that occur at all levels of the goods movement chain, from cargo ships to delivery trucks.

**Freight Studies**

In 2012, researchers Julian Allen, Michael Brown and Tom Cherrett published a comprehensive report detailing the various types of freight studies that have been conducted (at the macro scale) since 1960. From their research, they concluded that a total of 162 studies have taken place worldwide (Allen et al. 2012). However, the results of many of these studies are not publically available or even in existence anymore. Although the authors make no claim that 162 is an exact number, the general conclusion from their study and from most of the available literature is that there is a severe lack of information concerning freight (Allen et al. 2012; Ogden 1992; Chatterjee et al. 2008; Lindholm 2010). Much of this has to do with the hesitancy of private companies to engage in research for fear of how the data will be used in regards to their standing in a competitive business market. Also, any data collected is typically viewed with skepticism by researchers/academics because of the nature of the source (“unreliable” transport firms who might alter the
information for proprietary reasons) (Woudsma 2001; Figliozi et al. 2007). In addition to the reliability issues surrounding company surveys, many of the models utilized to estimate freight vehicle/commodity flows are directly borrowed from personal transportation models. These models do not take into account the inherent differences and nuances involved in freight transport (ie. size of truck v. car) (Figliozi et al. 2007).

In the United States, there is a tendency to research freight movement at a regional or national level so very few models or survey techniques have been applied to smaller urban areas (Ambrosini and Routhier 2004). A greater number of localized urban freight studies have taken place outside of the United States (the majority of which have taken place in the United Kingdom). The few localized studies undertaken in the US have focused on downtown CBD’s or as part of comprehensive plans to revitalize downtown districts (Chatterjee et al. 2008; Jones et al. 2009; NYDOT 2009; Scott 2009). These studies clearly indicate that freight pick-ups and deliveries generate significant levels of congestion that can seriously impact the downtown environment. These studies also highlight the obvious need to include freight carriers in the discussions concerning how to deal with problems generated by goods movement (Chatterjee et al. 2008; Pivo et al. 2002). Studies done at the regional level have been primarily aimed at estimating freight commodity flows (also known as trip chains or “tours”) on the regional highway network, and although accumulating sufficient data can be challenging some recent work has managed to utilize readily available data sources to do so (Guiliano 2010).
However, the results are much more promising for rail and air – truck flows are still relatively problematic.

**Approaches to Freight Planning**

Chatterjee (2004) states that planning for freight movement is typically approached from two different perspectives. The first one is concerned with economic development/business logistics and primarily focuses on freight planning at the regional or statewide level. As mentioned previously, this “macro scale” tends to focus on freight commodity flows and usually includes multiple modes and large-scale projects. The second perspective focuses on “the traditional engineering and physical infrastructure approach” that is “applicable at all levels of planning, including urban areas of large, medium, or small sizes” (Chatterjee 2004, p. 20). This approach uses vehicle movement data and the specific spatial characteristics of the built (and unbuilt) environment to influence the resulting transportation infrastructure. This second approach is the most common method for dealing with the problems that arise from all types of traffic issues including those resulting from delivery vehicles.

The physical design of an urban area is crucial to how goods movement occurs at all levels. Land use patterns and urban forms can dictate how urban transportation systems are created, maintained and altered (Litman and Burwell 2006; Rodrigue et al. 2009). Policies and regulations can have a significant effect upon how freight
interacts with the urban environment. For the most part, traffic engineers are predisposed to planning for the automobile and managing the traffic flow of these vehicles. As a result, many of the necessary elements for smooth urban freight operations are either forgotten or severely limited. The concept of “Complete Streets” – trying to incorporate all modes of transportation into the street network – has become a favored Smart Growth tactic aimed at revamping auto-centric street planning (Seskin 2012). Allowing for a multiplicity of modes (pedestrian, bicycle, car, freight) is a step in the right direction, but how this integrated system of modes can interact safely and efficiently, not to mention politically, can be remarkably challenging.

According to Chatterjee (2004), some of the key physical design elements that can help to alleviate the negative effects of goods movement in urban areas are:

- Off-Street Loading Spaces/Docks
- Curbside/On-Street Loading Spaces
- Transportation Parks or Freight Villages
- Intersection Design

In general, these elements and others can address some of the side effects of goods movement in urban areas. However, Manhattan’s mature infrastructure, limited physical space, and high population density magnifies these problems and can restrict the implementation of Chatterjee’s recommendations.
**Impacts of Freight Movement**

Freight movement in the United States is controlled by private business operations. These companies are beholden to the fact that having a successful business is primarily dependent on economic efficiency. It was commonly believed by economists that regardless of the environmental and equity costs, increased mobility provided net economic gains. However, as Litman and Burwell (2006) point out, high levels of vehicle movement can not only negatively affect the overall livability and environmental quality of an area, but also can also adversely affect perceived and actual economic benefits. Now it is commonly understood that after a critical mass is achieved, attempts to add additional mobility to a congested system may alleviate the situation for a short period but will soon become just as congested (and with a higher volume of vehicles). This is most commonly seen in highway development where additional lanes are built to alleviate heavy congestion. With the increased capacity, additional vehicles enter the system and soon the new lanes are just as congested as the ones they were meant to help.

Economic impacts are very important determining factors for how delivery companies will operate, maintain services, and pass on their costs to consumers. But this is only one part within the sustainability spectrum (the “three e’s” – economy, environment, and equity). In order to achieve some level of sustainability within the freight system, the other two elements need to be addressed (Allen 2011;
Lindholm 2010; Litman and Burwell 2006). Some of the key environmental and social/equity impacts caused by goods movement in a community include emissions (pollution), traffic congestion, noise, and safety issues (Allen 2011; Behrends et al. 2008; Lindholm 2010; Morris et al. 1999).

The surrounding fabric of the urban environment helps to determine its “quality”—and the road network is an integral part of this fabric. The size of the roads, and the amount (and type) of vehicles that traverse them, helps to determine the subsequent livability of an area (Lindholm 2010). On a heavily congested street, vehicles are idling for longer periods of time creating more emissions. More emissions have an effect on air quality, which in turn affects the “quality” or desirability of an area. In the case of delivery vehicles, delivering to congested areas means that there is greater competition for available space to unload goods. This typically results in frequent instances of double-parking, U-turns, and/or circling of the neighborhood to locate available space to park (Allen 2011; Morris 2009). But delivery trucks are not only victims of congestion they are frequent contributors to it. Delivery vehicles are larger and noisier than most passenger vehicles so if there is a high frequency of them in a specific location the quality of the environment can be affected. Noise pollution tends to decrease the desirability of residential neighborhoods because tranquility is usually coveted in these areas. The relative safety of an area can also be exacerbated by an influx of delivery vehicles. In the absence of off-street parking or loading zones, delivery vehicles can restrict the flow
of traffic, block bus stops, block sidewalks, block crosswalks and driveways, and hinder visibility for safe roadway crossings (Allen 2011).

“Quality-of-life” issues, and how to address them, have become more prevalent in the urban planning literature, but there are still many inconsistencies and differing notions as to what comprises the definition and meaning of “quality-of-life” (and its corollary term “livability”). Although somewhat normative, there can be noticeable effects by delivery vehicles upon the “quality-of-life” in an urban environment (for a general discussion on “quality-of life” issues see: Myers 1988; van Kamp et al. 2003).

**Last-Mile Deliveries & Ecommerce**

The “last-mile” can be defined as the final portion of goods movement in which the package is delivered to the intended recipient. Like many of the writers that discuss the issue of “last-mile” deliveries, Morris (2009) mentions that the intended recipients are typically located in commercial buildings in the Central Business
District (see also Allen 2011; Scott 2009; Woudsma 2001). However, this definition bypasses a large spectrum of deliveries that take place outside of this confined area. In high-density residential areas, the final destination point is typically one of two places – the recipient’s home or a collection point where the recipient can retrieve the item. Nonetheless, what occurs in both smaller commercial and residential models has a similar outcome: smaller, more maneuverable trucks deliver goods to their final destination.

![Image 1](Image 1_Goods Movement Supply Chain with "Last-Mile" Deliveries Source: (Gevaers et al. 2009))

What is not commonly known is that this last link in goods movement is one of the “more expensive, least efficient, and most polluting sections of the entire logistics chain” (Gevaers et al. 2011, p. 1). Typically, because of time-sensitive windows, “empty-running”, the use of smaller vehicles, delivery failures, operational inefficiencies, and poor environmental performance (higher emissions per parcel), “last-mile” deliveries can amount to anywhere between 13% and 75% of the total logistics cost (Onghena 2008 in Gevaers at al. 2011). This is a wide spectrum that can have significant economic repercussions for both the carrier and the customer.
It is understandable that "last-mile" deliveries in the commercial sector receive the majority of attention because of the more immediate economic concerns. But, “with the ongoing growth in Ecommerce, the direct-sales market is presently experiencing substantial expansion” (Gevaers et al. 2011, p. 3). A number of authors have noticed connections between changes in delivery technologies (ie. Ecommerce and "just-in-time" delivery services) and the way in which people obtain personal goods, and have started to look at the potential effects these might create. Home shopping, via the internet, is quickly becoming a major source of logistics activity, but some research studies have seen only a minimal change in the travel behavior of consumers and very little evidence of environmental benefits (Edwards et al. 2009; Golob & Regan 2001; Song et al. 2011). Online shopping could generate fewer emissions by reducing personal travel trips, but this is wholly dependent on the frequency of ordering goods, the amount of goods ordered, ordering from multiple carriers, delivery failures, and traditional personal shopping trips taken in conjunction with ordering online goods (Edwards et al. 2009). Customer density is also a very important factor in determining the efficiency of “last-mile” deliveries. Boyer et al. (2009) looked at the typical urban city in the United States and concluded that a maximum efficiency for “last-mile” deliveries occurs somewhere in the density range of 1.5 and 2.0 customers per square mile. In the borough of Manhattan, where the average population density is 70,951 people per square mile, the result is that there are considerably more customers per square mile than Boyer’s ideal number. On paper, this adds to greater efficiency through closer proximity, but in reality what happens is a multitude of delivery trucks flooding the
streets and adding to the widespread congestion. Congestion is a significant artifact of density, and “last-mile” deliveries can exacerbate the issue wherever the urban location – commercial or residential.

**Actions Taken to Address Urban Freight Issues**

In order to accommodate the movement of goods in the “last-mile”, cities around the world have implemented a variety of plans that present possible solutions to the problems surrounding urban freight. It is crucial to examine at least some of the strategies that cities (and private companies) have taken in order to get a better understanding as to why certain methods are chosen over others and what methods might work at different scales and in different regions. In the case of New York City, there have been numerous proposals over the years – mostly aimed at relieving the ever-growing levels of congestion in downtown Manhattan’s business district.

At the macro scale, the New York Metropolitan Area receives nearly 90 percent of its freight via trucks. This poses numerous problems - wear and tear on infrastructure, high levels of pollution, and the ever-present issue of congestion. In the case of Manhattan, over 93 percent of the region’s goods enter via truck through the George Washington Bridge (Nadler 2009; NYMTC 2004).
FREIGHT MOVEMENT IN THE NEW YORK METROPOLITAN AREA

Table 1, Inbound and Outbound Freight Movement, Manhattan, 2004 & 2030. Source: NYMTC website
Table 1 shows that by 2030 the inbound tonnage for Manhattan is estimated to increase by nearly 70% and outbound tonnage is also expected to increase by 63%. These are phenomenal numbers that will precipitate a dramatic increase in the number of commercial vehicles on the streets of Manhattan. Currently, the George Washington Bridge is the “only crossing that is part of the National Highway Network – the designated system of highways for 53-foot trailers”. It is possible for these vehicles to cross the Verrazano-Narrows Bridge, but in order for them to reach the bridge they are required to negotiate “narrow, substandard roadways” (Nadler 2009). In the process of doing this, they create even more congestion on the roadways. From a regional standpoint, this will have a tremendous impact. The physical geography of Manhattan makes it virtually certain that trucks will remain the primary method of transportation for moving goods in, out, and around the island.

Although these statistics are relatively current and show the future growth in goods movement, New York City has been struggling with the side effects of freight movement for a long time - well over a hundred years.

