

04

MOBILITY

ACCESSIBILITY

THIS CHAPTER SHOWS CONNECTIONS TO THE
MANHATTAN MOBILITY NETWORK, WHICH IS IN
NEED OF INVESTMENT

MODES OF MOBILITY

DATA ON DECLINING TRAVEL SPEEDS REFLECTING
THE GROWING DEMAND ON THE CITY'S
FINITE ROAD NETWORK

Jaap van den Hoogen
Justin Au





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Accessibility

The city centre of New York, of which Midtown is part of, lies on an island called Manhattan. Being the economical heart of the city means a vast majority of all New Yorkers commute to the centre every day. The limited number of connections to the island are one of Midtown's main problems, since the fact that Midtown lies on an island implies that there can only be a certain number of access points. All this limits the accessibility of Midtown and its potential growth.

Midtown is reliant on the inhabitants of New York, whom commute on a daily basis to and from the island. On a daily basis around 3,8 million people travel into the CBD compared to the 390 thousand living in Midtown, whom almost never, only 10%, make inter-borough trips. This number is still increasing each year. The main mode of transport to the island is the subway and other rail services, which moves 75% of the commuters. On the other hand the subway is one of the city's biggest headaches, since it is in poor condition and therefore the number of subway riders is decreasing the last few years. The subway system

has deteriorated to such a dismal state that nearly all available funds go into maintenance and overhaul; therefore, expansion of the network is currently almost impossible. Further more individual car trips into the city are declining, but the ride-hail services and carsharing are increasing, putting more pressure on the road network of the access points, like bridges and tunnels.

Summing up the growing number of New Yorkers who make use of the roads and public transport network are experiencing a more and more congested and cluttered transport system (DOT, 2018). The following trends have lately been observed in Midtown: An overfull metro system with many delays, an occasional gridlock on the Manhattan streets, buses and cars that have seen their travel speeds drastically drop over the last years and jammed car connections from and to the peninsula of Manhattan. All this is not just a problem of the recent years, but has been on going the last couple of decades.



A deteriorating transport network

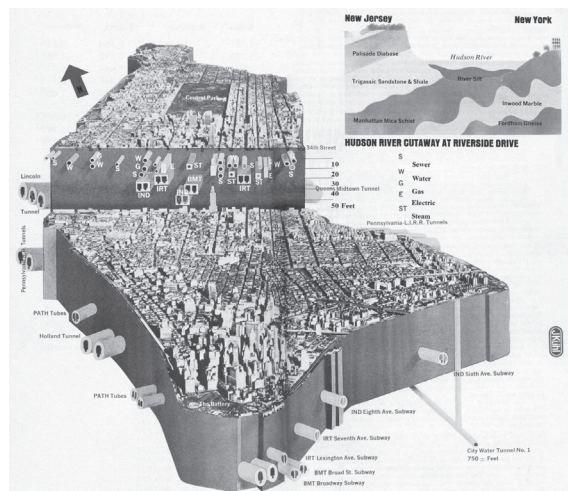
Midtown is growing enormously, with many housing and office developments being build and planned, with over 23 towers of 200m high or higher. All these buildings, mainly built for the housing market, will bring new residents to Manhattan. These inhabitants will make use of the roads and public transport network. All this movement will be added to the already congested and cluttered transport system of the city. As mentioned in the New York Times "New York is one of the most prosperous cities in the world, yet it has one of the world's most dysfunctional transportation systems." (Editorial Board. July 30, 2018. NY Times)

This city's reliance on a failing system is something which will be further investigate in this chapter. The infrastructure runs as veins through the city, but is experiencing clogged arteries. The complexity of all transport modes together and who has to take responsibility for what, has gotten the city into its grip. The first subway line was built in 1904, this was the start of two privately owned systems subway systems called the Brooklyn Rapid Transit Company (BRT) and the Interborough Rapid Transit Company (IRT) building the subway system as we know nowadays. From the 1930s on the municipality started to develop subway lines as well. Most subway lines existing today originate from the early 1910s and the last major line has been built in 1940. The grid has which was laid out over the city as a blanked in 1811 was designed when the streets were still full of horse carriages and are not meant for the fast amount of cars its currently serving. The main highway connections running north south, Franklin D. Roosevelt East River Drive (FDR) and Hudson River Greenway, have existed for over 50 years and are overfull. All the infrastructure has seen the city and its people change, but they have not developed. It has withstood time, but now needs to go with its time to keep the city alive.

New York was traditionally a frontrunner when it came to the development of new ways of transport . Like the world's first commercially operated steam ferry from New Jersey to Vesey Street Manhattan in 1811, The elevated rapid service steam trains in 1867, where the highline currently is built on, in 1905 the first gasoline-powered bus in America running along Fifth Avenue and the Holland Tunnel (1927), becoming the city's first underwater tunnel for motor vehicles connecting Manhattan to New Jersey. This shift in different

modes of transport has led to the expansion of the city. It gave the cities inhabitants the freedom to live outside the city and commute to it. When the New Yorkers started to live of the island, but still worked on it causing a change in the way the people entered the city. Now they had to enter from the other boroughs: Brooklyn, Queens, the Bronx, Staten Island or New Jersey. The connections designed as bridges, tunnels or as ferry routes were not made for that amount of number of people. Moving all the millions of people and goods to the island brought challenges, but also gave the city the urge and an opportunity to innovate.

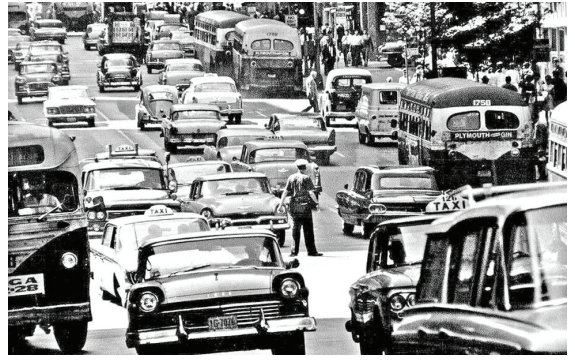
Furthermore, multiple new ways of movement through the city are up and coming and they are not helping the failing transport system. Since the founding of Uber and Lyft in around 2010 the number of ride-hailing cars have skyrocketed in New York to a number of 100.000 vehicles. These enormous amounts of vehicles have contributed to the average speed to fall in Midtown from 6.4 mph in 2010 to 5 mph in 2017. Also, the total number of transit riders into the Central Business District (CBD) has increased from 2.6 million in 2010 to 2.9 million in 2016, but is now falling again because of its poor condition. All this will put more and more pressure on an already struggling system, but the New Yorkers and its economy are very dependent on it. New York has arrived to a point where it needs to innovate again, to stay a world leading city.



