TNCs and Land Use Planning

EFFECTS ON THE SAN FRANCISCO GENERAL PLAN, PLANNING CODE, AND ENVIRONMENTAL REVIEW

San Francisco Planning

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Executive Summary

Emerging mobility services and technology have the potential to radically change human behavior and cities on a scale that other transformative technologies have similarly done. San Francisco is not prepared for this.

Emerging, app-enabled transportation services, such as ridesourcing services provided by transportation network companies (TNCs)(e.g., Lyft, Uber), caught cities off-guard, including San Francisco. The results of being caught off-guard for TNCs have been significant.

Studies show that TNCs shift people away from other means of travel, including walking, bicycling, and transit and that TNCs generate more car trips.[1] TNCs circulate on streets frequently with few or no passengers, induce travel, and compete with public transit, instead of supplementing it.[2] All these effects result in more vehicle miles traveled (VMT) and congestion on roads, even when accounting for multi-passenger (i.e., shared) TNC options.[3]

In San Francisco, it is estimated that TNC trips made up about 15% of all intracity vehicle trips in 2017.[4] TNCs accounted for approximately 50% of the increase in congestion between 2010 and 2016 in San Francisco.[5]

Less has been studied about TNCs' effects on land use planning and the built environment. This includes how location and densities of land uses could interact with the demand, supply, and operations of ridesourcing (also known as ridehailing) services.

This San Francisco Planning Department (Planning Department) study examined the potential effects of TNCs on land use planning in San Francisco and recommends policy options for the City to take based on the results.

Using a combination of regression analyses, interviews, focus groups, online surveys, and research on development applications submitted to the City and County of San Francisco (the City), the Planning Department made the following findings in relation to the study's research questions.

Are some land uses and densities associated with more TNC activity than others?

- **Visitor, retail, residential, and cultural, institutional, and educational land uses showed significant positive association with TNC activity.** Regression analyses showed that, of the five land use categories examined, visitor-related uses, such as hotels and other lodging, had the most significant positive association with TNC activity followed by residential land uses. This was true when variables such as time of day and density were controlled. (These findings resulted from regression analyses, which can show a relationship – or an association – between two variable and assess the strength of the relationship. Regression analyses cannot determine causality or directionality.)

- **Higher-density areas showed significant positive association with more TNC activity.** Regression analyses showed that areas in San Francisco with the highest density had the greatest correlation with TNC activity. These areas include neighborhoods in the northeast quadrant of the city, including downtown, Financial District, South of Market, and North Beach.

What other built environment features are associated with TNC activity?

- **High daily parking costs and lack of access to a vehicle were associated with more TNC activity.** Of the nine built environmental features examined, research findings indicated that high daily parking costs had the most significant positive association with increased TNC activity. The share of households without a vehicle were also significantly associated with more TNC activity.

- **Proximity to a BART station was slightly associated with increased TNC activity.** Findings showed that areas closer to a BART station had a positive association with TNC activity, although the strength of that association was minor. This is consistent with previous research conducted through the "TNCs and Congestion" study (2018), which found that TNCs were associated with vehicle delay in the downtown core.

Do TNCs create new or alter existing land uses?

- **The impact of TNCs on new or existing land uses is evolving.** Two separate efforts were employed to answer this study question. The Planning Department administered online surveys and focus groups with drivers to understand their routine and needs while they are driving for a TNC and how their behavior may impact land uses. The Department found no apparent patterns whether ridesourcing operations are changing land uses.

  The Planning Department also reviewed applications involving TNCs and/or autonomous vehicles (AVs). (While the subject of this study is TNCs, AVs were included in this review as TNCs and mobility companies have cited using such vehicles for ridehailing purposes.) The review found several applications that proposed changes in use of some properties, such as using parking or maintenance sites for fleet-operated, AV passenger services. Given that these uses would be new ones for San Francisco (if not other jurisdictions) and that the Planning Department believes that TNCs will be followed by AV passenger services, this strongly suggests existing land uses are being re-shaped.

How is the development community reacting to TNCs?