**Manhattan’s Garment District (1970’s – current)**

In 1972, the Manhattan Garment Center Project was created by the City of New York in conjunction with the US Department of Transportation. Its goal was to address the increasing environmental and traffic congestion issues that were plaguing the area primarily due to the high volume of goods movement (Ogden 1992). After
assessing the situation and coming up with a number of different proposals, five actions were decided upon in order to mitigate the heavy congestion:

- A passenger vehicle ban was created between the hours of 10am – 3pm.
- Left hand turning lanes and partial curbside parking bans.
- Truck parking durations were implemented in order to increase parking turnover (3 – 4 hours).
- Corner curb cuts and mid-block curb cuts were created to ease the interaction between vehicles and pedestrians. (Ogden 1992).

These measures implemented in the 1970's and 1980's were met with relative success, but increasing goods movement and other vehicular traffic eventually led to additional measures being taken - including the extension of the passenger vehicle ban which currently ranges from 7am – 7pm.

Most recently, NYCDOT enacted a number of curbside management practices that they had identified in their Commercial Vehicle Parking Plan to serve this same area of Midtown Manhattan. These strategies included:

- Providing for additional curbside spaces (on-street loading zones) for commercial trucks.
- Installing Muni-meters to encourage shorter loading times in loading zones/spaces.
- Encouraging greater enforcement mechanisms (USDOT 2009).
In addition to these three strategies, the city also enacted in this area the THRU Streets Program. This program designated specific streets in which turning and stopping were eliminated in order to increase and maintain the flow of traffic. Although this did increase the travel times for commercial (and personal) vehicles, after a period of time the net positive effects declined as enforcement became more lax.

On a much larger scale, the City of New York realized the trucking routes throughout the five boroughs needed improvements. In May 2007, the city published the *Truck Route Management and Community Impact Reduction Study*. This study looked at existing truck routes, analyzed crash locations, and the existing signage. Recommendations for improvements were made, but because of the difficulty of large infrastructure changes only two truck routes have been altered as of 2009 (USDOT 2009).

An experimental plan created by NYCDOT’s Office of Freight Mobility known as the “Off-Hours Delivery Program” (PILOT) was set in motion in 2010. This plan experimented with off-hour goods deliveries (between 7pm – 6am). Seventeen businesses in Manhattan agreed to be part of the project including Whole Foods and Starbucks (Holguin-Veras et al. 2011). Many of the participants were very happy with the program, but because of “after hours” personnel requirements as well as other issues, this type of alternative goods movement template is typically limited to larger commercial enterprises.
The methods and programs described above are by no means an exhaustive list for New York City. They are simply a handful of measures that the city has taken to combat the ills of urban goods movement. Throughout the world there are plenty of additional examples of other methodologies that attempt to alleviate the externalities created by goods movement. Some of these include:

**Cargo Tricycle Delivery Networks (Paris and London)**

Companies like DHL and FedEx have implemented the use of freight bicycles/tricycles that are used in the “last-mile” delivery of urban goods in London (Conway et al. 2011). This is a unique and commendable shift in transportation mode that is much more eco-friendly, quieter, and sustainable than traditional delivery vehicles. There are issues of safety and access for these alternative vehicles, of course, depending on the street type and what other vehicles use the same road. There are also limitations to package size, quantity carried, and commonly held perceptions of efficiency. Even so, this is a remarkable experiment that has great potential to change our perspective on freight movement in dense urban areas. Areas of Paris also use freight cycles, and its activities have been remarkably successful thanks to a company called La Petite Reine (see [http://www.lapetitereine.com/fr/index.php](http://www.lapetitereine.com/fr/index.php)).
**Amazon Lockers**

In an attempt to mitigate “failed” or “missed” deliveries, Amazon.com has spearheaded the use of delivery lockers in cooperating venues (grocery stores, convenience stores, and office supply stores). Delivery companies place the ordered goods (less than 10 pounds) in the lockers and patrons can access them through a single-use code that is emailed to them. Currently there are operating lockers in New York State, Seattle, Washington DC, and San Francisco (Bensinger 2012). In many ways Amazon Lockers are a more efficient use of space than traditional post office boxes since the lockers are utilized by multiple individuals instead of just one. Of course this is an initiative set in place by a private company aimed at increasing productivity and reducing costs, however, the implications of this business model could have effects that mimic policies implemented by local governments. This is a private sector response to the complex issues surrounding “last-mile” goods delivery.

**Allocation of Curbside Space and Off-Street Parking Facilities for Goods Delivery (Curbside Management) in Downtown Areas**

From case studies in Washington D.C., Greensboro, NC, and Fargo, ND - these three municipalities have attempted to address how the availability of curbside space versus off-street loading/parking facilities for delivery vehicles has affected their respective downtown areas (Chatterjee et al. 2008; Jones et al. 2009). These plans
primarily deal with the physical requirements that are necessary for curbside deliveries in a downtown area with a large commercial presence.

**Concerns and Implications**

There are obvious side effects from goods movement in urban areas, and researchers have primarily focused on the core areas that have traditionally been inundated with goods flow (CBD’s and large arterial highway systems). But goods movement has changed significantly over the past thirty years. The internet has helped to usher in a new era of personal goods delivery, widening the spectrum of how we obtain goods and commodities. Packages ordered from online shopping sources and delivered to private residences have increased nearly 25% per year for the past 10 years (Boyer et al. 2009, Goldman and Gorham 2006). Additional delivery services from grocery stores and online grocery services also add to the growing level of “last-mile” deliveries made to residential buildings in New York City. These changes in personal and commercial behavior have the potential to affect the urban environment in ways that can be difficult to quantify, but necessary to explore.
METHODOLOGY

1) Methodological Approach

In order to identify if “last-mile” deliveries and the resulting storage of packages could ultimately affect the overall traffic and environment in high-density residential areas, a mixed-methods approach (qualitative and quantitative) was utilized (see Gaber & Gaber 1997). This approach included observational studies that looked at the number of delivery vehicles in various study areas with a primary focus on how many of these vehicles double-parked. To assess how delivery packages are stored in residential buildings (until the residents can retrieve them), interviews with doormen and building management representatives were undertaken.

2) Location of Study

New York City has some of the largest concentrations of high-density residential developments in the United States. Of the Five Boroughs, Manhattan was selected for this study because of the vehicular limitations imposed by the geography of the island as well as its high population density. The specific sites chosen for the observational studies are identified in the results/findings section of the paper.
3) **Observational Studies**

The sites selected for the observational portion of this research project were chosen based on certain criteria. These included:

- Four buildings in total - located in different areas of Manhattan
- Buildings must be high-density residential (greater than 100 units)
- Frontage is on a residential street (but near or adjacent to main road)
- Two buildings with on-street loading zones and two without

In addition, observational data concerning the physical layout of the streets was collected in an attempt to identify the physical characteristics of the surrounding environment. An attempt to identify levels of safety within the environment was also undertaken. The observable characteristics/inventory included:

- Street type (one-way/two way) and street dimensions
- Number of street parking spaces
- Number of loading areas (on-street and off-street)
- Number of delivery vehicles over the course of time (3 hour intervals)
- Relative safety of the road/area (vehicle speeds, obstruction of crosswalk visibility due to trucks, any blockage of emergency vehicles, and perceivable levels of congestion based on the number of vehicles that are unable to pass through an intersection on a green light).
The key observational variable(s) (at the street level) were:

- The occurrence of double parking by delivery vehicles
  - The number of vehicles
  - The duration of stay

Within this observational framework, photographs were taken to graphically illustrate the different types of situations observed. The primary content of the photographs include:

- Double-parked delivery trucks
- Levels of safety and/or congestion related to the double-parked vehicles
- Use of on-street/off street loading zones

Photo 2, Double-parked Delivery Truck
Photograph by Author
4) **Interviews**

In addition to observations based on vehicle counts/activities and the physical elements of the environment (observational surveys/techniques), interviews with doormen and building management companies were also performed (see Allen et al. 2012). For privacy purposes, both of these interview groups were not associated with the four study areas. However, the selection of the doormen was based on their employment in buildings similar to those in the observational study (high-density residential buildings and/or areas). Interviews with representatives from building management companies were also selected based on their operation of high-density residential buildings.

The key variables(s) (at the interview/building level) include:

- Presence (or lack) of “package rooms” for the storage of deliverables
- Whether or not the storage rooms were able to handle the amount of deliveries per day (based on doorman input/perception)

The following two types of interviews were conducted:

Interview/Establishment: Selective interviews with doormen/building supervisors (based on their positions as the “recipients” of the deliveries). Interviews with these voluntary participants (10) consisted of questions intended to find out their opinions concerning optimal delivery scenarios and how the building deals with the
storage of delivery items. Interviews were strictly voluntary and no personal information or affiliation was obtained.

Interview/Building Management: Selective interviews with representatives from building management companies (based on their positions as upper management officers). Interviews were entirely voluntary and the selection of the building management representatives were not based on the buildings observed.
RESULTS/FINDINGS

1) **Observational Studies:**

The four study locations included:

1) The Apthorp  
   390 West End Avenue  
   New York, NY 10024

2) The Solaire  
   20 River Terrace  
   New York, NY 10282

3) “New York By Gehry”  
   8 Spruce Street  
   New York, NY 10038

4) The Lyric  
   255 West 94th Street  
   New York, NY 10025
Image 2, Population Density of Manhattan by Census Tract (2010) & Study Area Locations

Source: U.S. Census Bureau, 2000 & 2010 Census Public Law 94-171 Files
Population Division - New York City Department of City Planning
These sites were chosen based on generalized criteria: They needed to be residential buildings with a large number of units; the main entrance was (preferably) on a residential side street; the building was near, or adjacent to, a larger collector road. The selections of the Gehry building and the Apthorp were particularly appropriate considering their places in recent and past history. When the Apthorp was built between 1906 and 1908, it was envisioned and designed to be one of the largest residential buildings in New York City. Encompassing an entire city block, it was added to the National Register of Historic Places in 1978 (Apthorp website). The Gehry building is also of note because it holds the accolade of being one of the tallest residential buildings in the Western Hemisphere, with an extraordinarily large number of residential units (903) (New York by Gehry website). This juxtaposition of old and new has the potential to show how two buildings from two vastly different eras interact with their surrounding streetscape and the activities therein - more specifically in the case of this study, how the streets and the buildings could be affected by small package delivery vehicles.

Observations took place during the weekday between the hours of 2pm to 5pm (3 hours total for each site). The choice of time in which to observe the deliveries was randomly chosen, but proved to be an opportune time based on generalized comments made by doormen (although these doormen were not affiliated with the particular sites observed). For each site, the immediate streets surrounding the buildings (varying from 1 to 4) composed the focus area. It was in this immediate vicinity that observations were made based on number of delivery trucks, their
duration of stay, and if they were double-parked or otherwise illegally parked. Trying to account for all of the small parcel delivery trucks that could potentially serve the various sites did prove to be somewhat difficult. The Apthorp, for example, has a footprint of an entire city block (“4” streets) – making it tremendously challenging to keep track of all of the delivery vehicles serving the building. However, this actually became a moot point. For example, a delivery truck, whose packages are bound for a particular building, could in fact be parked around an adjacent corner (out of the study area) delivering to a number of different buildings (residential or otherwise) including the study building. But, since the actual delivery vehicle was not in the observable study area, the vehicle would not be counted. In this instance, the observational methodology was limited but it did not disregard the fact that somewhere nearby there was a delivery vehicle that could have had some effect on the streetscape. To partially account for this discrepancy, a tally of “walk-in” deliveries was recorded. These were small package deliveries that were observed (usually with an accompanying hand truck/dolly) but could not be associated with any particular parked delivery vehicle in the visible study area.

The term “small package delivery vehicles” does require an asterisk. For this research project, the “vehicles of interest” were primarily commercial companies that specialize in delivering parcels/packages to both residential and commercial locations. Companies such as the United States Postal Service, Fed Ex, UPS, and even Fresh Direct were the carriers most likely to be covered under the auspices of this
study - although other smaller private operators were observed in the field and also met the criteria of “small package delivery vehicles”. However, it was not the task of this research to numerically quantify or study the particular companies, only to count these types of vehicles that qualified under the common “generic” purpose of delivering small packages to residential buildings and/or their immediate surroundings. It was also not the purpose of this study to analyze or critique these specific companies and great lengths were taken to ensure that the statistics recorded in the field did not relate to any specific organization.

It is also important to note that vehicles associated with large goods movement – semi trucks, moving company trucks, construction vehicles, or other service-type vehicles were not counted.