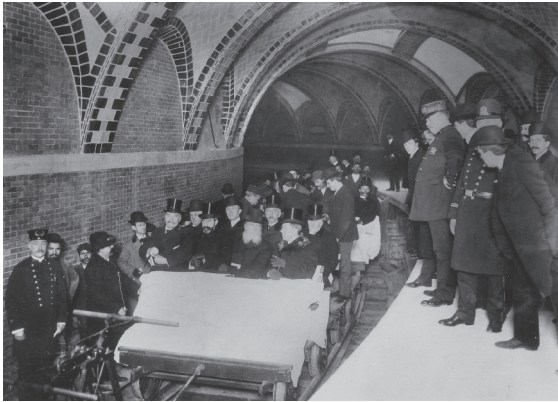
4.1.1 Underground network of Manhattan



4.1.2 Equitable occupies the whole block



4.1.3 After 1916 zoning introduced district and yards rules



4.1.4 First metro in New York



4.1.5 Toll entries at the Holland tunnel

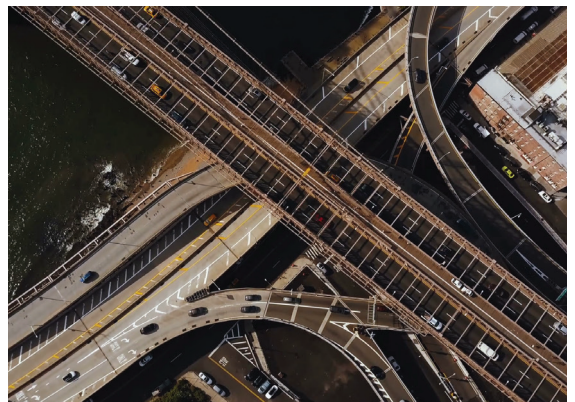
¹ DOT, *Mobility report* (New York, 2019)

² REGIONAL TRANSPORTATION PLAN, Plan 2045 Maintaining the vision for a sustainable region (New York, 2017)

³ NY TIMES, Editorial Board (New York, July 30, 2018)



4.1.6 Ed Koch Queens boro bridge entry node



4.1.7 Brooklyn bridge entry node

et
Columbus
Circle
et





Access to Manhattan

JFK International Airport



9,900,000

Newark International Airport



7,600,000

La Guardia Airport



5,400,000

4.1.8 Number of passengers to Mid-Town per million per year,



4.1.9 Time from airport to Midtown

Above 60th St.



43.7%

Brooklyn



24.2%

Queens



18.7%

New Jersey



13.3%

4.1.10 Percentage of daily vehicle traffic into CBD per direction



33.6%



28.8%

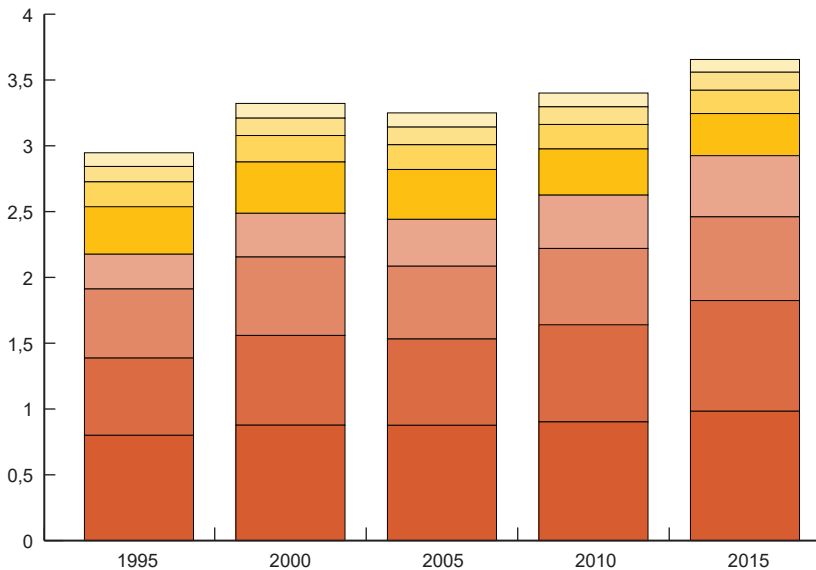


21.7%



15.9%

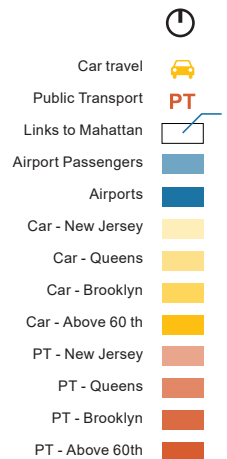
4.1.11 Percentage of daily transit riders into CBD per direction



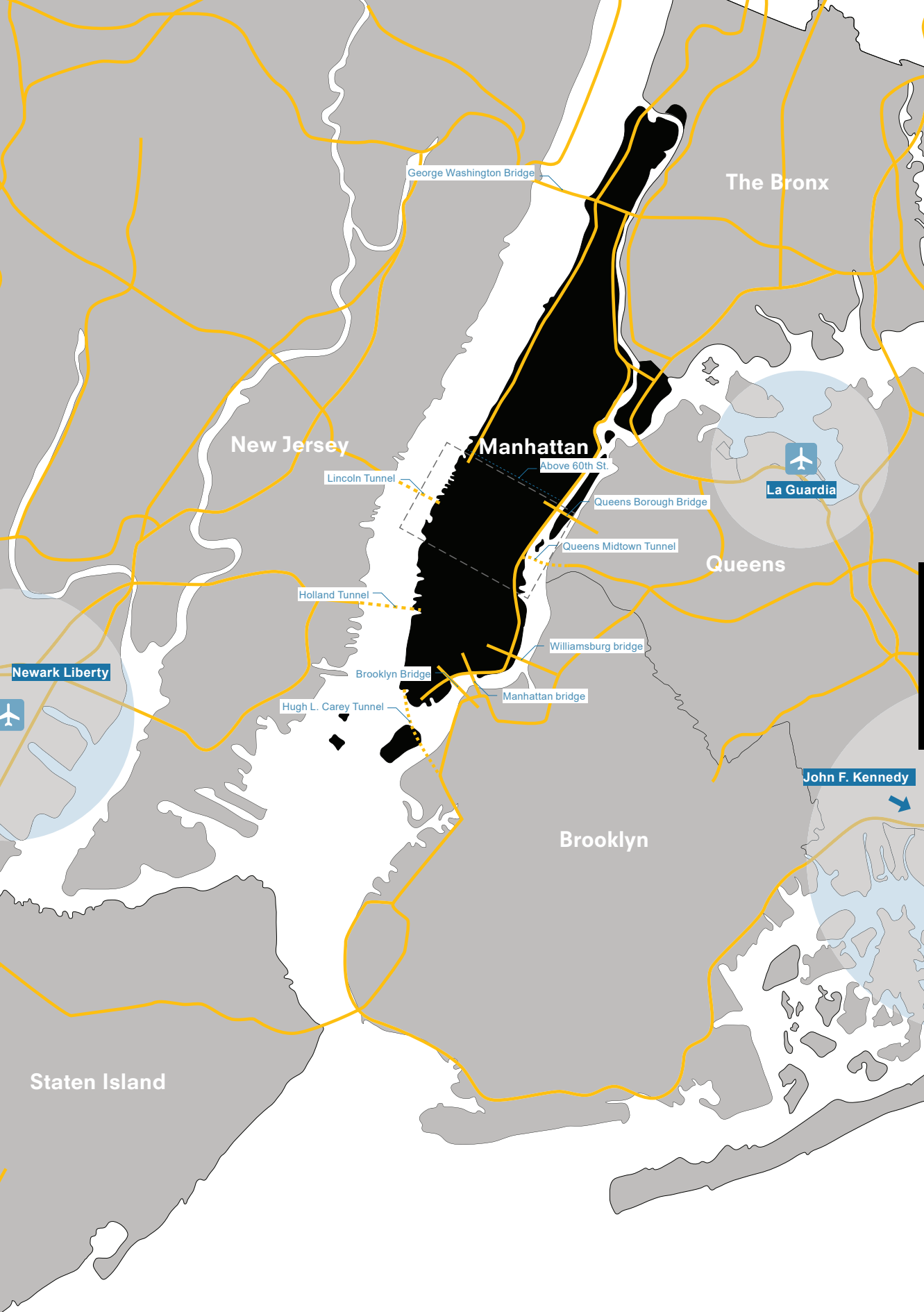
4.1.12 Daily transit riders & vehicle traffic into CBD per million per day

¹DOT, *Mobility report* (New York, 2018)

²The port authority of New York and New Jersey, *Traffic & Volume Information* (New York, 2016)



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George Washington Bridge

The Bronx

New Jersey

Manhattan

Above 60th St.