- **Many developers perceive a reduced demand for off-street parking and/or private vehicle ownership because of ridesourcing services.** They see this reduced demand, most notably in office and multifamily residential developments, as they observed many young professionals have shifted how they get to and from work, especially if those places are in high-priced parking areas. In response, many developers plan to build less parking in the future due to this perceived decline in parking demand and are instead increasing loading spaces to accommodate TNCs. In existing buildings, some developers have adaptive reuse plans for what may become extraneous parking.

In response to these results, the Planning Department determined key findings and their potential policies for consideration by City decisionmakers. These include:

1

KEY FINDING

Convenience typically wins.

POLICY OPTION

Maintain General Plan policies that are consistent with the City's Transit First policy and update the General Plan to identify the ways emerging mobility can advance City goals (e.g., climate action, safety, access) and/or take steps to manage and attempt to avoid or minimize conflicts with City goals.

2

KEY FINDING

Demand for curb space is high and will likely increase as emerging mobility usage grows.

POLICY OPTION

Update the General Plan to establish (a) priorities for curb space by land use and (b) policies to address the ongoing loading effects from emerging mobility.

3

KEY FINDING

The Planning Code may not appropriately or fully consider land use impacts by emerging mobility services and companies.

POLICY OPTION

Update the Planning Code to classify land uses involving emerging mobility.

4

KEY FINDING

Ridesourcing could counter some of the benefits of Planning Code provisions that encourage sustainable travel.

POLICY OPTION

Continue to regularly monitor the effectiveness of the Transportation Demand Management Program.

5

KEY FINDING

Developers are challenged to respond to TNCs and anticipated AV passenger services, particularly for existing developments.

POLICY OPTION

Provide guidance for developers in responding to emerging mobility, including TNCs and AV passenger services.

6

KEY FINDING

Environmental review appropriately considers TNC activity.

POLICY OPTION

Align environmental review with any future adopted policy or regulations concerning emerging mobility and monitor and integrate reputable emerging mobility evidence into reviews.

The Planning Department does not expect TNC impacts and issues to go away, especially as ride-sourcing becomes available using AVs, as recently permitted by California law. In many ways, TNCs preview what may come from AV passenger services. If and when AVs will be widely available, accepted, and used by the public is unknown. Yet, the stakes are high if TNCs are a preview of impacts to come.

Without further government intervention, it is unlikely San Francisco will meet its safety, equity, and climate goals. Given TNCs' tendency to increase vehicle travel, we will instead see more cars on the road, which will have dire consequences on air quality, health, economic prosperity, and safety.

Additionally, technology-based transportation services will be available for a select segment of able-bodied people who can afford them, which will compound the socioeconomic divisions and inequities that we see today.

The City should set the policy foundation for TNCs and other emerging mobility providers to respond to its principles and rules instead of the other way around. It must be the City, through its residents, community representatives, and elected representatives who should manage the City's public streets.

To be clear, San Francisco welcomes new technology and services. From the building of the Golden Gate Bridge to the invention of television, San Francisco has long been the home of innovation. The City welcomes innovation – as long as it serves the goals of the people in San Francisco and the Bay Area and not the reverse. The City's streets are a vital, limited resource that must serve people – residents, workers, and visitors – and not private entities and vehicles.

The Planning Department, specifically, needs to work with stakeholders to affect land use planning policy locally, including through the General Plan and Planning Code, and to influence various regulations at other levels.

Through this study, the Planning Department adds to previous research conducted by City agencies by analyzing the impact of TNCs on land use planning and identifying policy options on how those impacts can be addressed. The Planning Department, Transportation Authority, and San Francisco Municipal Transportation Agency (SFMTA) collaborated to look at the impacts of TNCs and published several studies, including "TNCs Today" (2017), "The TNC Regulatory Landscape" (2017), "TNCs and Congestion" (2018), and "TNCs and Disabled Access" (2019).

Other cities may have limited to no emerging mobility services now. But these technologies will likely come to their cities, and they may find the need to follow San Francisco's lead in planning for the future instead of reacting to it.

Notes:

COVID-19 pandemic: The Planning Department anticipates TNC trips to return to their pre-COVID-19 levels as the economy recovers and possibly grow through other emerging ridesourcing technologies (e.g., AV passenger services) without new regulations or court decisions, even despite recent increases in TNC trip prices.[6] Thus, the Planning Department anticipates the key findings and policy options herein to remain valid, although the study team largely conducted the research for this study prior to the onset of the pandemic.