The data gathered from each site included the following:

- Street type(s) in the study area
- Number of parking spaces (street) in the study area
- Number of on-street loading zones
- Number of off-street loading zones/spaces
- Number of delivery vehicles (3 hour interval)
- Average duration of stay in minutes (for the total # of vehicles)
- Whether the vehicles were double-parked
- Number of private cars illegally parked in loading zones
- Number of speeding vehicles (all-types)
- Number of delivery vehicles that obstructed sidewalk crossings
- Number of “walk-ins” (no delivery vehicle in the visible study area)
Table 2 shows the year the particular residence buildings were constructed and the total number of residential units in the building.

<table>
<thead>
<tr>
<th>building</th>
<th>year built</th>
<th># of units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solaire</td>
<td>2002</td>
<td>293</td>
</tr>
<tr>
<td>Apthorp</td>
<td>1908</td>
<td>163</td>
</tr>
<tr>
<td>Gehry</td>
<td>2011</td>
<td>903</td>
</tr>
<tr>
<td>Lyric</td>
<td>2000</td>
<td>285</td>
</tr>
</tbody>
</table>

Table 2, Building Information (year built and number of units)

The number of delivery vehicles represents the total number of vehicles counted over the course of 3 hours (2pm to 5pm) during an average weekday. Observations took place in mid January and represented a period in time that is considered post-peak (after the massive delivery rushes associated with the holiday season in December). The average duration of stay (per vehicle) for the combined sites was 21.5 minutes. However the various durations of stay per vehicle observed ranged from 1 minute to over 2 hours.

<table>
<thead>
<tr>
<th>building</th>
<th># of delivery vehicles</th>
<th>average duration of stay (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solaire</td>
<td>6</td>
<td>13</td>
</tr>
<tr>
<td>Apthorp</td>
<td>4</td>
<td>19</td>
</tr>
<tr>
<td>Gehry</td>
<td>11</td>
<td>21</td>
</tr>
<tr>
<td>Lyric</td>
<td>9</td>
<td>29</td>
</tr>
</tbody>
</table>

Table 3, Delivery Vehicles (number and duration of stay)
Table 4 indicates the number of delivery vehicles that parked within the study areas along with the number of those vehicles that were double-parked. Although the data collected represents only a portion of the day (2pm-5pm), for the purposes of this research it is assumed that the flow of delivery vehicles remains fairly consistent between the hours of 9am and 5pm. This assumption is based on the need for delivery vehicles to utilize curb space consistently throughout the workday. A full description of this assumption is examined in the analysis section of this paper (also see Habib 1985; Pivo et al. 2002). By following this assumption and extrapolating the raw numbers we can estimate the total number of vehicles over the course of the day. This calculation does not include the earlier and later delivery windows (before 9am and after 5pm), but it safe to assume that there are deliveries falling within those time frames as well. However, those numbers have been excluded from these estimates. Table 5 shows the estimated numbers of delivery vehicles at each site per hour and per day.

<table>
<thead>
<tr>
<th>Building</th>
<th># of delivery vehicles</th>
<th>double-parked (of total #)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solaire</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Apthorp</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Gehry</td>
<td>11</td>
<td>7</td>
</tr>
<tr>
<td>Lyric</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
<td><strong>20</strong></td>
</tr>
</tbody>
</table>

Table 4, Delivery Vehicles (Frequency and Double-Parking), Weekday 2pm-5pm
<table>
<thead>
<tr>
<th>Building</th>
<th># of delivery vehicles per hour</th>
<th># of delivery vehicles per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solaire</td>
<td>2</td>
<td>16</td>
</tr>
<tr>
<td>Apthorp</td>
<td>1.33</td>
<td>10.6</td>
</tr>
<tr>
<td>Gehry</td>
<td>3.66</td>
<td>29.3</td>
</tr>
<tr>
<td>Lyric</td>
<td>3</td>
<td>24</td>
</tr>
</tbody>
</table>

Table 5, Total Numbers for Delivery Vehicles in Study Areas (per hour/per day)

As we could have easily predicted, a building with a higher volume of residential units is more likely to produce more delivery trips. According to these numbers, over the course of the day a residential building with 163 units (the Apthorp) will generate approximately 11 delivery vehicle trips per day, and a residential building with over 900 units (Gehry) will generate approximately 30 delivery vehicle trips per day. However, it must be noted that these delivery vehicle trips cannot be solely identified with the residence buildings as these vehicles were typically delivering parcels to other establishments in the immediate area as well. The areas under observation had a multiplicity of retail, commercial, and other high-density residential buildings in the immediate vicinity (with the slight exception of the Solaire which only had a limited number of retail stores), so the delivery generation rates are compounded by the additional delivery points. The Lyric and the Solaire each have very similar residential unit numbers (285 to 293 respectively), but the Lyric had more delivery vehicles park in the study area. This is most likely due to the more predominant mixed-use facilities surrounding the Lyric. It takes much more time, effort, and volume (trucks) to deliver multiple packages to multiple destinations instead of multiple packages to one destination. Thus, the delivery
vehicles affected the immediate study area surrounding the residential buildings, even if a specific delivery was not targeted for the residence.

Also, by the very nature of “last-mile” and “just-in-time” deliveries, many of the trucks are not filled to capacity and thus generate more trips as they shuttle back and forth between their delivery pick up points and their destinations (Gevaers et al. 2009). This means the same vehicle can sometimes deliver to the same building/area two or more times during the day – an observation that was witnessed more than once.

**Safety Issues**

The measurement of how safe a neighborhood is can be extremely subjective. In any particular location, there are numerous factors at play that can have significant effects on “quality-of-life” issues which can be determinant upon such things as level of crime, general safety, adequate sanitation, poor air quality, proximity to large transportation infrastructures (rail yards, rail lines, interstate highways) and proximity to heavy industry (Lindholm 2010; Litman and Burwell 2006). For the purposes of this particular study, two observable phenomena were recorded in an attempt to measure some of the surrounding effects of personal and delivery vehicles in residential neighborhoods. 1) The number of speeding vehicles on the low-volume residential streets by all motor vehicles, and 2) the number of times the visibility of pedestrians and/or bicyclists was fully or partially obstructed from
safely crossing intersections (crosswalks) because of the parking habits of delivery truck drivers. In other words, if a delivery vehicle parked close to a crosswalk (or sometimes on) and it adversely affected pedestrians and/or bicyclists in their attempts to cross the street safely, this was tallied as an “obstruction of the sidewalk”. In many instances, pedestrians or bicyclists were hesitant to cross and had to peek around a delivery vehicle in order to ascertain whether a crossing would be safe.

Photo 3, Delivery Trucks Obstructing Pedestrian Visibility with Pedestrians Crossing on a Red Light Photograph by Author

This phenomenon occurred on both green light and red light crossings. When the overall width of a residential street is small enough to cross in less than 10 seconds, there is a tendency for pedestrians and bicyclists to cross on a red light. This based on their ability to see the patterns of oncoming vehicles. When there are no vehicles or they are far enough away, pedestrians and bicyclists will cross. On a large eight-

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With a road having no center median, this would present an obvious safety issue in crossing the street. In New York City where pedestrians are more likely to cross the street on a red light when they have determined the “coast is clear”, having large vehicles obstruct their path of visibility could clearly affect their ability to properly judge the “relative safety” of a red light.

<table>
<thead>
<tr>
<th>building</th>
<th>safety (speeding vehicles)</th>
<th>obstruction of crosswalk(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solaire</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Apthorp</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Gehry</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Lyric</td>
<td>4</td>
<td>6</td>
</tr>
</tbody>
</table>

*Table 6, Relative Safety of the Study Areas Based on Vehicular Speeding and Obstructions to Visibility for Pedestrians (3 hour interval)*

Based on the criteria mentioned above, Table 6 shows the number of speeding vehicles (all types) and visual obstructions to pedestrians and/or bicyclists generated by parked delivery vehicles. Table 7 uses the numbers in Table 6 to estimate what the scenario over an 8-hour day (9am - 5pm) might look like. This estimated time frame coincides with the delivery vehicle schedule established in the previous section of this chapter.
### Table 7, Relative Safety of the Study Areas Based on Vehicular Speeding and Obstructions to Visibility for Pedestrians (per day)

<table>
<thead>
<tr>
<th>Building</th>
<th>Safety (Speeding Vehicles)</th>
<th>Obstruction of Crosswalk(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solaire</td>
<td>2.6</td>
<td>2.6</td>
</tr>
<tr>
<td>Apthorp</td>
<td>5.3</td>
<td>2.6</td>
</tr>
<tr>
<td>Gehry</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Lyric</td>
<td>10.6</td>
<td>16</td>
</tr>
</tbody>
</table>

The data and estimates for levels of safety are admittedly very subjective and somewhat difficult to interpret. The Solaire is located in an area without heavy vehicle, foot traffic or retail services thus the observations were skewed to the low end. The Lyric, on the other hand, had a much higher volume of both speeding vehicles and obstructions. This could be attributed to its location near the 96th Street access point to the Henry Hudson Parkway and its proximity to Broadway, which has heavy vehicle and foot traffic. However, the environment around the Apthorp has many characteristics that are very similar to the Lyric (high vehicle and foot traffic), but the recorded numbers are very different. Any conclusions drawn from this data would be extremely speculative, but as the numbers from the Lyric suggest, visual obstructions resulting from parked delivery vehicles can occur regularly. Something of this nature, which can adversely affect the safety of pedestrians and bicyclists, must be taken into account when thinking about how we plan for our street environments. One misplaced vehicle can be enough to create safety problems for numerous individuals.
2) **Doormen Interviews:**

In order to ascertain whether or not there has been a marked increase in package deliveries to residential buildings it would be ideal to have itemized records from the past and the present in order to compare the actualities. However, even if the records existed from previous decades it would still be difficult to obtain access to the current databases of residential buildings for obvious privacy and proprietary reasons. As previously mentioned, Boyer et al. (2009) found that online shopping has increased nearly 25% per year for the past 10 years. The trend appears to be true in many European countries as well. For instance, between 2011 and 2012, England’s online retail sales increased 14% (Guardian 2012). For the purpose of this study, interviews with doormen were geared towards finding out whether or not this purported increase in online sales could be affecting the storage rooms in residential buildings. When deliveries are made to large residential buildings in Manhattan, typically the doorman will sign for the package, inventory the item (via computer program or handwritten list), and then place the package in a storage room where it will wait until the resident returns in the evening. There are many ways in which residents retrieve their packages. For instance, in some buildings the doormen will simply mention that a resident has a package when he/she passes through the lobby. Other buildings have a computer system that will notify the resident by email when they have a package at the front desk (one such system is called BuildingLink). If, according to the recent data that indicates an increase in
online sales, then the storage rooms where the packages are kept should have less available space in them.

Ten (10) doormen were interviewed about their particular experiences with package deliveries and to obtain their qualitative assessment of how crowded their storage rooms were. The residential buildings/doormen selected for interviews fit many of the same criteria as the initial buildings selected for observations (high-density, located on a side-street near a larger access/collector road), but there were a few notable differences. First, buildings were chosen in order to compare older buildings (pre-war) with newer buildings (1980 – present). The assumption being that older buildings were more likely to have smaller spaces allocated to the storage of packages, whereas newer buildings could potentially have more space allocated because of a design response to recent historical trends. Five (5) of the ten (10) doormen worked in buildings that predated 1929, whereas the remaining five (5) worked in buildings that post-dated the year 1982. Secondly, a few of the selected buildings contained fewer than 150 dwelling units. However, these buildings were still located within areas of high-density residential concentration and also had a high FAR for their relative size.

In every instance the individual buildings had a space designated for the storage of packages. However, most of the doormen did not indicate the specific size of their storage room (or allow a visit to the chamber). Nearly all of the doormen indicated that they received multiple deliveries throughout the day from the same delivery
company. For instance, UPS might deliver in the morning as well as the afternoon. Doormen from buildings with a very high number of residential units (200 or more) mentioned that the number of times an individual delivery company would deliver seemed somewhat erratic. But doormen from buildings with a smaller number of residences (100 or less) seemed to have consistency and usually followed the morning and afternoon dual delivery schedule. Only one doorman indicated that a specific delivery company only stopped by once during the day. In his opinion it was infrequent that a company like the United States Postal Service would deliver more than once a day. Not surprisingly, this particular building had the fewest residential units.

Table 8 shows the build year and indicates whether or not the doorman from that building felt that the storage of packages was a problem (or becoming a problem).