Lincoln Tunnel

Queens Borough Bridge

La Guardia

Queens

Queens Midtown Tunnel

Williamsburg bridge

Newark Liberty

Holland Tunnel

Brooklyn Bridge

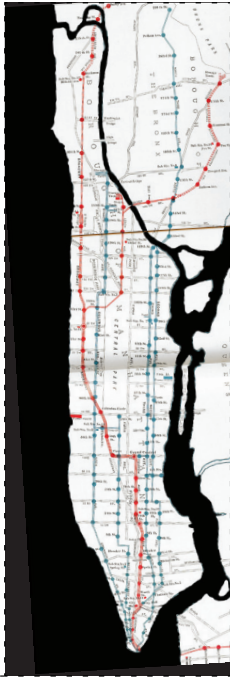
Manhattan bridge

Hugh L. Carey Tunnel

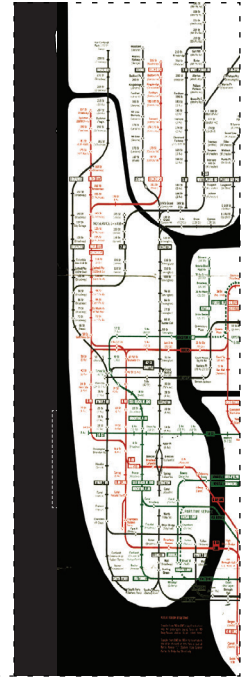
John F. Kennedy

Staten Island

Brooklyn



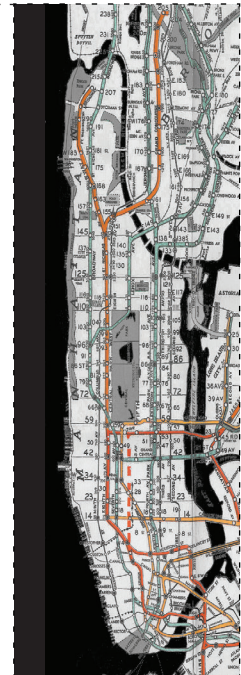
4.1.13 1904 IRT system



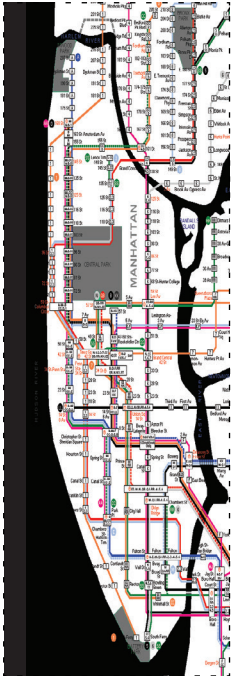
4.1.15 1959 Combined network

pre
1900

1900
1960



4.1.14 1939 Combined networks



4.1.16 1968 Combined network

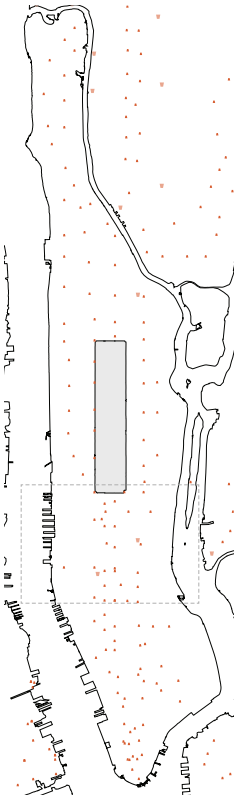
1960
1990

1990
2019

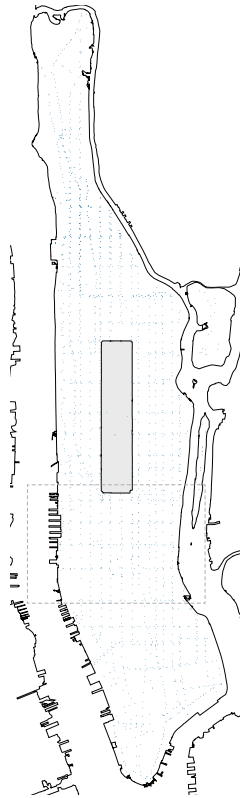


4.1.17 2017 Metro network

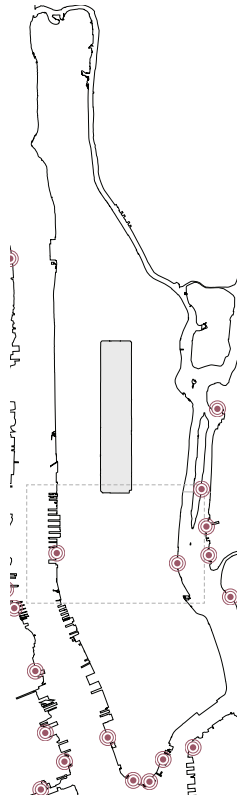
Transport nodes



4.1.18 Train/Metro stations



4.1.19 Bus stops



4.1.20 Ferry docks



4.1.21 Car: Gas stations & parking lots

04









Transport nodes are points in the city where travellers can access transport. This can be in stations, stops, parking lots or any other points of access. Many of the problems having to do with accessing the island come together at the places where different modes of transport meet. Also known as a node as:

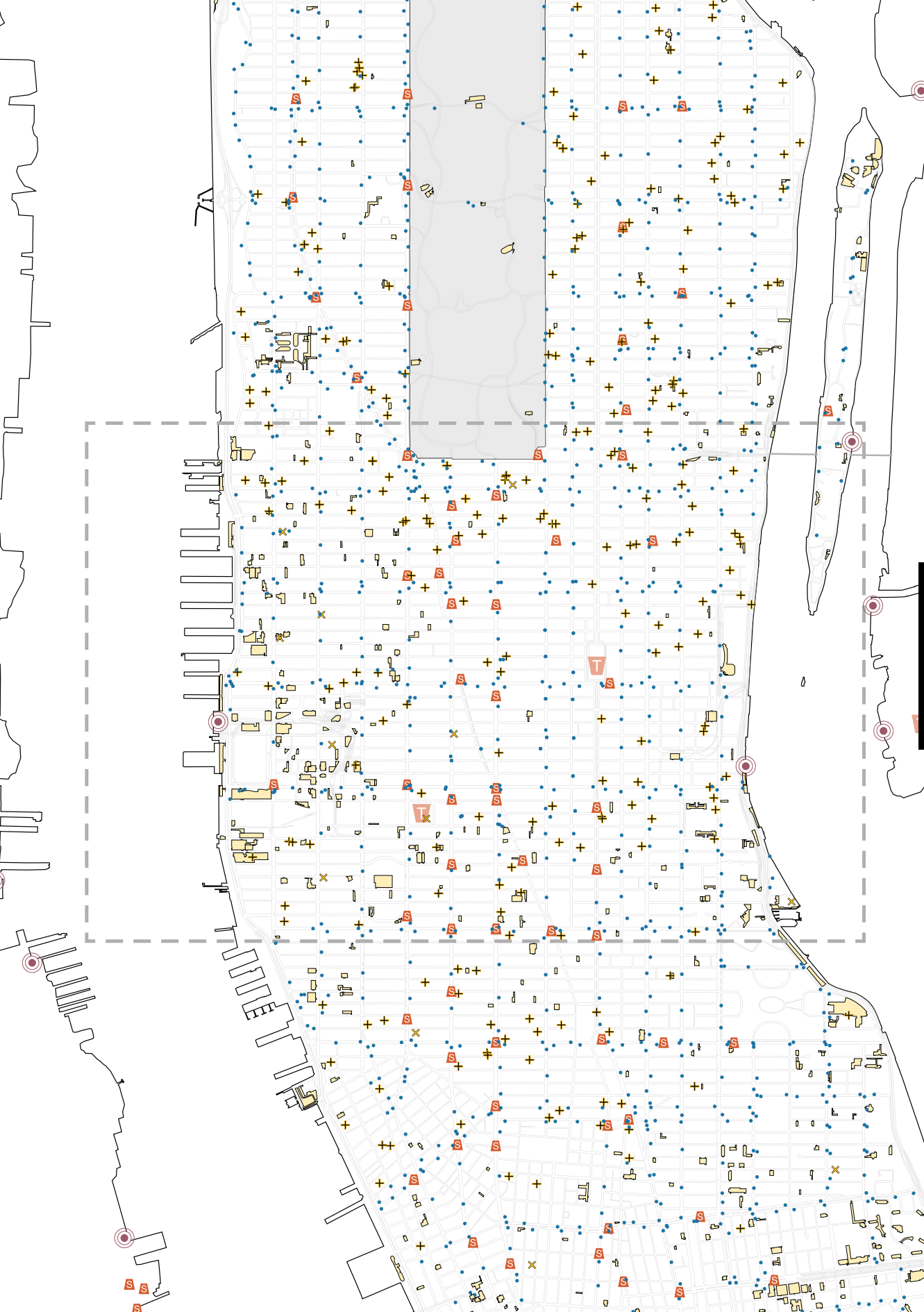
Node /nəʊd/

“Nodes are points, the strategic spots in a city into which an observer can enter, and which are the intensive foci to and from which he is traveling. They may be primarily junctions, places of a break in transportation, a crossing or convergence of paths, moments of shift from one structure to another.”

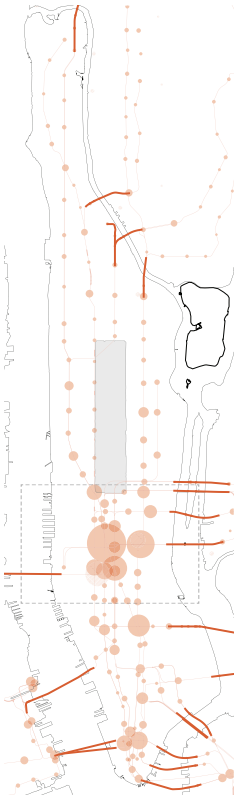
These nodes are getting busier and busier. More people are visiting the city for business, tourism or leisure. Meaning the more pressure on the transport system. The train and subway nodes are in the area between 8th Avenue and Lexington Avenue. Bus stops are widely spread over the island running on all avenues and on every 7th or 8th Street. Midtown has one main ferry terminal on West 39th Street. The building is wrapped around the ventilation pipes of the Lincoln Tunnel. Most parking garages and gas stations are located at the borders of the island along the two main highways entering Midtown.

Data: NYC planning, *PLUTO* (New York, 2018)

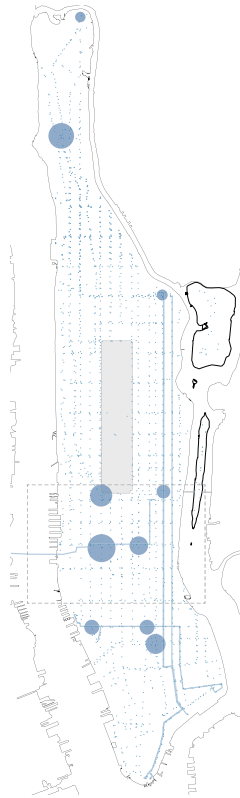
-  Subway station 
-  Train station
-  Bus stop
-  Ferryterminal
-  Energy station
-  Gas station
-  Parking lot