Assumptions related to TNCs and AV passenger service: Much has been written and anticipated about how AVs will affect transportation. While the technology is moving rapidly and much remains unknown and assumed, the Planning Department anticipates that the public arrival and use of AVs will be in the form of passenger services. Some observers have referred to these services as "robo-taxis." While they are not identical, TNCs and the presumed characteristics of AV passenger services have many similarities (e.g., app-based; curb usage; potential effects on equity, congestion, air quality, greenhouse gases). Given the lack of a model of how AVs in general and AV passenger services will operate, the study team assumes that the effects of AV passenger services could be like the effects of TNCs. Practitioners and others who study emerging mobility services and technology have also made this connection.[7]

Key Terms / Glossary

Autonomous vehicle: A vehicle equipped with technology that has the capability of performing the entire driving task on a sustained basis without the active control and supervision of a human driver. This includes capabilities called conditional driving automation, high driving automation and full driving automation, as outlined by the Society of Automotive Engineers. (See https://www.sae.org/news/2019/01/sae-updates-j3016-automated-driving-graphic.) Cars with driving assistance features that depend on the presence of an active and attentive human driver are not AVs.

Autonomous vehicle passenger services or autonomous vehicle ridehailing: Pre-arranged, on-demand transportation services in an autonomous vehicle offered under permits. In California, the California Public Utilities Commission issues these permits.

Built environment: Physical, human-made structures or systems (as opposed to the "natural environment"). This includes any physical facilities and infrastructure that supports people's everyday activities. Examples include houses, schools, shopping centers, streets, freeways, and utilities. (Source: US EPA, https://www.epa.gov/smm/basic-information-about-built-environment)

Density: In planning, density is considered the amount or intensity of a unit within an area or site. These units can be people, households, workers/jobs, residential units, buildings, or another type of activity or physical development.

Emerging mobility services and technology: Transportation service or technology that uses public roads and sidewalks and automates at least three of the following characteristics: driving, vehicle tracking, matching/sharing, routing, billing, crowd-source routing, reservations/orders, customer feedback, and vehicle locking/unlocking. Examples include bike sharing, ridesourcing/ridehailing, microtransit, AV passenger services, and others. (Source: Transportation Authority, https://www.sfcta.org/sites/default/files/2019-02/Emerging%20Mobility%20Studies_11.pdf)

Land use: Land use generally refers to how land or a structure, or both, is used. Land use regulations could specify that only certain categories of uses or operations may occur on a piece of land (e.g., residential, office, retail). Land use also often refers to size, shape, density, and features of the use or structure on the land.

Land use regulations often vary by geography. Land use activities can be affected by transportation systems and can affect the natural environment and human health. Similarly, there are human activities and natural phenomena (e.g., earthquakes) that could affect land use. Land use planning can respond to these various items. (Source for portions: US EPA, https://www.epa.gov/report-environment/land-use)

Planning: For the purposes of this study, planning refers to the San Francisco Planning Department's responsibilities of guiding growth and development.

This is accomplished through processes and policies such as preparing and reviewing amendments to the General Plan, the guiding document for the future physical development of the city; guiding land use projects through the building permit and entitlement process to ensure compliance with the General Plan, Planning Code, zoning regulations, and design guidelines; administering and enforcing the Planning Code; and reviewing projects, including land use and transportation projects and policies, for potential environmental impacts pursuant to the California Environmental Quality act (CEQA). It may also refer to the Planning Department's coordination with other agencies on these or other agencies' planning efforts.

Ridesourcing or ridehailing: Ridesourcing or ridehailing services use smartphone apps to connect TNC drivers with passengers. See also definition of transportation network companies.

Traffic analysis zone (TAZ): A unit (usually geographic area) used in models for transportation analyses and other planning purposes. Traffic analysis zones vary in size, ranging from single city blocks in the downtown core to multiple blocks in outer neighborhoods to even larger zones in historically industrial areas.

Transportation network companies (TNC): These companies provide prearranged transportation services for compensation using an online-enabled application or platform (such as smart phone apps) to connect drivers using their personal vehicles with passengers. These services are referred to as ridesourcing or ridehailing and are regulated at the state level by the California Public Utilities Commission (CPUC), unlike taxis which are regulated locally.