<table>
<thead>
<tr>
<th>building</th>
<th>year built</th>
<th>Are there storage problems w/ delivery packages?</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2011</td>
<td>&quot;no&quot;</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>2008</td>
<td>&quot;no&quot;</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>2000</td>
<td>&quot;no&quot;</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>1991</td>
<td>&quot;decent, but frequent overflows&quot;</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>1983</td>
<td>&quot;starting to get tight&quot;</td>
<td>packages in the lobby</td>
</tr>
<tr>
<td>F</td>
<td>1928</td>
<td>&quot;yes, especially around the holidays&quot;</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>1927</td>
<td>&quot;yes, it overflows all the time&quot;</td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>1926</td>
<td>&quot;no&quot;</td>
<td>multiple packages in the lobby</td>
</tr>
<tr>
<td>I</td>
<td>1920</td>
<td>&quot;not too much trouble&quot;</td>
<td>overflow packages on table</td>
</tr>
<tr>
<td>J</td>
<td>1912</td>
<td>&quot;no, never&quot;</td>
<td>packages in elevator</td>
</tr>
</tbody>
</table>

Table 8, Building Year and Doorman Responses to Storage Issues
As the table indicates, the most recently constructed buildings claim to have no issues, whereas the buildings from 1991 and 1983 indicated some issues with the amount of storage space available. The pre-war buildings were much more problematic in that three of the five doormen claimed that they had no problems with their storage rooms. But in two of those situations there was physical evidence that seemed to contradict the doormen’s claims – excess packages were huddled in the corners of the lobby. When asked about those extra packages, one of the doormen responded “Oh, that’s normal”. And, the doorman who claimed that they never had any storage issues (Building J) revealed that their storage room was actually the freight elevator. These contradictory responses could be attributed to a “business-as-usual” scenario that has simply become the way in which things are done based on the particular limitations of a building. After all, it is quite difficult to modify a 100-year-old building in order to accommodate for the changing needs of a different era (or multiple eras).

3) **Building Management Interviews:**

As a corollary to the interviews with doormen, two (2) interviews with representatives from building management companies were undertaken. The two companies interviewed managed both older and newer buildings (following the previous criteria set up for the doormen interviews). One representative claimed that some of their older buildings were definitely having issues with storage space. This same individual actually attributed it to more online orders from the residents,
“They must be ordering more stuff online, and during Christmas its utter chaos” (Interview #1). During the holidays they usually expected three times the amount of packages. Even some of their buildings constructed in the 1980’s were beginning to feel cramped for storage space. The second representative (Interview #2) reaffirmed these assumptions as well. However, he also indicated that some of their buildings had a system that allowed for the management to place delivered goods (packages or groceries) into the residential units while the residents were away (at work, school, and so forth) - so long as the resident signed a waiver allowing the company to do this. This mitigated some of the storage issues, but the company still required a space in which to stage the items while the doorman/concierge organized and subsequently distributed them. According to the representative, not all of the residents were comfortable with the process although many regarded it as a very convenient luxury.

When asked about whether or not they had off-street or on-street loading facilities, one representative indicated that they had off-street loading facilities for one of their newer residential buildings. However, the representative indicated that those loading dock facilities were limited for use by larger vehicles (moving vans, heavy construction) and not the everyday small package delivery vehicles. Both mentioned that some off-street parking areas are present in a few of their managed buildings that contain large commercial or retail. Neither of the companies could indicate specifically if there were on-street loading zones located near the buildings they managed.
ANALYSIS

The main analytical framework for this research study (looking at instances of double-parking and crowding of storage rooms) was employed as a way in which to examine whether or not “last-mile” deliveries to high-density residential areas in Manhattan could be adversely affecting these locations. Although the methodology is limited in its scope and by no means can it conclusively argue that this phenomenon can be fully explained by looking at double-parking or package rooms alone, what this analysis is meant to reveal is that “last-mile” deliveries can, and do, generate impacts in these densely populated residential areas. These impacts have been recognized in Central Business Districts for years (ie. the various policy mechanisms and physical remedies employed in Midtown Manhattan), and the growing trends in logistics technology, online shopping, and personal travel choices could be facilitating this change in other high-density areas. Also, because residential areas have a high volume of people that includes a wide spectrum of the population (young, old, and families - not just “workers”), this study looked at how delivery vehicles can adversely affect the safety of these residents. A key element that defines “quality-of-life” in a neighborhood is how safe that area is. Are the streets safe to cross? Are vehicles obstructing crosswalks? Are speeding vehicles a constant threat? If delivery vehicles can compromise the safety of pedestrians and cyclists, then the “quality-of-life” for those residents (and others) will be diminished significantly.
Although it was beyond the scope of this project to accurately measure the levels of congestion in the study areas, this research paper assumes that double-parking will have an adverse effect upon traffic flow. In areas of high population density the likelihood of high concentrations of motor vehicles is pretty much a given. And under these circumstances, it is generally accepted that “concentrations of traffic and motor vehicles in urban areas cause negative externalities, including congestion, air pollution, and a range of health and social problems” (Melia et al. 2011, p. 46). Melia et al. (2011) also argue that although high-density urban areas have the benefit of reducing overall personal automobile travel, local traffic in these areas will more than likely increase. Double-parking only exacerbates the traffic issue.

1) **Curb Space & Double-Parking**

There are many different uses that compete for curb space – traffic lanes, bus stops, automobile parking, delivery vehicles, and taxi loading zones - to name some of the more prevalent ones. But as Chatterjee et al. (2008) mention, when there is a massive confluence of the competing elements, there needs to be organized restrictions placed upon the curb space and priorities assigned to the various uses. Automobiles typically have more alternatives to park (parking lots and garages), but delivery vehicles are quite limited in where they can park especially if there are no off-street or on-street facilities available for them. In these instances, more often than not, delivery vehicles will resort to double-parking.
In a 1985 study of curb space sharing in San Francisco, Habib described the “felicitous sequencing of curb space needs in which commuter, delivery and shopping demand fit neatly into different time segments during the business day” (Habib 1985 in Pivo et al 2002, p. 15). In this scenario, the use of curb space by three different modes (traffic/commuters, freight, and shoppers) seemed to follow conveniently arranged peak utilization periods. This observed phenomenon supported the policy framework for allocating curb space at certain time periods during the day as required by these different activities.

![Graph 1](image)

**Graph 1, San Francisco Curb Space Use Observed by Habib (1985)**

Source: Pivo et al. 2002

However, based on more recent information collected from delivery truck drivers in Seattle, this convenient graph no longer explains the delivery scenario. According to the drivers, delivery vehicles now require more available curb space consistently throughout the day in order to deal with the increasing number of deliveries. As exemplified through a reworking of Habib’s graph (Graph 2), perceptions and
observations by the delivery drivers indicate the curb space allocation need for delivery vehicles as increasing from 7am to 9am, plateauing until 5pm and then decreasing into the evening hours (Pivo et al. 2002). Although speculative, these changes in delivery truck curb allocation need could indicate a relationship to recent innovations in “last-mile” deliveries, “just-in-time” deliveries and the potential increase in goods delivered as a result of Ecommerce.

The lack of available curb space can have two significant results – a driver could be forced to circle the area until an available spot is found or simply double-park close to the desired point of delivery. Either scenario creates negative externalities that can be felt within the localized neighborhood as well as the greater region. These externalities can include an increase in pollution, more VMT, noise, and congestion. Although by no means a precise indicator of the cumulative externalities, for the purposes of this study, the frequency of double-parking was identified as a potential significant contributor to these negative factors. The overall effects of double-
parking depends on the size and capacity of the street involved, but taken at face value it can be argued that double-parking effectively removes a driving lane from use. Double-parking can stop the entire flow of traffic on a small residential street where passing becomes impossible, or it can render a lane useless and force traffic to slow down to avoid the obstructed lane on much larger collector/arterial roads (such as Broadway in Manhattan).

As indicated earlier in Table 4 (in the results/findings section), nearly two thirds \((2/3)\) of the total number of delivery vehicles (for all locations) were double-parked. If we extrapolate further utilizing the information in Tables 3, 4 and 5, it could be estimated that the number of double-parked delivery vehicles at each site over the course of a day would be as follows:

<table>
<thead>
<tr>
<th>building</th>
<th># of double-parked vehicles per day</th>
<th>Total duration of vehicle lane occupation ((x's 21.5 \text{ minutes})) per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solaire</td>
<td>10.6</td>
<td>227.9 mins</td>
</tr>
<tr>
<td>Apthorp</td>
<td>7.1</td>
<td>152.65 mins</td>
</tr>
<tr>
<td>Gehry</td>
<td>19.5</td>
<td>419.25 mins</td>
</tr>
<tr>
<td>Lyric</td>
<td>16</td>
<td>344 mins</td>
</tr>
</tbody>
</table>

Table 9, Estimated Number of Double-Parked Delivery Vehicles (per day) and the Total Duration of Vehicle Lane Occupancy (per day)

Table 9 also indicates the estimated total number of minutes per day in which double-parked vehicles would be occupying valuable lane space. The numbers in Table 9 were generated by multiplying the estimated number of double-parked
vehicles per day (at each site) by the average duration of stay (21.5 minutes – see Table 2). In the extreme case of the Gehry building, this would indicate that for nearly seven (7) hours of the day a delivery vehicle is occupying space that is not officially designated for parking. Even the Apthorp, with the smallest total number would generate an occupancy spectrum of over two and a half (2.5) hours. These numbers indicate that the potential for vehicular congestion in these areas would be remarkably high, especially in locations that are already inundated with traffic. In the case of Midtown Manhattan where this issue has been present for over a century, extreme measures had to be taken to mitigate the congestion issues. What these numbers suggest is that the “artifacts of density” normally associated with downtown CBD’s (higher truck volumes, congestion, and so forth) could now be affecting other areas not typically associated with these problems.

However, the estimated numbers from Table 9 can be somewhat misleading because in the case of the Solaire there were no actual instances of double-parking. Much of this has to do with the nature of its isolated location in Battery Park City – it is far removed from the chaotic traffic patterns of the other locations, there are fewer mixed-use/retail services in the immediate area, and it is bordered by a waterfront park. All of these exogenous factors add to the relative ease in which delivery vehicles can park in this area. Of the 4 buildings, only the Solaire and the Gehry building had designated on-street loading zones nearby (both had 5). The other two locations (the Lyric and the Apthorp) had none. Even though the Gehry building has a significant number of loading spaces, because of the frequency of
illegally parked private automobiles that occupied these spaces, the delivery vehicles were forced to double-park. The Solaire also had a number of illegally parked vehicles in their designated loading zones, but this problem was somewhat mitigated by a large area of vacant curb space in the immediate vicinity (this was a no-parking zone that the delivery vehicles utilized frequently). As for dedicated off-street loading spaces, none of the buildings under observation had any. The geographic limitations on an island such as Manhattan, where space is held at a premium, contraindicates off-street parking in most instances. Even so, according to one building management representative, in the case of their newer buildings designed with off-street loading zones/docks, those areas were off limits to package delivery vehicles. Access to these loading areas was only given to construction/service vehicles or moving trucks bringing in or taking out resident’s belongings.

As already indicated, the average time that a delivery vehicle remained parked was around 21.5 minutes. Technically, it is legal to double park in Manhattan “during such hours that stopping, standing, or parking is not prohibited, while expeditiously making pickups, deliveries or service calls, provided that (1) there is no unoccupied curb space within 100 feet on either side of the street that can be used for standing, and (2) that the standing is in compliance instructions from police officers and flagpersons” (New York City Traffic Rules 2012). This seems to be a reasonable guideline, but one that is frequently stretched.
2) **Correlations**

As mentioned previously in the results/findings chapter, it seemed highly likely that a larger residential building (more units) would receive more delivery vehicle trips than a smaller residential building (fewer units). But in order to confirm this assumption, a simple correlation between the two variables was measured to see how they were related. Table 10 shows the estimated number of delivery vehicles per day and the total number of residential units for each of the four buildings.

From these variables, the correlation coefficient was calculated, which measures the strength of the linear relationship between the two variables. In this instance, there is a strong positive correlation between the number of delivery vehicles and the number of residential units per building. Or rather, as the number of residential units increases, the number of delivery vehicles will also increase.