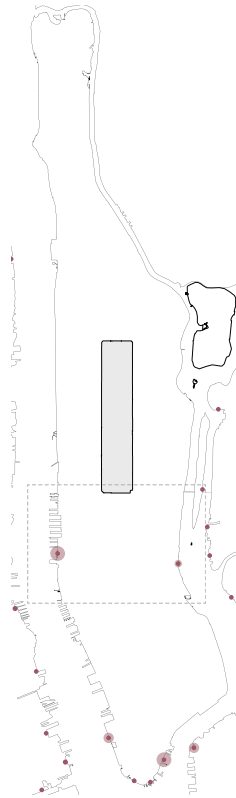
Transfer hubs



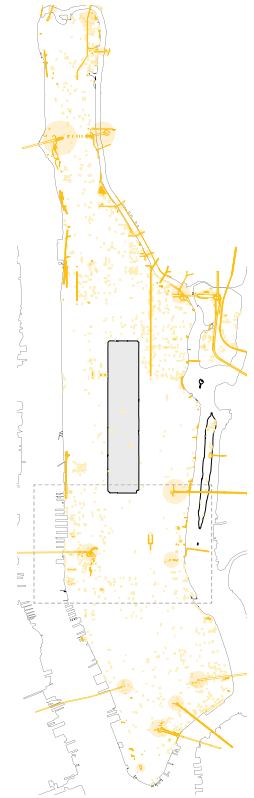
4.1.22 Train/Metro nodes



4.1.23 Bus nodes



4.1.24 Ferry nodes



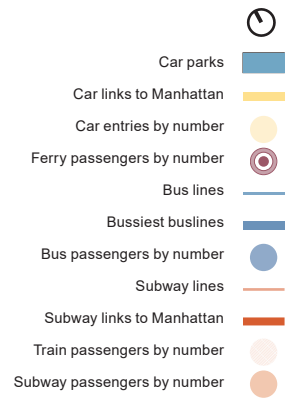
4.1.25 Car connections, Parking spaces

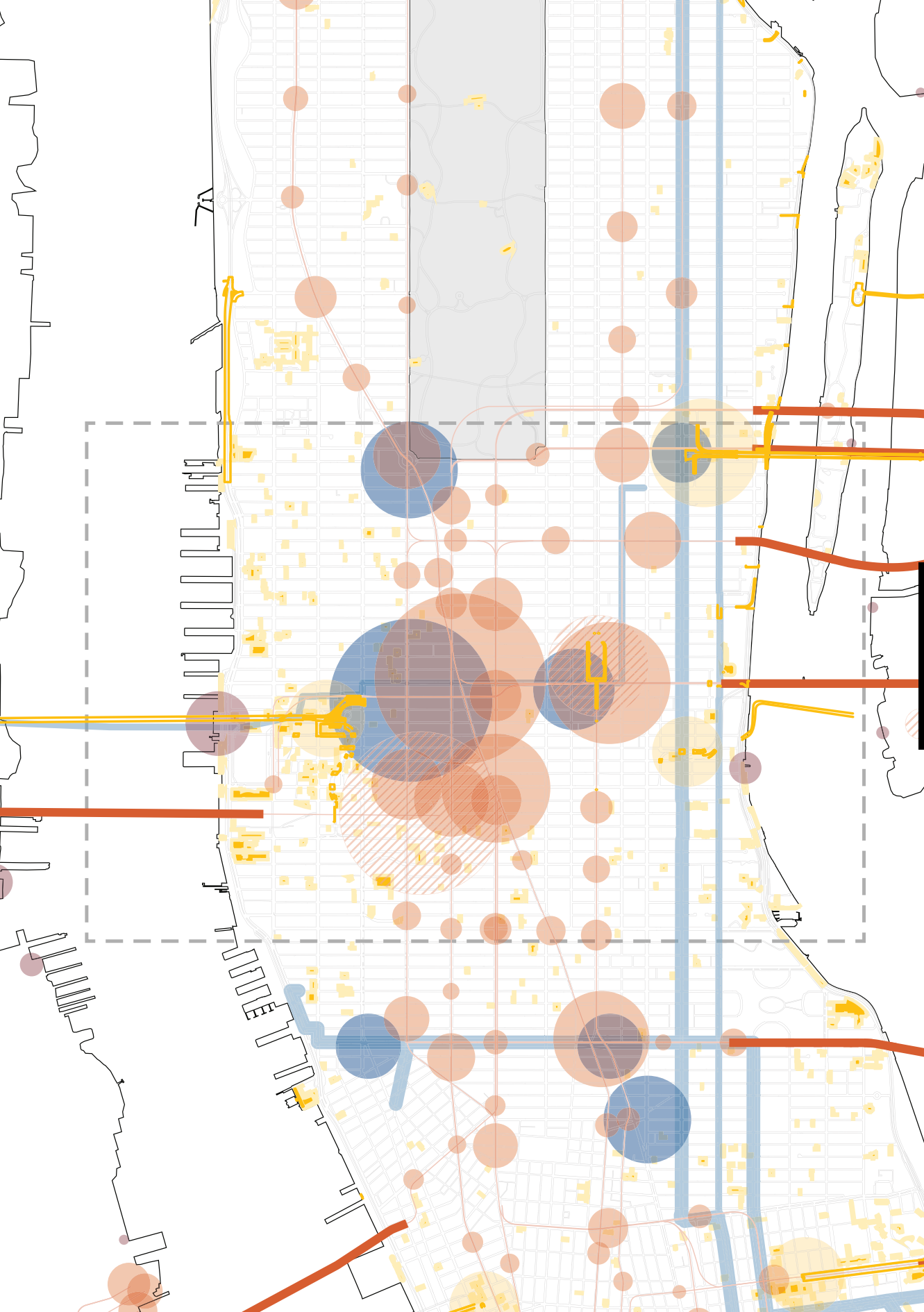
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A transport hub (also transport interchange) is a place where passengers and cargo are exchanged between vehicles or/and between transport modes. These are the points in the city where people enter or exit different modes of transport and where they can connect to and from the island.

The main public transport hubs in Midtown are Penn station, Times Square, Central station and Columbus circle. Cars and rideshare vehicles are concentrated along the Queens Borough bridge and the Lincoln Tunnel. Other main car entry point to Manhattan are situated on the north side at Washington Heights, which connects to New Jersey by the George Washington bridge.

Data: NYC planning, *PLUTO* (New York, 2018)



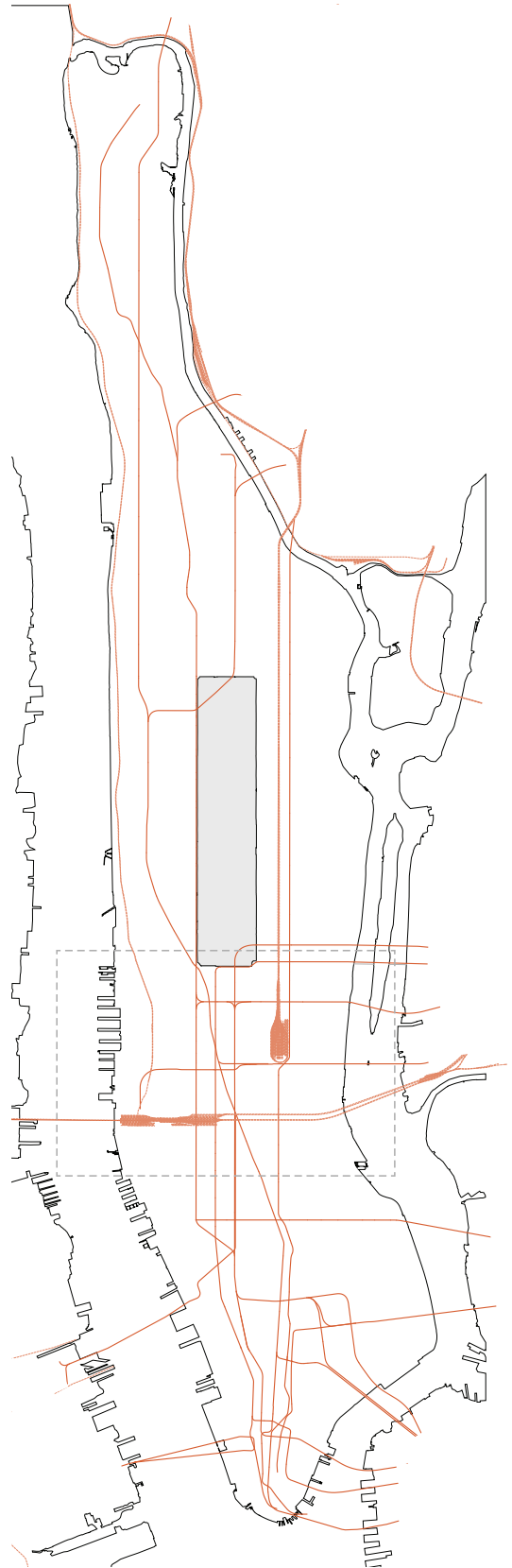


Public transport Network

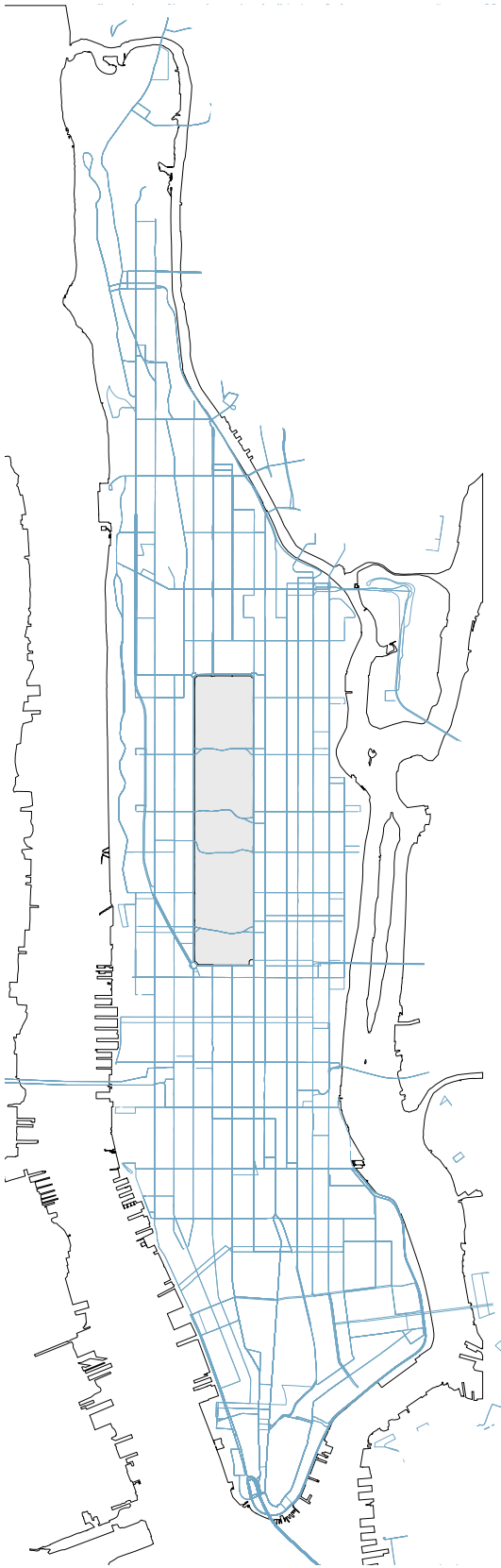
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The train connections run east-west from New Jersey underneath Penn station, past Grand Central Station to Queens. From 34th Street the rail lines only go north. Lower Manhattan is serviced by the subway also connecting to New Jersey with the PATH system. Most bus connections are from Manhattan to Queens and Brooklyn, where New Jersey is only accessible by bus through the Lincoln Tunnel. The Midtown connection with ferry is underused with only 4.6 million users a year. Compared to the subway system, which transports around 2.3 million people a day.