TNCs are further distinguished from taxis in the following ways: they may not accept street hails, only prearranged rides; there is no regulatory limit on the number of vehicles allowed to operate simultaneously; and fares are not regulated. (Source: CPUC, https://www.cpuc.ca.gov/tncinfo, and UC Berkeley Transportation Sustainability Research Center, http://innovativemobility.org/wp-content/uploads/2015/11/SharedMobility_WhitePaper_FINAL.pdf)

Vehicle miles traveled (VMT): This measurement of all the miles that are driven in a personal, private vehicle. In transportation planning, this usually measures the amount of travel for all vehicles in a geographic region (e.g., San Francisco) over a given period of time (e.g., one weekday or one-year period).

Photo by Jeremy Menzies, SFMTA

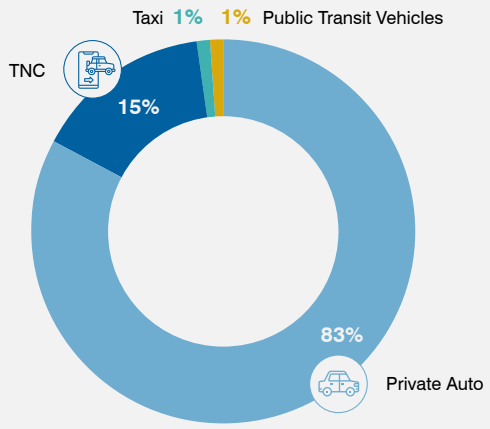
1. Introduction

Background

The use of ridesourcing services offered by transportation network companies (TNCs) has grown substantially in recent years in San Francisco and many cities around the world.[8] These companies, (like Lyft and Uber) provide a direct and convenient mode of transportation that is similar to an individual driving their own private car but without the associated costs of private vehicle ownership or parking inconveniences. In San Francisco, the San Francisco County Transportation Authority (Transportation Authority) estimated TNC trips to be about 15% of vehicle trips within San Francisco in 2016.[9] See Figure 1.

Researchers have attributed ridesourcing growth largely to its convenience for the individual user, such as TNC point-to-point services.[10] These services are like taxis but often with lower and/or more variable costs, shorter wait times, and more convenient or easy-to-use/summon for passengers. Similarly, these services can provide mobility equivalent to an individual driving their own vehicle but without all the associated private vehicle ownership costs or parking inconveniences. These services may also result in shorter wait and travel times and/or a more direct route than public transit, bicycling, walking, or taxis.[11] For some people, the TNCs' mobile applications are also easy to use to reserve and pay for rides.

Figure 1. Average Wednesday Intracity Vehicle Trips* by Mode in San Francisco (2017)

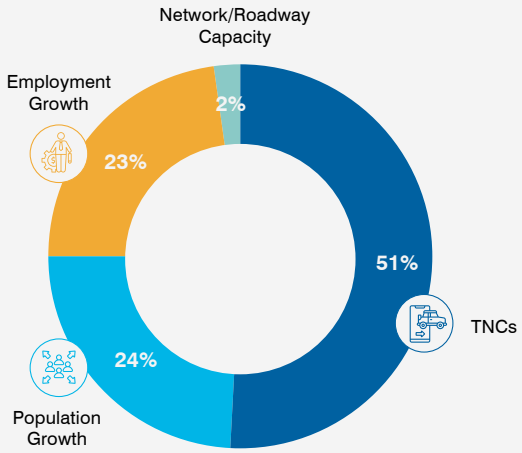


* A "vehicle trip" refers to an individual vehicle making a trip regardless of the number of people within the vehicle. It is not a measure of how many people are making trips by vehicle. For example, a trip taken in a taxi with one fare-paying individual in it counts as one vehicle trip. A trip taken in a car with three people in it also counts as one vehicle trip.

Source: Transportation Authority, "TNCs Today," 2017


Photo by Jeremy Menzies, SFMTA

Figure 2. Factors that Contributed to Traffic Delay in San Francisco (2010–2016)



Source: Transportation Authority, "TNCs and Congestion," 2018

In addition, the Transportation Authority noted the increased use of TNCs in San Francisco is "in part an outcome and reflection of relatively light regulatory requirements under which TNCs operate relative to taxis and other for-hire vehicles."[12] This differs from the heavy regulatory requirements under which taxis operate. The California Public Utilities Commission (CPUC) is responsible for regulating most aspects of TNCs. The CPUC does not restrict the number of TNCs that may operate in San Francisco, nor has it publicly shared data that TNCs provided them despite decisions requiring its release.