<table>
<thead>
<tr>
<th>building</th>
<th># of delivery vehicles per day</th>
<th># of residential units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solaire</td>
<td>16</td>
<td>293</td>
</tr>
<tr>
<td>Apthorp</td>
<td>10.6</td>
<td>163</td>
</tr>
<tr>
<td>Gehry</td>
<td>29.3</td>
<td>903</td>
</tr>
<tr>
<td>Lyric</td>
<td>24</td>
<td>285</td>
</tr>
</tbody>
</table>

**Correlation Coefficient** 0.827890645 (Strong Positive Correlation)

**Table 10.** Estimated Number of Delivery Vehicles (per day) and the Total Number of Residential Units, with Correlation Coefficient

But what does this really mean? In urban areas where there is already a multitude of vehicles, adding more to the mix only results in more traffic congestion. Although
high-density areas do have the benefit of reducing overall personal automobile travel, these areas will still have high traffic levels because of limited space and high levels of activity. Smart Growth policies promote the idea of greater density because of the many positive externalities that are generated from these principles. In New York City, the current administration is very proactive in thinking about how to deal with the population increase that is estimated to take place by 2030 (900,000 “new” New Yorkers). PlaNYC specifically mentions that 95% of the capacity (housing) for these new residents “would be created within a half-mile of mass transit, reaffirming the urban values of efficiency, mobility, and environmental responsibility” (PlaNYC 2007, p. 19). Based on their projections, the city determined that it would need to increase the housing supply by 500,000 units. So, over the course of approximately twenty years, more than 2,000 new residential units would need to be built every month to make up for this housing shortage. This would mean two buildings roughly the size of “New York by Gehry” would have to be constructed near a transit stop every month for twenty years. Although it is unlikely that anyone, including Frank Gehry, would be able to accomplish such a feat, what this example indicates is the immensity of PlaNYC’s development proposal.

But if we consider that the city wants to build transit-oriented developments of this nature, then there will be complications resulting from the number of delivery vehicles that would be serving these new buildings. If Manhattan were to increase residential density around its subway stations, then residents would have better
access to transit. However, based on the positive correlation between delivery vehicles and number of residential units, it would also increase the likelihood of more delivery trucks, more congestion, and more “quality-of-life” issues (ie. safety and others). Although the city is making a concerted effort to follow Smart Growth and transit-oriented development principles, currently there is no consideration for how this growth will affect the managed chaos of “last-mile” deliveries in Manhattan.

Another interesting correlation is between the number of double-parked delivery vehicles and the number of available on-street parking spaces (metered and un-metered) in the study areas. As seen in Table 11, there is a strong positive correlation between these two variables, indicating that as the number of on-street parking spaces increases the number of double-parked delivery vehicles also increases. To most people this would seem counterintuitive – if there are more parking spaces in an area, wouldn’t this larger number increase the chance of a delivery vehicle finding a parking space? Shouldn’t double-parking decrease? But this doesn’t appear to be the case. A possible explanation could be that a large number of parking spaces actually attract more vehicles, thus making it more difficult to find parking spaces that are “open” or “available”. In fact, if we take into account that residential streets in Manhattan must have “free” on-street parking (meters are not allowed on these streets), then it makes sense why delivery vehicles would find it harder to park. Residents are taking advantage of this luxurious
misallocation of curb space and severely limiting the possibility that delivery vehicles could actually use the curb.

<table>
<thead>
<tr>
<th>building</th>
<th>double-parked (of total #)</th>
<th># of parking spaces (on-street)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solaire</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>Apthorp</td>
<td>4</td>
<td>26</td>
</tr>
<tr>
<td>Gehry</td>
<td>7</td>
<td>20</td>
</tr>
<tr>
<td>Lyric</td>
<td>9</td>
<td>29</td>
</tr>
</tbody>
</table>

**Correlation Coefficient** 0.794506095 (Strong Positive Correlation)

Table 11, Number of Double-Parked Vehicles (3 hour intervals) and the Total Number of On-Street Parking Spaces, with Correlation Coefficient

Of the total number of on-street parking spaces in the study areas (87), only 9 of those spaces were metered (Muni-meters). This includes residential side streets as well as larger commercial corridors (like Broadway). Given that 90% of the parking spaces in the study areas are free (thus, highly desired by residents) and sees little turnover apart from the few hours a week when there is street-sweeping, it is no wonder that delivery vehicles are relegated to “inventing” their own parking spaces (double-parking). There is very little accommodation made for delivery vehicles, and even when Muni-meters are available, there are a number of disincentives as to why delivery drivers wouldn’t use them. First of all, the size of the trucks usually makes it difficult to park, and the drivers are fearful of being unable to “escape” from the parking space (being “boxed-in”). And secondly, there is a perceived level
of unfairness - why should they have to pay when there is so much free parking that is “available” to personal vehicles?

Of course it must be noted that the small sample size within this study limits the strength of the two correlations (Tables 10 & 11), but these correlations still raise significant questions that need to be addressed in one way or another. A further exploration into the relationships between these variables would help to solidify the findings and analysis presented here.
3) **Photographic Evidence**

Although the following photos are not necessarily specific to the sites studied, they are indicative of the unique double-parking practices in Manhattan.

![Photo 4. Double-parked Delivery Truck with Available Curb Space](image)

In Photo 4 there is a large area of open curb space, yet the vehicle is double-parked. Although double-parking is technically legal according to the New York City Traffic Rules (§ 4-08 f1), if there is available curb space within 100 feet, then it becomes a violation. However, due to the size of their vehicles, drivers frequently choose to double-park for accessibility and maneuverability purposes - even when there is potential curb space. This is usually due to the potential threat of being blocked in
by other vehicles that might double-park or by the limited maneuverability the trucks would have in a parking spot designed for smaller vehicles. The proximity to delivery destinations and easy access to a convenient source of parking is crucial to delivery drivers (Pivo et al. 2002; Morris 2009; Chatterjee 2004). In many instances this translates into a driver utilizing the available space located in a driving lane.

![Photo 5](image)

**Photo 5, Multiple double-parked Delivery Trucks with Available Curb Space**

*Photograph by Author*

*Note: There is actually a lineup of 5 double-parked delivery vehicles (the fifth is barely visible in the distance), with available curb space unoccupied.*

One of the requirements set up in the methodology was that the residential buildings needed to be in somewhat close proximity to a major collector (or
arterial) road. On an anecdotal level, a majority of the delivery vehicles observed utilized the larger roads to park/double-park. Given the nature of these larger roads – they have multiple lanes – there is a greater opportunity to double-park as the additional lanes compensate for the lane blocked by the delivery vehicle. In the case of smaller residential roads that tend to be 25-45 feet in width (with parking on either side), a delivery vehicle that is double-parked will render the street impassable. However, there is a paradox at play: these residential roads have fewer vehicles that use them so even if a delivery vehicle obstructs them for up to 5 minutes, there is the potential that this would still cause less congestion than if the trucks were similarly double-parked on the larger collector roads. On these larger roads there is a higher volume of vehicles, thus, there is the potential to affect a greater number of vehicles over a larger area.
In Photo 6, it is clearly visible how a double-parked delivery vehicle can obstruct a lane forcing the vehicles behind it to merge into a lane that is not obstructed. This process slows down traffic and causes congestion. In terms of traffic throughput this is not advantageous, but perhaps if looked at another way, this could indirectly create traffic calming measures that might make the area safer for pedestrians. However, the size of the vehicle and the resulting sightlines can be restrictive for safe crossing of the sidewalks. This particular location (Photo 6) was near the Lyric. As previously shown in Tables 5 and 6, the Lyric had the highest occurrence of crosswalk obstructions. A few people trying to cross the street (against the light,
mind you) made the decision to peek out past the truck to see if it was ok to cross. This is not legal nor is it safe, but it is indicative of some of the crossing habits of New Yorkers. To not address it would be shying away from what actually happens.

![Photo 7, Double-parked Delivery Truck Blocking Traffic on a Small Residential Side Street](image)

Photo 7 is indicative of the traffic problems that are created by double-parking on a side street with limited lane space. In this instance there was enough space to drive the blocked vehicle around the truck, but assistance was required to maneuver it. The whole process delayed the automobile for approximately 5 minutes.
4) **Package Rooms**

For the purpose of this paper, one of the main assumptions concerning package rooms is that the size of these storage areas was most likely determined by the overall trends in package delivery during the time that the building was constructed. If there were an inherent need, then the owners and/or architects would be more than likely to incorporate the additional space within a building. For instance, according to one of the building management representatives interviewed (Interview #2), in one of their older residential buildings they found it necessary to renovate the lobby area to create a larger package/storage room. This was accomplished by removing a portion of an existing rental unit. The loss of square footage for the unit resulted in an obvious loss in rental price. In a building that has not gained any residential units for over 80 years, there must be some sort of precedent that would require such an alteration? The assumption held in this situation is that it could be attributed to the need for more space to accommodate delivery packages, as these are what the rooms are primarily used for.

As mentioned in the results section, two of the five doormen who worked in pre-war buildings claimed to have storage issues. The other three claimed to not have any issues, but through additional questions and observations it could be argued that they actually were inundated with packages (see Table 8). Of the three doormen interviewed whose buildings were all built since the year 2000, all of them mentioned that they did not have any current problems with capacity. One
doorman (Building A) made the comment, “They did a pretty good job designing the place. They took a lot of things into account”. Although visiting the rooms was not possible under the circumstances, there was no evidence to contradict their claims – as was witnessed in the older buildings (overflow into the lobby, use of other rooms/elevators). However, the other two post-war buildings (1983 & 1991) were somewhat on the verge of being overly affected (“Starting to get tight”, Building E). Following the assumption made about package rooms and their design, these two buildings do fall into that transitional realm where logistics innovations were beginning to gain serious momentum (“just-in-time” deliveries), but the internet was “virtually” unknown.

This small sample size is by no means conclusive on the issue and can only be used anecdotaly, but does seem to follow the general trend assumed here. Further analysis on the issue would really need the cooperation of building management companies and a larger sample size to really indicate if there was a connection. However, based on the statistics regarding the growth in online shopping for the United States and most of Europe, it seems likely that this could be a contributing factor.
5) **Research Questions**

Based on the results of the study and the initial analysis presented above, responses to the three proposed research questions are as follows:

1) What are the incidences of double-parking (by delivery vehicles) on high-density urban residential streets in New York City and how long are the average occupancies?

The instances of double-parking and the duration of occupancies indicate that this is a significant phenomenon occurring in the study areas (see Table 9). The average time of occupancy for parked delivery vehicles was 21.5 minutes and two thirds (2/3) of all delivery vehicles in the study areas double-parked. Both of these numbers (rate and time of occupancy) suggest that associated impacts upon the surrounding environment and its inhabitants must also be present. Evidence of these associated impacts is well documented in the academic literature (Melia et al. 2011; Morris 2009).

2) Is storage room capacity (for delivery packages) in residential buildings sufficient or are there indications to the contrary?

It would appear from the study sample that the design of newer buildings has taken into account the growing number of delivery packages to residential buildings.
Older buildings are more likely to be affected because of antiquated storage rooms that do not meet the present day requirements. These “requirements” are of course very subjective. It is also very difficult to determine what guidelines, if any, that current buildings use to design their storage rooms. But based on these observations it could be beneficial to establish some baseline criteria for incorporating storage room “size” requirements into building design. However, this would only apply to high-density buildings with doormen. Smaller buildings without doormen present a different challenge - one of repeated delivery failures. When no one is present to receive the packages, this results in multiple trips for the delivery truck and adds to the negative externalities generated by delivery vehicles (Gevaers et al. 2009; Melia et al. 2011). Although this phenomenon was not explored in detail for this study, it can be another significant generator of “quality-of-life” issues in residential areas for the obvious extra trip generations that it produces. The private sector’s introduction of Amazon Lockers is an attempt to address this issue and one that could help to alleviate some of the negative externalities associated with “last-mile” deliveries. Even though this is a response that is more concerned with the operational costs of businesses, it does have the additional benefit of concentrating package deliveries. The drawback is that it has the potential to generate more personal trips for customers. However, at this point it is difficult to say what the resulting trip generations will produce.
3) What “quality-of-life”/safety issues are created by “last-mile” deliveries on high-density urban residential areas in New York City?