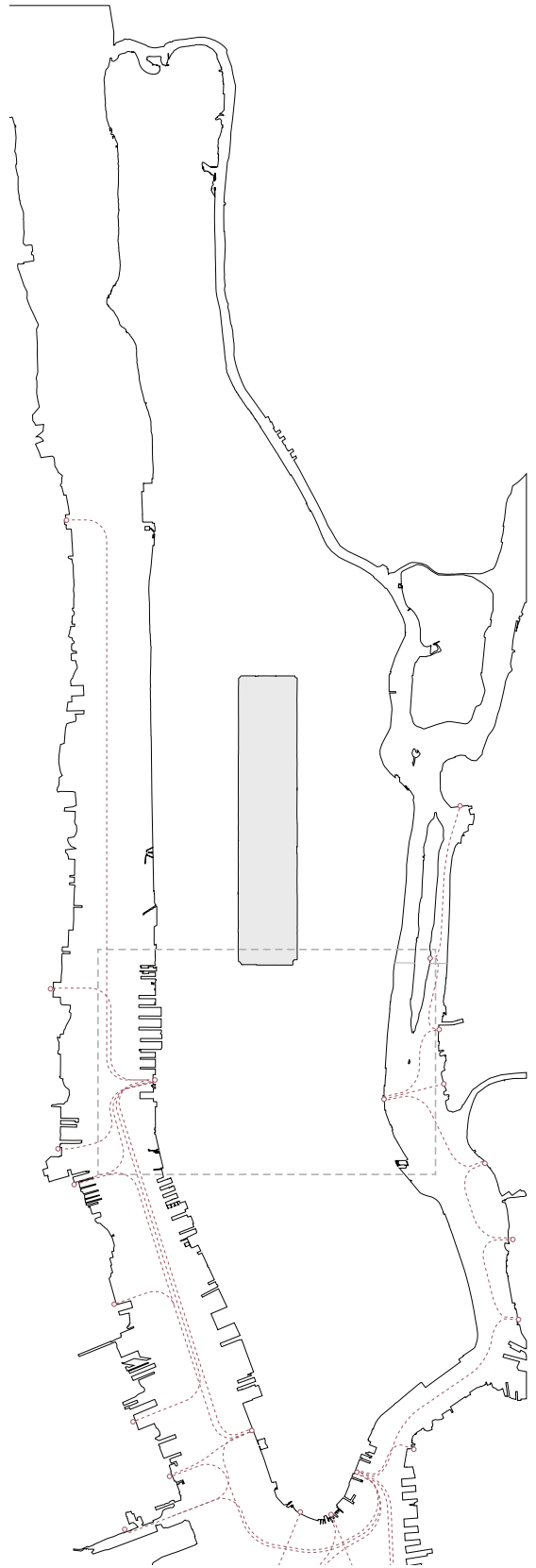
Data: NYC planning, *PLUTO* (New York, 2018)