Researchers have studied TNCs' effects on individuals' travel behavior and congestion, among other factors (e.g., safety, labor). Their findings show that TNCs shift people away from other means of travel, including walking, bicycling, and transit. TNCs also generate more car trips, thereby increasing congestion.[13] TNCs circulate on streets frequently with few or no passengers, induce travel, and compete with public transit, instead of supplementing it.[14] This, in turn, results in increased vehicle miles traveled (VMT) and congestion, even when accounting for multi-passenger (i.e., shared) TNC options.[15]

In San Francisco, TNCs accounted for approximately 50% of the increase in congestion between 2010 and 2016. See Figure 2. This led to decreasing average travel speeds, delays for transit, and increasing greenhouse gas emissions. TNC trips that occurred during peak periods in dense areas of San Francisco likely had greater effects on congestion than trips that occurred during off-peak periods in less dense areas.[16]

Many of these TNC effects undermine the City's goals, including those related to climate action. San Francisco has set a target to have 80% of trips be on sustainable modes by 2030, specifically those taken on foot, bike, and transit. Achieving this target will reduce emissions and is imperative given our climate crisis. The target is also instrumental to reducing congestion on City streets.

However, it will be challenging to reach this milestone given TNCs' tendencies to induce vehicle travel. It will be critical for TNC vehicles to become electric, as deadheading (when TNC vehicles are driving around without a paying passenger onboard) produces more

emissions per passenger mile than a private car owners' vehicle.[17] In fact, one study found that 35% of miles traveled in a TNC in San Francisco did not include passengers in the TNC vehicle, as the TNCs were driving around waiting or searching for their next fare-paying passenger.[18]

More vehicles and associated VMT on the streets may also result in more collisions,[19] which would undercut the City's ability to meet its Vision Zero goal of eliminating traffic fatalities by 2024.

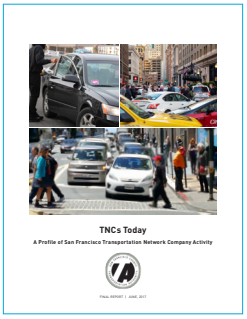
There is also evidence that competition with public transit is part of TNCs' business model. Uber has acknowledged it must compete with public transportation to grow. The company wrote in its registration filing with the U.S. Securities and Exchange Commission in 2019 that its "growth depends on a number of factors, including our ability to ...reduce the costs of our Personal Mobility offering to better compete with ... other low-cost alternatives like public transportation, which in many cases can be faster or cheaper than any other form of transportation."[20]

While competition is not unwelcome, TNCs providing services that public agencies currently provide raises serious questions of accountability and equity, including lack of local regulatory authority over TNCs and lack of access to ongoing service data. TNCs like Lyft and Uber, as publicly held companies, are beholden to private interests, such as shareholders and the stock market, and may not provide services to all segments of society as mandated by local, state, and federal mandates (e.g., Title VI).

An example of accountability and equity concerns includes TNC services not being provided to certain groups of people or locations. Research findings suggest TNC drivers turn down ride requests from neighborhoods with communities of color and low-income households.[21] Service discrepancies also exist for people with disabilities. In San Francisco, the Transportation Authority's Emerging Mobility Evaluation Report (2018) found that TNCs did not provide vehicles accessible to people using wheelchairs, charged higher fares for users requesting wheelchair-accessible vehicles, and relied on mobile applications and websites that were not accessible by screen readers or assistive devices.[22]

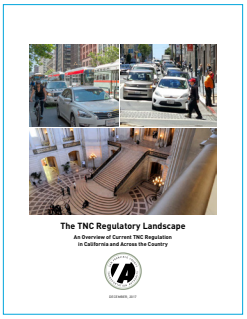
Prior San Francisco Agency Studies About TNCs

City agencies have conducted several studies to explore how TNCs affect people and travel patterns in San Francisco. The Transportation Authority and the San Francisco Municipal Transportation Agency (SFMTA) prepared prior TNC studies, some in collaboration with the San Francisco Planning Department.