This is a very complex subject with many contributing variables that can all affect the “quality-of-life” within a particular neighborhood. The negative externalities generated from high levels of traffic (congestion, air pollution, noise, safety issues, and health/social problems) work in tandem to create both measurable and immeasurable effects on the landscape and its inhabitants. Of the wide spectrum of elements that determine "quality-of-life", safety is a crucial component. Over the course of this study, there were noticeable issues of safety that were generated by delivery vehicles. By introducing high concentrations of delivery vehicles (consistently) throughout the day in a dense residential area, the likelihood of these safety issues and other associative negative externalities occurring will undoubtedly escalate unless measures are taken to alter or mitigate these side effects. With the evidence of increasing levels of online/internet consumption, the high levels of double-parking within the study areas, and the anecdotal patterns of package storage in Manhattan’s residential buildings, the preliminary evidence seems to support that (in this context) “last-mile” deliveries could be contributing to the negative externalities within these high-density residential areas. Although this research was more exploratory in nature, further studies on the issue would clearly benefit from more extensive quantitative and qualitative studies that look at the cumulative effects associated with delivery vehicles – congestion modeling, particulate matter counts, residential surveys, and others.
DISCUSSION

One of the most pressing issues for planners should be the growth of freight that is projected to occur nationwide and worldwide. A 2009 research brief by the Rand Corporation states,

“For years, the improved reliability and low cost of freight transportation in the United States have kept supply-chain costs low; supported new business approaches, including distributed, on demand manufacturing and just-in-time inventory models; and boosted economic productivity. This efficiency is threatened. Projections indicate that insufficient capacity in the system, especially in urban areas (emphasis added), will begin to limit freight movement within the next 15 to 25 years and that congestion may be severe after that” (Hillestad et al. 2009, p. 1).

The Texas Transportation Institute’s (TTI) 2012 Urban Mobility Report even admits that, “new capacity to handle freight movement might be an even larger need in coming years than passenger travel capacity” (Lomax et al. 2012, p. 15). Most of the research focused on large-scale freight movement indicates that the United States is ill prepared for all of the infrastructure requirements and upgrades that freight sector growth will require. Many research organizations stress the importance of addressing issues with the large networks, distribution centers, ports, freeways, and rail lines, but little attention gets paid to the localized effects/problems that are also bound to occur with a growth in the sector. If more goods are moving through the entire network, their final destination points are just as important as the freeways that carry them there. The chart below, produced by TTI, shows the percent of delay (due to congestion) for all road types across the United States.
As Chart 2 indicates, the greatest percentage of delay occurs during peak-hour travel on streets – not freeways. Also interesting to note is that delay for off-peak streets is only three percentage points below peak freeway delay. This indicates that our local streets are taking the brunt of congestion delay. So, if we are to address the daunting issue of congestion in our urban streets we need to acknowledge the forces that are contributing to it. “Last-Mile” delivery vehicles are just such a force. Even the Federal Highway Administration has stated that, “a significant amount of city gridlock can be attributed to restrictions on freight movement, like a lack of space for trucks in cities” (Nichols 2013, p. 1). This “lack of space” results in a very noticeable trend – double-parking. And double-parking fuels congestion in dense areas.
1) The Uniqueness of “Last-Mile” Residential Deliveries

So why is it important to think about “last-mile” deliveries in high-density residential areas, and how is it different from delivering to retail or commercial areas? There are two aspects of residential deliveries that make it unique. First of all, the deliverables need to get to the residents themselves either through the proxy of a doorman, or actual physical handoff to the recipient. In a dense city where leaving a package near a doorway, on a stoop, or in any other unsecure area can make it a target for theft, there is a need to ensure the final customer that their package will be safe. In the absence of a doorman, this usually translates into a failed delivery notice, which either requires additional delivery visits to finally unload the package or the customer must go to a distribution center to pick up the package for themselves. By the nature of where logistics companies site their distribution centers, this typically means travelling to the outskirts of the city. However, with the introduction of alternatives such as Amazon Lockers – where package delivery storage lockers are sited in convenience/office supply retail stores - this makes for a more accessible pick up point for the customers who would have otherwise been required to schedule an alternate delivery time or make a trip to the distribution center themselves. Residents that do not have doormen are also much more limited as to when rescheduled deliveries could take place. Residential availability is dependent on work or school schedules, which also happen to take place during the same daylight hours as delivery truck drop-offs.
As mentioned in the literature review, Amazon Lockers are a relatively new model in which to deal with the failed delivery scenarios and could present a shift towards delivering residential packages to concentrated locations. However, in large residential buildings with doormen and package rooms, this would most likely be perceived as an inconvenience as those residents might feel that they already have such a service located in their own building.

Secondly, there is a strong temporal restriction as to when deliveries can occur. If congestion reduction in an urban environment is our ultimate goal then delivering goods in off-peak hours – such as late at night – is ideal. Instead of a “demolition, bricks and mortar” approach to changing the buildable environment, the concept of Transportation Demand Management (TDM) looks at ways to influence drivers (personal or freight) to reduce travel during peak-period times and/or choose
alternative methods for doing so (in the case of personal travel this includes carpooling, changing work hours, and using available transit) (Morris et al. 1999).

In the world of freight movement this is typically referred to as Freight Demand Management. In fact, New York City’s PILOT program explored this type of freight delivery system to large retail locations. It has been rather successful and they are currently continuing to explore further options with it. However, this type of off-hours delivery program can only work for large retail businesses that can afford to maintain a 24-hour operation where someone is always available to answer the “door”. Smaller stores would find it very impractical and expensive to maintain someone on site all hours of the day. But more importantly, delivering to residential buildings would mean waking up the customers in the wee hours of the morning – a situation that would not go over so well. Although it may seem practical (and wholly possible) to deliver to high-density residential buildings that have doormen on duty all the time, this presents a logistical nightmare for delivery companies. They would have to deliver to the buildings with doormen during the night, and then to the non-doormen buildings during the day. In essence this would require them to increase their workforce (for the night shift) and basically double their fuel costs since they would be following many of the same routes both day and night. These economic disincentives are not in the least bit attractive to delivery companies who are always have to be very concerned about their bottom line.

Residential deliveries in urban areas are restricted by these two elements – where it has to go, and when it has to go – which limits the number of solutions to how their negative externalities can be managed.
2) **Compatibility, Safety, and Complete Streets**

The move within planning to include multiple modes of transportation within our streets – walking, bicycling, transit, personal vehicles, and freight – is a notable endeavor that will help to shift street planning away from the dominant auto-centric model that has been prevalent for so long. Especially in dense urban areas, the Complete Streets model gives a voice to otherwise marginalized transportation users. But “last-mile” deliveries can be somewhat problematic in this model because of the compatibility issues associated with them. Delivery vehicles are much larger than the average personal vehicle. Their physical size makes it more difficult for them to park and navigate the streets. And as mentioned before, their size raises safety concerns for pedestrians and bicyclists. Under their guidelines for “Trucks and Commercial Vehicles”, the NYDOT specifically mentions that these types of vehicles are more likely to obstruct the vision of pedestrians than any other environmental element (NYDOT website).
As Photo 9 displays, the pedestrian has entered the street and is peeking around the parked delivery truck in an attempt to ascertain whether it is safe or not to cross. This presents a safety issue in both “illegal” pedestrian crossings or even in situations where the pedestrians have the green light. The NYC Pedestrian Safety Study and Action Plan (2010) documented that 27% of crashes that kill or seriously injure pedestrians are caused by the driver’s failure to yield (NYCDOT 2010a, p. 6). In cases such as these, a large delivery vehicle that can obstruct a pedestrian’s and a driver’s vision only adds to the unsafe atmosphere. The same study also found that pedestrians and bicyclists are more likely to die if they are in a collision with a delivery truck - the case of “size does matter” (NYDOT 2010b, p. 21). And in Manhattan, the most densely populated of the five boroughs, pedestrians are four (4) times more likely to be killed than in any of the other boroughs (NYDOT 2010a).
What this indicates is that delivery vehicles can pose a serious threat to the safety of pedestrians and cyclists in both direct (collisions) and indirect ways (including delivery vehicles parked/double-parked near crosswalks). High-density residential areas are also more likely to have higher concentrations of children and senior citizens than in CBD’s, so the safety issues in residential locations are heightened by the presence of these two vulnerable groups. Whether or not it falls under traditional street planning or the new Complete Streets paradigm, both models need to be able to address the issue of how freight vehicles interact with the surrounding transportation modes in order to create a safer environment for all. The “quality-of-life” of the residents can be significantly compromised if these types of safety issues generated by delivery vehicles are not addressed.
Photo 11, Delivery Trucks Double-Parked Next to Bike Lane in Washington D.C.
Photograph by David Alpert (greatergreaterwashington.org)

Photo 12, Delivery Trucks Parked on Bike Lane in Los Angeles
Photograph by Ted Rogers (lastreetsblog.org)
Recently, local, regional and state governments have begun to include other modes of transportation when planning for their jurisdictions. Currently, 27 states, 42 regional planning organizations, 38 counties, and 379 municipalities have adopted Complete Streets policies (Seskin and Gordon-Koven 2013, p. ii). Much to their credit, the majority of Complete Streets policy documents tend to focus on integrating pedestrians and bicycles into the roadway networks. However, as indicated here, “last-mile” deliveries are a crucial component of city life that needs to be carefully planned for as well. If this component is left out of the Complete Streets equation it can result in the scenarios evident in Photos 11 & 12. In both instances, bicyclists have been given a dedicated path to ride in, but delivery vehicles have either taken over the space or they have been forced to double-park alongside the bike lane.

One of the most frequently cited reasons for adopting a Complete Streets policy is the resulting increase in safety for pedestrians and bicyclists (Tolford 2012, p. 8). However, it is apparent - especially in high-density areas – that “last-mile” delivery vehicles can negate some of the safety gains that Complete Streets policies are meant to address if these types of delivery vehicles are not part of the conversation. Currently, New York City seems unwilling to effectively act upon the issue of “last-mile” deliveries/double-parking as it relates to the congestion issue, but when the safety of its inhabitants is compromised, this should be a clear indication that something is lacking in the overall planning for goods movement. After all, 40% of crashes involving pedestrians occur in crosswalks (NYDOT 2010a). This is not to
say that delivery trucks are entirely responsible for this number, but the city should be concerned as to why this number is so high, especially in a designated area that is perceived as a safe haven for pedestrians.

3) **The Stipulated Fine Program**

As this research study has shown, double-parking is a widespread activity that can consume available traffic lanes for long periods of time, both individually and cumulatively. In a city of over 8 million people (all 5 boroughs), there are approximately 2,300 Traffic Enforcement Agents and 370 Traffic Enforcement Supervisors (NYPD website). Parking tickets can generate a hefty source of income for a city inundated with more vehicles than it can geographically hold, but it has to ensure that the enforcement mechanism actually works. Are there enough officers to enforce parking/vehicle restrictions, and does the city have the ability to collect the fees imposed on the parking offenders? In 2004, New York City created the NYC Delivery Solutions Program (more commonly referred to as the Stipulated Fine Program), in which delivery vehicles that have been issued a ticket would be given a reduced parking fine in exchange for, 1) waiving their rights to contest parking summonses and, 2) making their payments within 15 days” (Kim 2012, p. 1). In an attempt to reduce the bureaucratic expenses incurred from contested tickets, the city concluded that this type of fee reduction program would actually generate more revenue by streamlining the process and eliminating court expenses. However, as City Comptroller John C. Liu uncovered after an audit of the Department of Finance,
the “DOF does not effectively pursue collection of outstanding fines for parking summonses issued to vehicles owned by companies participating in its Stipulated Fine and Commercial Abatement Programs” (Kim 2012, p. 1). Some would argue that the program itself tries to maximize revenues for the city while encouraging illegal parking, but according to the Office of the Comptroller, the city’s efforts are falling very short of trying to maximize revenues. According to the report, the DOF had “no procedures on how to deal with non-compliant participants” and thus was owed over 9 million dollars in fines (Kim 2012, pg. 1-2).

This unfortunate situation indicates that there is a very sharp disconnect between issuing parking violations (for “excessive” double-parking or other illegal parking) and the need for enforcement/collection. The city seems to have identified double-parking as inevitable otherwise it would not have made it “legal” under certain circumstances – in an “acceptable” time frame and in “acceptable” areas. But by not following through on enforcement procedures for those violations that extend outside of those boundaries, the city has not only lost a substantial source of revenue, but they are encouraging this type of parking behavior (double-parking and illegal parking). In a city that tries desperately to reduce congestion – even trying to introduce congestion pricing – this seems counterintuitive. By encouraging and perpetuating this type of behavior they are only adding to congestion.
As a result, the Stipulated Fine Program is a rather weak response to a growing physical problem. The problem is terrifically straightforward yet painfully complex - how can we get delivery vehicles to their final destination(s) in areas with very little space to do so? When one takes into consideration the projected increase in population and the resulting number of delivery trucks that will be needed to accommodate the new population, it seems obvious that the limited “space” will only grow smaller. More people, more trucks, more congestion... more of everything. What New York City needs is a better public policy response that actually addresses the problem instead of exacerbating it.