4.1.26 Metro and Train connections

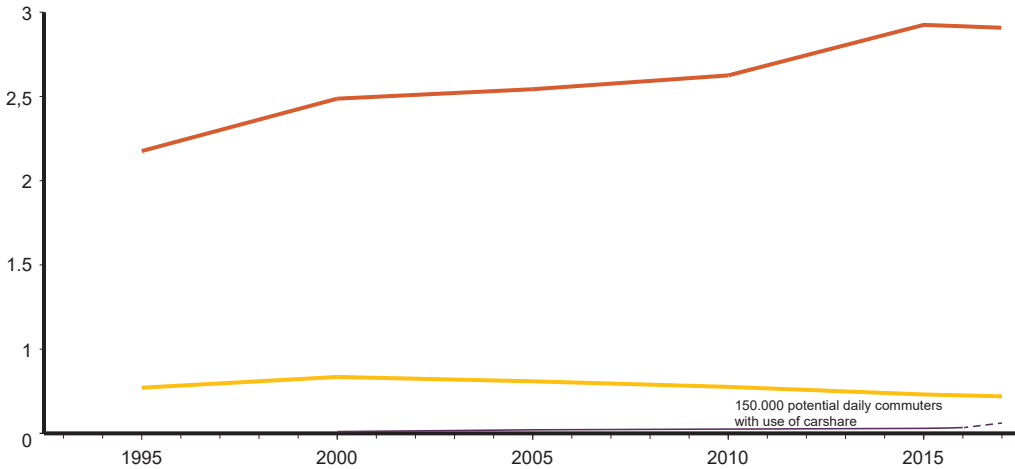


4.1.27 Bus connections



4.1.28 Ferry connections

Change in Accessibility

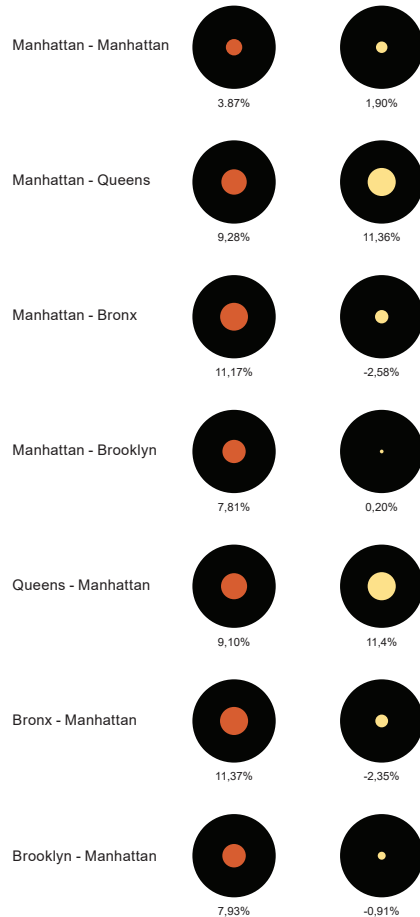


4.1.29 Change of transit riders, vehicle traffic and careshare users into CBD per million per day

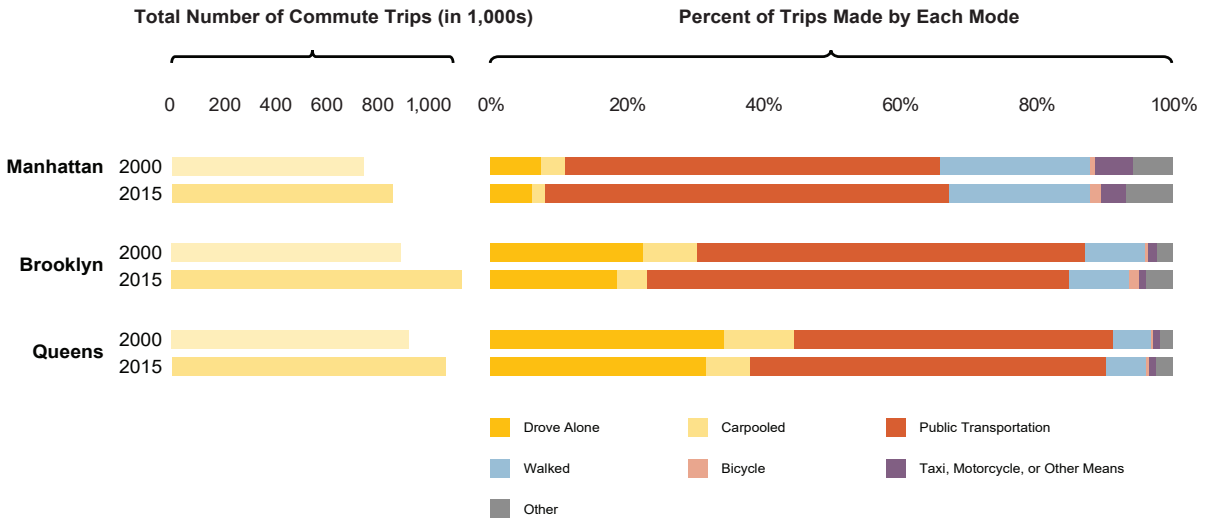
The total number of transit riders to and from Manhattan has been rising since 1995, and the number of cars has been in decline since that period. Also it's interesting to see that the growth of Public Transport (PT) is larger than the number of cars, but this gap is getting smaller in the most recent years. To money needed to solve and renovate the PT in New York currently goes into patching up the outdated technology creating a vicious circle leading to a never ending story of repairs and more repairs. Andrew Cuomo governor of the state New York is pushing for a new congestion tax, to be paid when entering Central Business District of Manhattan. It could generate between \$810 million and \$1.1 billion annually, this could then be used to fund critical repairs to the New York City subway. New York city would become the first American city to implement a congestion pricing following the examples of London, Singapore and Stockholm whom have implemented this system successfully as early as the 1980s.

The drop of the numbers of car trips can be partially described because of the car sharing trend. In the past decade, shared-use mobility services, like carsharing, have emerged as mobility options in a number of cities in the United States. Carshare programs, in particular, have multiplied in New York City. Researchers have begun to analyse the impact of these services: a 2010 review of several studies found that 23 to 32 percent of carshare members had given up a vehicle since joining a carshare service. Since Queens is relatively bad connected by public transport the number of cars entering from that area are pretty high. This is shown in the daily number of passengers crossing the 4 main bridges and tunnels to Manhattan. Here is seen that the Ed Koch Queen Borough Bridge has most car traffic, compared to the others and is an interesting node to research.

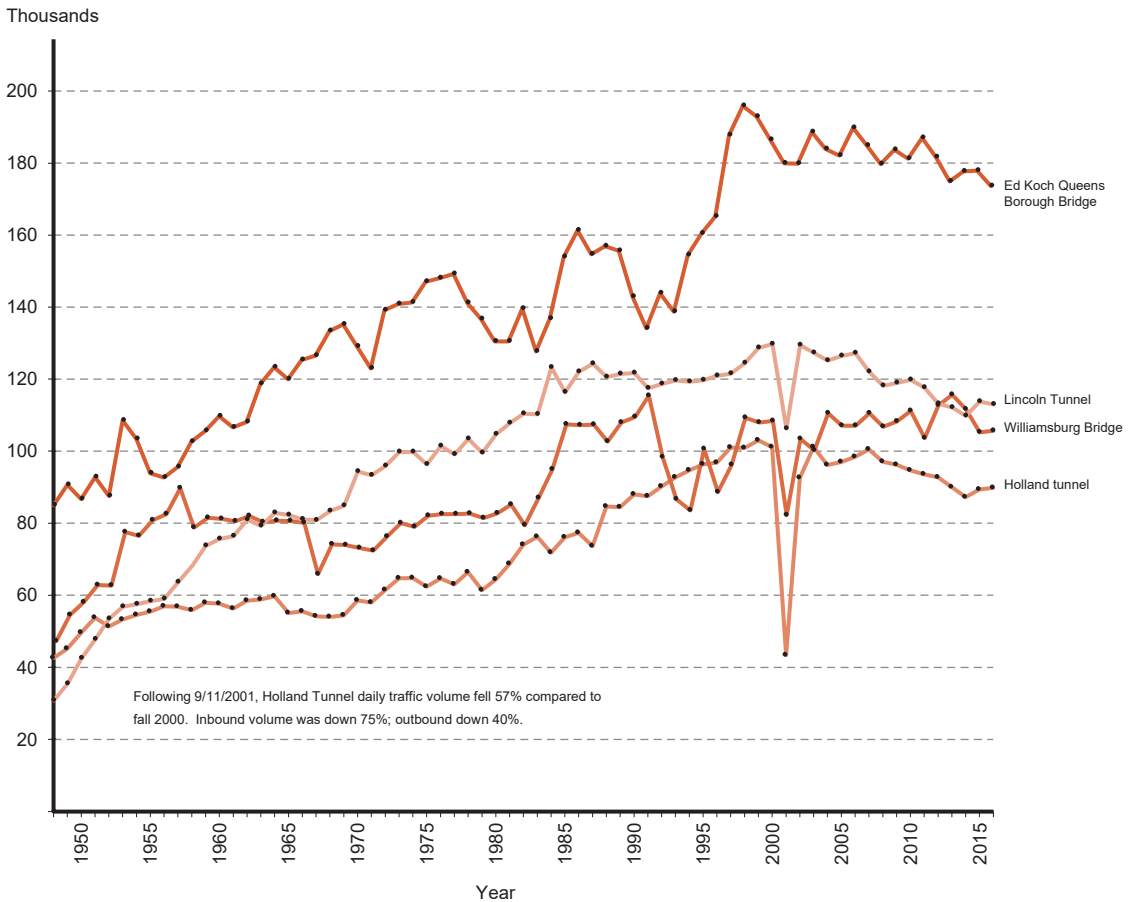
Data: DOT, *Mobility report* (New York, 2018)



4.1.30 County to County trips % growth from 2017-2045



4.1.31 Modal choice for daily commuting trips



4.1.32 Daily vehicle traffic into by main tunnel and bridges into CBD per thousands a day

Future of the car

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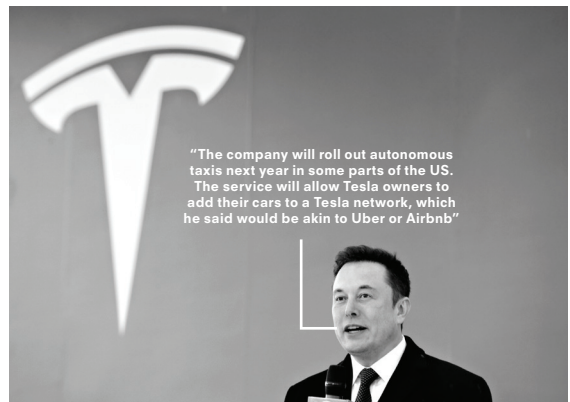
By averting the car from the CBD the city is giving a clear signal to prevent polluting cars to enter the inner city. But the car has given the Americans but also the New Yorker the freedom to go where ever they want to go and live. The start of the mass produced car from the 1920s made the city expand rapidly and most of the working class moved away from Manhattan to commute to work by either car or subway. But still within the island and Midtown people move in many occasions by car.