Transportation Authority, "TNCs Today" describes the characteristics of ridesourcing companies in San Francisco, including the number, location, and timing of trips.

Released: June 2017



Transportation Authority, "The TNC Regulatory Landscape" provides an overview of existing state and local TNC regulatory frameworks across the country and within California.

Released: December 2017

Transportation Authority, "TNCs and Congestion" provides the first comprehensive analysis of how TNCs collectively affect roadway congestion in San Francisco.

Released: October 2018

SFMTA, "TNCs and Disabled Access" identifies opportunities and barriers that TNCs present for people with disabilities.

Released: April 2019

Are TNCs a Preview of Robo-Taxis?

Much has been written and anticipated about how fully autonomous vehicles (AVs) will affect transportation. While the technology is moving rapidly and much remains unknown and assumed, the Planning Department anticipates that the public arrival and use of AVs will be in the form of passenger services. Some observers have referred to these services as "robo-taxis" – on-demand services that can be summoned using a smart phone app and provided by a fully AV.

In 2021, the California Public Utilities Commission gave permits to two companies (Cruise and Waymo) to provide AV passenger services with some caveats. In March 2022, these same companies obtained another permit from the commission to charge passengers for rides.

While they are not identical, TNCs and the presumed characteristics of AV passenger services have many similarities. See Figure 3. Given the lack of a model of how AVs in general and AV passenger services will operate, the study team assumes that the effects of AV passenger services could be like the effects of TNCs. Practitioners (e.g., public employees, such as planners, transit operators, and airport staff), academics, and others who have studied study emerging mobility services and technology have also made this observation.

Throughout the 2010s, San Francisco and other cities were caught off guard with the appearance of various emerging mobility services and technologies, including electric kick scooters and even TNCs. Public discussions (sometimes heated) ensued along with temporary bans, permit programs, and regulatory requirements. Government entities were responding reactively, as they did not forecast the entry of these new transportation services and technologies.

The difference with AVs is that cities should be aware about their potential deployment, given the press they have received and, in San Francisco, frequent sightings of driverless cars being road-tested on City streets. Municipalities should think about the role they want AVs to play to meet their goals and to proactively develop local policies or influence various regulations at other levels to meet them.

San Francisco must leverage its experience and knowledge of TNCs on City streets (including curbs) and land use to formulate policies and parameters for how AV passenger services operate, including those described in the policy options in this study. The City should start these actions soon before the technology gets ahead of and potentially out of alignment with the City's goals.

Figure 3.
Characteristics of TNCs (existing) and AVs (anticipated)