4) Levels of Service (LOS)

Level of Service (LOS) is a performance metric that identifies the levels of congestion and mobility on roadways by classifying them on a scale of ‘A’ to ‘F’ – where ‘A’ represents free-flowing vehicles, and ‘F’ represents a severely restricted flow (Toth 2012). Initially created to assist in the design of highways in the 1950’s, LOS standards have been applied to all types of roads to ensure that appropriate mobility standards are maintained. But by following these LOS guidelines and ensuring that vehicles speeds are held constant, other modes (walking, bicycling, and so forth) are usually marginalized and the automobile becomes the standard for how the built environment is constructed and maintained. Using LOS standards has been problematic, but it is still the primary method used for identifying and resolving the issues of congestion and mobility. It is obvious that double-parked
delivery vehicles can potentially affect the LOS of the roadways they obstruct. It is true that a double-parked vehicle is a nuisance, but it is also compromising LOS. On streets or thoroughfares that have state or federal jurisdiction, there is a mandate by the government that the appropriate LOS be maintained. In fact, under these circumstances, a crosswalk cannot be added to the roadway if it is calculated that it could reduce the LOS of that roadway. And yet under this same logic, a double-parked delivery vehicle that affects the LOS is still allowed to carry on its activity. Since the LOS ratings determine the acceptable levels of mobility and the prioritization of improvements, it is somewhat startling that there has been little in the way addressing the issue of double-parking on these particular roadways in Manhattan. There appears to be a double standard at work here that perhaps the city would be wise to address. By ignoring the double-parking issue, the city is complicit in compromising the LOS standards. This is not to say that LOS is an ideal methodology, but it cannot be haphazardly applied to one situation and not another.

New “Multi-Modal” LOS standards are being produced, but this development is far from becoming the official standard (this is analogous to the Complete Streets paradigm). By incorporating a “Multi-Modal” LOS approach there would be clear benefits, but how to deal with the “last-mile” delivery issue still needs to be included in the discussion. And as mentioned previously, the way in which delivery vehicles interact with the environment and affect pedestrian visibility complicates any easy solution.
5) **Transportation Parks/Freight Villages**

Another potential solution to “last-mile” deliveries includes promoting Transportation Parks or Freight Villages in the New York Metropolitan Region. These are facilities that involve “the trans-shipment of goods directed to urban areas, aiming to consolidate deliveries, and thus provide greater efficiency in the distribution process by increasing the truck load factor and decreasing the number of trucks used, which help mitigate urban congestion and air pollution” (Panero et al. 2011, p. 4). Freight Villages allow for a concentration/clustering of freight activities while at the same time taking into account aesthetic issues surrounding the neighboring community. Typically freight facilities are haphazardly scattered around the outlying suburban areas and frequently come into conflict with surrounding developments. Freight Villages are designed to counteract these problems and coordinate the distribution process more efficiently.

Many delivery companies use their own vehicles as “mobile storage units”. These vehicles are typically parked in one location for long periods of time and serve as distribution centers that replenish the delivery vehicles actually doing the “last-mile” deliveries. One might say that this is a private sector response (albeit pseudo-illegal) aimed at solving the problem of “last-mile” distribution, but it is one that simply exacerbates the issues of congestion, safety, and noise pollution. This is especially true if numerous delivery companies are simultaneously engaged in this activity. However, it also could be argued that these companies have few
alternatives to this type of behavior given the physical limitations of both the delivery vehicles and the environment in which they are delivering. It is generally believed that the development of Freight Villages in the Greater New York region would alleviate some of these distribution problems. In fact, there is strong evidence to conclude that Freight Villages do have the potential to mitigate congestion by reducing VMT, increase modal balance, focus development in desired areas, and promote economic development through job growth (Boile et al. 2011, p. 29; Panero et al. 2011). Both of these studies (Boile et al. 2011; Panero et al. 2011) stress the point that there needs to be a strong public sector initiative to help in the creation of Freight Villages, but the private sector’s interest and involvement is critical for the success of such an undertaking. Although there is evidence to prove that Freight Villages do provide cost-savings for the private sector, many within the private sector are hesitant to co-operate with one another for fear of “disclosing competitive information about order quantities, products, customers… and particularly of losing customers to their competitors” (Panero et al. 2011, p. 20). This can be a concern, but effective communication between the public and private sectors can help to assuage any of the perceived problems (both real and imaginary) surrounding Freight Villages.
6) **Freight Tricycles and Urban Micro-Consolidation Centers (UMCs)**

Freight tricycles are another very interesting alternative to help deal with some of the “last-mile” delivery problems in Manhattan. Freight tricycles can be human-powered or electrically-powered and they are significantly smaller and more maneuverable than standard delivery vehicles. They are also much more environmentally friendly and have the potential to reduce the risk of pedestrian and bicyclist fatalities. Conway et al. (2011) looked at the strengths and weaknesses of freight tricycles/UMCs based on the current systems operating in London and Paris and came to the conclusion that it is possible to replicate those models here in Manhattan. With a rapidly growing bicycle network (more than 200 bicycle lane-miles created between 2006 and 2009), limited curbside access, and inadequate loading spaces, freight tricycles could be a good alternative strategy to help reduce congestion and improve safety in Manhattan (Conway et al. 2011, p. 2).

Somewhat similar to Freight Villages on a micro-scale, UMCs are the facilities that house and distribute the goods to the freight tricycles. The limited space in Manhattan could be prohibitive to creating a UMC (or multiple ones), but with the proper public and private coordination, it is possible that solutions could be found that would be beneficial to both sectors. London’s freight tricycle program was created solely by the private sector so it is possible to implement such a program without public support/interest, but it is difficult to determine how successful such an endeavor would be in Manhattan without some public support or investment.
There are complexities inherent in implementing any alternative strategy to "last-mile" deliveries, but freight tricycles address many of the problems and challenges that face “last-mile” deliveries in a dense urban area. The particular research undertaken by Conway et al. (2011) focuses on implementation in Midtown and Downtown Manhattan, so it is difficult to ascertain whether or not this model could be successfully applied to additional (residential) areas of Manhattan. However, anecdotally, there seems to be a greater likelihood of finding feasible locations for UMCs in areas outside of Midtown and Lower Manhattan. How applicable this model is to high-density residential areas remains to be seen, but based on the “last-mile” delivery problems that affect these areas, freight tricycles and UMC's might very well be a proactive solution that addresses key congestion and safety issues throughout Manhattan. Except for maybe in the hilly parts.
7) Summary

“Last-Mile” deliveries in high-density urban areas present difficult challenges for all involved parties: delivery companies, package recipients, and users of all modes of transportation in the affected areas. Traditionally most of the attention given to this issue has been aimed at relieving the negative externalities that are caused in Central Business Districts. It is in these commercial and retail areas that the majority of delivery activity has usually been concentrated. In the case of Midtown Manhattan, many different solutions have been attempted and many have been successful (see for example, Muni-meters and the THRU Streets program) (USDOT 2009). The purpose of this research paper is not to deny the large impacts that are still felt in these areas (CBDs), but to initiate a discussion that acknowledges the potential growth in “last-mile” deliveries to areas outside of this traditional arena – specifically to high-density residential buildings (areas) in Manhattan. There is widespread evidence that internet shopping is expected “to be the driving force of growth in the $188.5 billion global courier and delivery sector” (Nichols 2013, p. 1), and although the methodology utilized by this study to interpret this growth (the effects on package rooms) is limited in scope, it is still useful in identifying a problem that could grow worse in the coming years. Manhattan will always be starved for space, and anything that compromises additional space will need to be addressed.
In regards to package rooms, it is impossible to create any citywide requirements for how older buildings could deal with the crowding issue. For these older buildings it is primarily a private sector problem. Either more freight elevators and lobbies will be inundated with packages or the building management companies will choose to decommission rentable space and turn it into storage. However, in regards to newer construction, perhaps the city would be wise to incorporate various standards into the building code that would ensure there would be enough package room space based on the number of residential units in a proposed building. It would appear that current architects and builders have taken this into account based on doormen responses, but the limited sample size studied here is not sufficient to confirm this. This is an element that would need much further analysis to indicate whether or not this type of public policy solution would actually be feasible, both physically and politically.

Double-parking can have significant negative externalities, and can directly and indirectly affect the “quality-of-life” (including safety) in residential areas. But as explained here, if companies cannot capitalize on “last-mile” deliveries to residential buildings using off-peak delivery methods (TDM/FDM), and if enforcement remains relaxed, then it is a net loss for the city and its inhabitants. So what are some other potential solutions that might address the incidents of double-parking and safety infractions that are likely to occur in these areas?
One thing that seemed obvious from this study was the availability of loading zones. Because of the mature infrastructure and limited space, it is very difficult to create/require off-street loading zones in Manhattan, and it is virtually impossible for existing buildings. None of the residential buildings studied had any off-street loading zones, and only two of the buildings had nearby on-street loading zones.

Giving delivery vehicles the available space necessary to unload their wares without hindering traffic or compromising safety needs to be part of the planning conversation for these residential areas. As the FHA states, city gridlock is inexorably linked to the “lack of space” for delivery trucks. Any large urban center is bound to be full of physical and legal contradictions, but there is something peculiar about a dense urban area that allows free parking on the streets for residential vehicles but does not take into account curb space needs for delivery trucks. In fact, nearly 98% of all New York City’s street parking is free. So in a city that has 81,875 metered spaces (both Muni-meters and single-space meters combined), there is somewhere between 3.4 and 4.4 million on-street parking spaces that are “completely unpriced and untracked” (Kazis 2011, p.1). Taking this into consideration, pricing curbside parking could be beneficial in order to reduce parking demand and at the same time incorporate appropriately sized loading zones/spaces for delivery vehicles. Midtown Manhattan followed a similar model that was met with success. Dense residential areas may not need the extreme regulation that was created for Midtown, but using elements of this type of policy and pricing could contribute to fewer incidents of double-parking as well as an overall vehicle reduction.
As explored in this paper, Table 12 highlights some of the potential public policy responses to the problems associated with “last-mile” deliveries:

**Public Policy Responses**

| Physical Design | - increase curbside availability/on-street loading zones  
|                 | - proper placement and sizing of loading zones/spaces  
|                 | - intersection & roadway improvements  
| Pricing Curbside Parking | - “Muni-meters”, and reducing/eliminating free parking  
|                 | in residential areas  
| Enforcement/Collection | - ensure there is sufficient capacity and ability to do both  
| Freight Villages | - needs private sector cooperation  
| Freight Tricycles | - needs private sector cooperation  

*Table 12, Public Policy Responses to "Last-Mile" Deliveries in Residential Areas of Manhattan*
And Table 13 highlights some of the potential private sector responses (delivery companies and others) to the problems associated with “last-mile” deliveries:

**Private Sector Responses**

<table>
<thead>
<tr>
<th><strong>Physical Design</strong></th>
<th>- storage room size (owners, builders &amp; architects)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Amazon Lockers</strong></td>
<td>- alternative location for “missed” deliveries</td>
</tr>
<tr>
<td><strong>Vehicle Size</strong></td>
<td>- smaller, alternative energy vehicles</td>
</tr>
<tr>
<td><strong>Freight Villages</strong></td>
<td>- typically needs public sector cooperation</td>
</tr>
<tr>
<td><strong>Freight Tricycles</strong></td>
<td>- typically needs public sector cooperation</td>
</tr>
</tbody>
</table>

*Table 13, Private Sector Responses to “Last-Mile” Deliveries in Residential Areas of Manhattan*
CONCLUSION and POLICY RECOMMENDATIONS

The purpose of this study was to take an exploratory look at “last-mile” deliveries in high-density residential areas within Manhattan to identify if this activity might be significant enough to affect environmental and “quality-of-life” issues in those areas. As previously indicated throughout this paper, there are significant drawbacks to the delivery of goods in an urban area – such as problems with street congestion, pollution, safety, and noise. This paper focused on two important components of “last-mile” deliveries – the occurrence of double-parking on the street and the impact packages have on storage rooms in residential buildings. General observations concerning the “quality-of-life” in the research areas were also explored based on the presence of observable safety issues associated with delivery vehicles.