The yellow cab is intrinsically connected to the image of New York, even though Uber and other ride-hailing services are taking over, there are still 13,500 yellow cabs in New York. Where Uber provides a service for people wanting to ride in the city, it also causes less cars to be parked since the usage rate of cars is higher than of a car which is only privately used. This new trend can be seen as collaborative car consumption and there are three types of collaborative consumption, for future of car sharing, which are peer to peer, business to consumer and not-for-profit. Peer to peer is where individual car owners rent their cars; business to consumer, where a business owns the cars and facilitates their use to members; and not-for-profit, where a community group owns cars and facilitates their use. Start-ups as VIA car and Car2go, by BMW and Daimler, even take it a step further and provide an app based service where people can rent a car whenever they need it, just parked throughout the city. This could cause a for a cluttered city and an uneven distribution of cars throughout the city. Besides this the high parking costs in Midtown and the limited amount of parking spaces has caused an enormous increase of carsharing hubs around the city's main arteries.

One of the main companies investing in carsharing services and transport infrastructure is Tesla owned by Elon Musk, who has set his mind to create a new transport system "the Hyperloop", but also runs a project called SpaceX, enabling humans to become a spacefaring civilization and a multi-planet species by building a self-sustaining city on Mars and commuting to it. Tesla the electrically powered cars are already chipped for a self-driving software, which could mean the start of the autonomous vehicles being mass produced. Also Elon Musk said: "The company will roll out autonomous taxis next year in some parts of the US. The service will allow Tesla owners to add their cars to a Tesla network, which he said would be akin to Uber or Airbnb." Meaning car sharing and autonomous cars could be combined in the near future.

This could be the real game changer since the current limits on shared mobility imposed by population size and density. Self-driving cars would enable mobility players to reposition vehicles optimally, allowing smaller fleets to provide adequate coverage and reducing the fixed cost base. Autonomy would also let companies target different user segments via smaller differentiated fleets of vehicles.

¹ DOT, *Mobility report* (New York, 2019)
² THEVERGE.COM, "Here are Elon Musk's wildest predictions about Tesla's self-driving cars" (2019)
³ THOUGHTCO.COM, "History of the Automobile: The Assembly Line" (2018)
⁴ NY.CURBED.COM, "NYC opens public parking spots to car-share programs for the first time" (New York 2018)
⁵ IMAGE: Elon Musk, <https://www.ttnews.com/sites/default/files/styles/image-660-367/public/images/articles/teslanorwaymain.jpg?itok=nkYwj8P0>



4.1.33 Elon Musk Tesla plans

“Where can these cars be parked while not in use?”





4.1.35 Most valuable buildings assess.

4.1.37 Most valuable buildings assess.







4.1.36 Most valuable land assess.

4.1.38 Most valuable land assess.

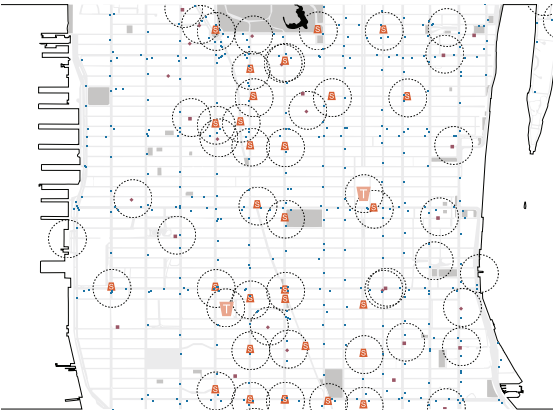
Vehicle self-parking capabilities could reduce inner-city congestion. For instance, by self-parking meaning less space used for roads and a higher efficiency of the parking spots. This could lead into more space, which could contribute to the urban space of Midtown, since that is currently lacking. These inherent benefits could make car sharing more acceptable to local governments and would likely also increase customer use of the service. To promote and test the carsharing hub a Tesla service center, showroom and city head quarter can be implemented as an example for future car sharing within high dense inter city neighbourhoods.

Through the synthesis of new technologies and current modes of transport, carsharing nodes can contribute to solving the congestion problems of Midtown. Does this give opportunity to generate new relations between transport and the New York inhabitants?

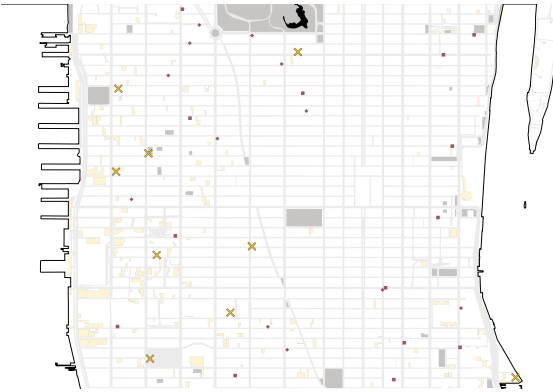
Data: NYC planning, *PLUTO* (New York, 2018)

-  Rideshare hub
-  Energy charging station
-  Gas station
-  Parking lot

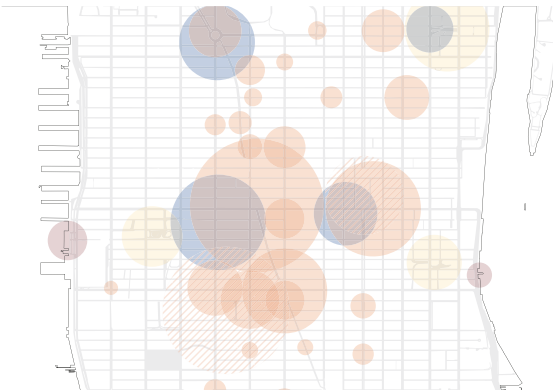




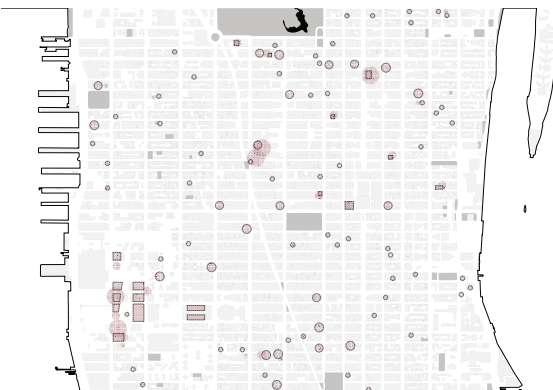
4.1.39 Public transport nodes



4.1.40 Rideshare and parking spaces



4.1.41 Size of the nodes by passengers



4.1.42 New development

By taking the transfer hubs as a starting point and looking at where multiple nodes of transport meet a pattern of clusters starts to arise. These are the moments in Midtown where the people come into the city and either move by foot or take a different mode of transport to continue their journey. These moments of entry play a key role in the congestion of the Midtown. Since most of the nodes are clustered around Penn station, Times Square and Grand Central Station, the borders of Midtown are under serviced. The bus stops are often the only modes of transport who service these areas, together with the rise of the carsharing hubs, whom are situated close to the car entry points of Midtown.

When we overlay this with the new development happening in Midtown, we notice that the new development takes place in the border areas. The current developments are around Hudson Yards, which has access to a Subway, but all other border development does not have this access to transfer nodes. This in relation to the rise of the public transport use and decline of the car, which gives people freedom to go everywhere, shows that the border zones with new development are under serviced. Especially if more people start will start living in these developing areas. My research question to research these nodes is: "How will the lack of mobility on the banks of Midtown influence the development of Midtown?"