What this study uncovered is that double-parked delivery vehicles in residential areas do contribute to a significant amount of lost road space and can do so for a large amount of time. In addition, these double-parked vehicles can have an adverse effect upon public safety and thus, the “quality-of-life” in a residential neighborhood. Also, based on interviews with doormen and building management companies, there is a possibility that the growth in internet/online shopping has created a need for larger storage rooms within these types of residential buildings. Although this is merely speculative and by no means causal, the annual growth rate in
internet/online sales indicates that this scenario could be highly possible. But overall, what this study shows is that there is a large amount of “last-mile” delivery activity taking place in the dense residential areas of Manhattan. If these trends continue, there will likely be significant negative externalities generated that will affect the “quality-of-life” of the residents.

**General Recommendations**

- Further research into the specifics of “last-mile” delivery impacts in high-density residential areas of Manhattan.

Although it was beyond the scope of this project to identify and quantify all of the negative externalities associated with “quality-of-life” issues in the study areas (measuring pollution levels, decibel levels, and congestion levels), any future research on the topic of “last-mile” residential deliveries could clearly benefit from such an undertaking. Specific studies utilizing congestion modeling techniques would be extremely helpful to determine which high-density residential areas would be more susceptible to the effects of double-parked delivery vehicles. Contrary to the belief of most traffic engineers, not all roads can be dealt with in the same way. As the study observations indicate, many unknown factors contribute to why one location might be more susceptible to safety issues from delivery trucks than others. In the same vein, certain residential areas are more likely to be susceptible to congestion than others. And it is in these problem areas where we
should focus our attention. Although this study assumes that double-parking contributes to congestion, a more thorough investigation is really necessary to determine which areas would be more affected by double-parking and why this might be the case.

Safety is an important element of any urban environment. Any compromise to safety can seriously hinder the “quality-of-life” for the residents of an area. Further inquiries into “last-mile” deliveries need to take into account how these vehicles affect safety, especially in residential areas. Size and visibility matters, especially when it comes to how delivery trucks, cars, pedestrians, and cyclists interact within the streetscape.

- Encourage a cooperative relationship between city government, delivery companies, building management companies, and community/neighborhood groups.

Of all the transportation modes, goods movement is one of the least publically studied and most complicated. The only way to really address how our cities can function better in the complex world of goods movement is to engage the stakeholders and begin a discussion to find out if better solutions can be found to our mounting urban problems. Some might believe that “last-mile” delivery solutions should be the responsibility of the private sector (and, in fact, Amazon Lockers are a unique solution), but in cases where private sector activity adversely
affects the public realm, actions must be taken to remedy them. The possibility of establishing Freight Villages and encouraging the use of freight tricycles in New York really depends on cooperation between the public and private sector. This is not to say that it couldn’t be possible without interaction between these two sectors (as seen in London), however, there are clear advantages to approaching it this way. It is never too early to start the conversation.

**Public Policy Recommendations**

- Improve curbside availability for delivery vehicles in high-density residential areas of Manhattan.

There is clearly a lack of curbside availability for delivery vehicles and the inability to provide sufficient off-street loading facilities only exacerbates the issue. This “lack of space” has been identified by the FHA as a major contributor to congestion in urban areas. Off-street loading facilities are ideal, but with the mature infrastructure of Manhattan, other options need to be explored. In fact, many new residential buildings “push” freight delivery to the street. The Gehry building has a loading bay, but no official place to park. They also have a large access road that goes directly in front of the building with a large sign that says NO TRUCKS. Facing these severe limitations, the city is forced to deal with the problem “on-street”. Thus, policies should be created to optimize available curb space for delivery vehicles in these residential areas. Also, considerations must be made for these
loading zones to be able to conform to the size of the delivery vehicles or perhaps
the use of smaller vehicles (or freight tricycles) to compensate for the limited street
space. Proper placement of the loading zones is also necessary to minimize the
obstructions to pedestrian and bicycle visibility that can be caused by delivery
vehicles.

- Ensure that proper enforcement and collection of fines is maintained.

Without proper enforcement mechanisms, the hard won gains of various policies
can wither away. But more than just having the manpower to issue violations, there
needs to be proper procedures to actually collect the fines. This also raises the
question of whether or not NYC's Stipulated Fine Program is actually beneficial to
the city and its inhabitants. The program does nothing to reduce or deal with the
affects of double-parking and actually encourages the process. It also assumes that
the city can save money by streamlining the bureaucratic process, but it has no
effective means in which to actually collect the reduced fees. In regards to fostering
more cooperative interaction between the public and the private spheres, the
Stipulated Fine Program is a step in the right direction. However, the overall
effectiveness of what the program has generated in both monetary and physical
(double-parking) results is severely lackluster. It is a weak response to an
important issue.
• Reduce parking demand by pricing curbside parking in residential areas (for both delivery trucks and personal vehicles).

Parking is a hot button topic these days and the way in which we think about free parking obviously needs to change. The curbside management policies in Midtown Manhattan – installing Muni-meters with an escalating rate structure – have been remarkably successful in encouraging shorter dwell times (USDOT 2009). However, this is only one aspect of the larger picture. More attention needs to be placed on not only creating parking pricing for delivery vehicles, but also personal vehicles. Given that 90% of the parking spaces in the study areas were “free” combined with the correlation that more parking equaled more double-parking, there is an indication that our current parking policies are failing. Curb space in Manhattan is highly desirable - to give it away for free is economically unsound and socially irresponsible.


Apthorp Website: http://www.theapthorp.com/


http://www.greenlogistics.org/SiteResources/ee164c78-74d3-412f-bc2a-024ae2f7fc7e_FINAL%20REPORT%20Online-Conventional%20Comparison%20(Last%20Mile).pdf


“New York by Gehry” Website: http://www.newyorkbygehry.com/
New York City Traffic Rules


New York Metropolitan Transportation Council (NYMTC):
- Website: http://www.nymtc.org/project/freight_planning/freight_village.html

New York Police Department Website:

http://www.theatlanticcities.com/commute/2013/02/delivery-trucks-secret-cause-urban-traffic/4653/


APPENDIX

Verbal Consent Form/Recruitment

Questionnaires

Study Area Sketches
Principal Investigator: David King
Co-Investigator: John Woodard
Department: GSAPP (Urban Planning)

This is the Verbal Script for how I will obtain informed consent (verbal consent) from the interview subjects:

Hello, my name is John Woodard and I am a graduate student at Columbia University. I am conducting a research project that looks at how package deliveries affect residential streets, sidewalks, and buildings. I was wondering if you could spare a moment of your time to answer a few questions about your experience dealing with package deliveries. The interview should take no longer than 5 minutes. Your participation is absolutely voluntary and no personal information will be collected. I just need to ask for your verbal consent so that you understand that any information you give me could be used in this research project. I would be more than happy to describe the research in further detail if you like, or, you are also welcome to read the detailed summary that I have included here. If you initially decide to participate in the study but then change your mind, you are welcome to do so at any time. And of course, you are not required to answer all of the questions if you would not like to. I would also like to thank you in advance for your participation.

The following contains additional information that would help inform the research subject if he/she would like greater detail as to the purpose and procedures of the study:

Purpose of the Study:

The purpose of this study is to look at package deliveries to high-density residential areas within New York City to help facilitate a greater understanding of how goods movement at this level can affect the city and its residents. There are significant drawbacks to the delivery of goods in an urban area – street congestion, pollution, safety, noise, and many others. And it is important to look at all levels of goods movement to help direct the complex systems that support the urban fabric. Trying to remedy the side effects of goods movement is not easy, but cities need to address these issues in a competent and reasonable fashion otherwise urban areas will be inundated with unwanted consequences. This research project is an exploratory study aimed at gathering information about the potential “quality-of-life” issues that could be related to these “last-mile”/curbside deliveries.
Procedures:

This is a research study that includes observational studies and interviews. Techniques such as vehicle observation surveys and parking surveys will be used to gather information about vehicle movements and available parking resources. Observations will also include an inventory of street and building types for the areas studied (number of residences, parking spaces, and loading zones). The specific sites studied (4) will be chosen based on the presence of higher-density residential buildings. Also included in the data collection will be brief interviews with doormen and representatives from building management companies. All of the data collected - observational notes and interview notes – will be entered into a password-protected computer. The original notes will be held strictly in the researcher’s possession until the data is entered into a personal computer. Thereafter the paper questionnaires will be destroyed (shredded and separated).

The only identifiers from the interview questionnaires will consist of the street name that the interview took place on and either “doorman” or “delivery driver”. For the building management companies, no indication will be made as to which company was interviewed or where the interview took place. In an attempt to minimize risk, keep the data confidential, and protect the privacy of the delivery drivers, there will be no association made with the particular delivery company within the data collected. Also, in order to protect the identities of the doormen they will not be associated with a particular building name or number, only the street on which they work.

In addition to limiting the identifiers associated with doormen and the building management companies, the interview questions will be primarily based on the procedural flow of delivery goods. For example, how the deliveries take place, what are ideal scenarios for deliveries, as well as possible alternative scenarios. Any questions that may be opinion-based will not be construed to infer how the “delivery company” or the building’s “management company” could handle the situation better, merely the preferences of the particular interviewee.

If you have any questions or concerns about the research, please feel free to contact the Principal Investigator/Faculty Sponsor David King at (212) 851-5685 or the Columbia University Institutional Review Board at:

Columbia University Morningside IRB
Studebaker Building
615 West 131st Street, 3rd Floor
New York, NY 10027

212-851-7040
1) Over the course of your shift, approximately how many deliveries do you receive? (the number of deliveries made by individual drivers, not necessarily the number of packages)

2) How many hours is your shift?

3) What time of day do you usually receive the greatest number of deliveries?

4) Do you receive multiple deliveries throughout the day from the same delivery companies? (do not identify which companies)

5) Once you receive the packages, what do you do with them? Where do they go?

6) Is the storage of packages ever an issue? Is there a lack of space in the storage areas?

7) Do you have multiple storage rooms?
COLUMBIA UNIVERSITY
QUESTIONNAIRE – BUILDING MANAGEMENT
“Last-Mile” Deliveries in High-Density Urban Residential Areas of Manhattan

Principal Investigator: David King
Co-Investigator: John Woodard
Department: GSAPP (Urban Planning)

1) Do you primarily manage older buildings (pre-war), newer buildings, or a mix of both?

2) Do you keep track of how many package deliveries are made to your buildings?

3) IF YES... In the case of your larger residential buildings, do you know approximately how many deliveries are made to your buildings per day (or month, year)?

4) Do you have a dedicated storage room for holding packages in any of your buildings? (ie. the need for more or less space)

5) Have there ever been any issues concerning the amount of storage space available for holding residential packages?

6) Are there any dedicated off-street loading spaces, or on-street loading zones for any of the buildings you manage? If YES: Are they an effective use of space?
INVENTORY/CHARACTERISTICS:

SITE:________________________________________________________________________

DATE:________________________________________________________________________

TIME (& DURATION):________________________________________________________________

STATIC:

1) Street type (one-way/two way) and street dimensions

2) # of street parking spaces:

3) # of loading areas (on-street and off-street):

DYNAMIC:

4) # of Delivery Vehicles over the course of time (4 hour intervals):

5) Delivery Vehicles (duration of stay):

   Relative safety of the road/area (based on vehicle speeds, obstruction of crosswalk visibility due to trucks, and any blockage of emergency vehicles)

6) # of Speeding Cars:

7) # of Pedestrians/Bicyclists affected by Delivery Vehicles (Obstructions):
8) Vehicular congestion (based on the number of times that vehicles are unable to pass through an intersection on a green light):

Within this survey framework, I will also take photographs to graphically illustrate the different types of things that I observe. The primary content of the photographs will include:

1) Double-parked delivery trucks

2) Significant levels of congestion related to the double-parked vehicles

3) Use of on-street/off street loading zones
Study Area Sketch

The Solaire

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The Solaire - 12

Loading - 5
Parking - 7

METERS → 0
Non-METERS → 12
Study Area Sketch

The Apthorp
Study Area Sketch

The Gehry
Study Area Sketch

The Lyric