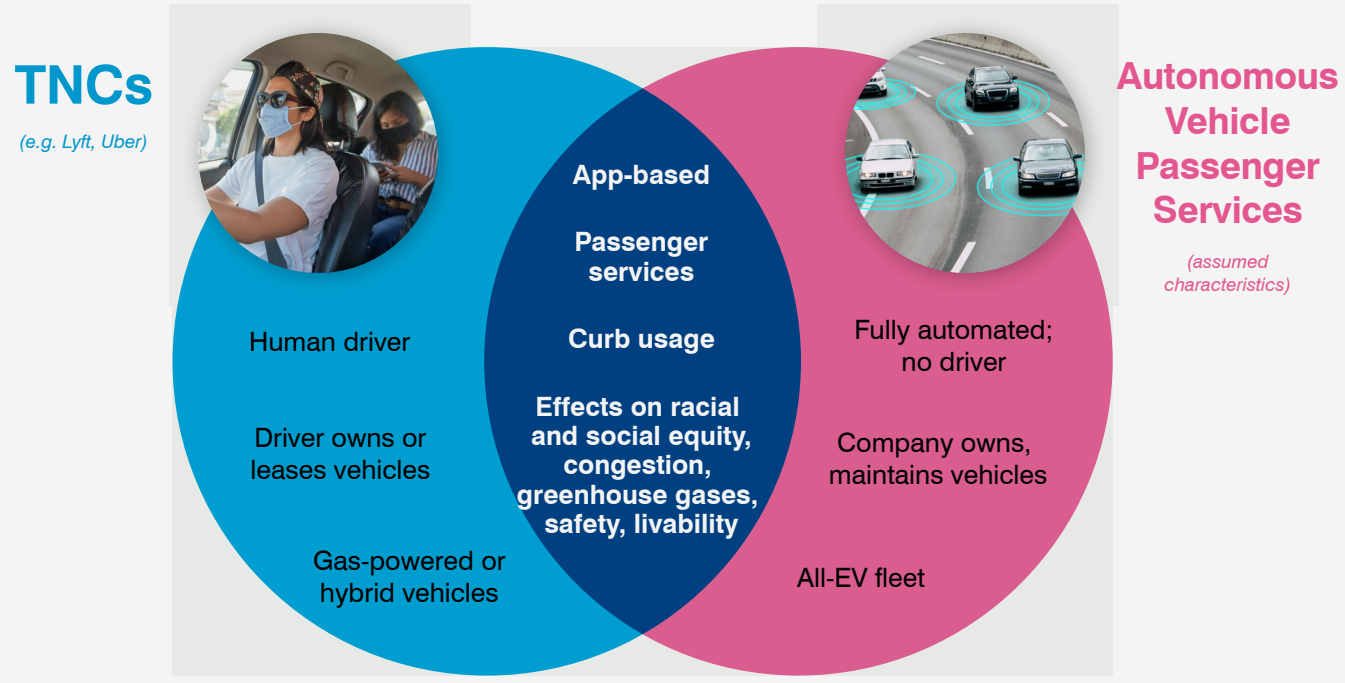


Photo by Jeremy Menzies, SFMTA

2. Study Overview

Why Land Use Planning?

TNCs may directly and indirectly affect land use planning. Land use generally refers to how land or a structure, or both, is used. Land use regulations could specify that only certain categories of uses or operations can occur on a piece of land (e.g., residential, office, retail). Land use also often refers to size, shape, density, and features of the use or structure on the land. Land use regulations often vary by geography or location.

Land use and transportation are interdependent. People travel to and from land uses, including (but not limited to) where they live, work, and visit. This travel occurs on a transportation system, such as sidewalks, streets, and transit. The number of trips from a land use and the ways people travel between land uses is dependent on several factors, including the activities found at the location (e.g., hospitals, offices, schools), number of people (size and density) and the convenience, cost, and safety of different travel options.

Transportation agencies consider land use in their decision-making. For example, they can increase transit service to serve people at major activity centers or allocate curb space differently near a new high-density land use. Another example is the requirement of impact fees on the new land use to offset a portion of increased transportation needs and impacts by the new land use.

Land use agencies consider transportation in their decision-making. For example, they can increase density in locations that have high-capacity or high-frequency transit service (e.g., near Muni Rapid lines or regional rail service, like BART and Caltrain). Or they can set land use regulations that incentivize residents, employees, and visitors in these locations to choose transit over driving (e.g., transportation demand management tools such as free transit passes or carpooling).

As TNCs may directly and/or indirectly affect land uses, TNC activity can influence the decisions that transportation and land use agencies make on these issues. This can happen if some land use categories are associated with more TNC activity, if certain land use features influence TNC activity, or if TNC activity is altering existing land uses or creating land uses that the agencies had not considered.

San Francisco Planning Department's Role

The Planning Department is responsible for land use in San Francisco. It guides growth and development through processes and policies, such as:

- Preparing and reviewing amendments to the General Plan, the guiding document for the physical development of the city, including land use and transportation;
- Guiding land use projects through the building permit and entitlement process to ensure compliance with the General Plan, Planning Code, zoning regulations, and design guidelines;
- Administering and enforcing the Planning Code; and
- Reviewing projects, including land use and transportation projects and policies, for potential environmental impacts pursuant to the California Environmental Quality Act (CEQA).

The Planning Department is often involved in discussions with the community and appointed and elected officials about the impacts of San Francisco's growth, including transportation. In recent years, discussions have included the amount of TNC activity associated with a proposed land use, such as housing, office building, or a grocery store, and how developers should respond to anticipated TNC activity (e.g., if/how to provide loading or parking).

Additionally, the Planning Department is charged with establishing policies that outline how transportation in San Francisco can move people safely, efficiently, and equitably. These include a range of activities, from making determinations about how to classify land uses associated with the amount of trips they are anticipated to generate to developing long-range transportation policies.

By extension, the City can set the policy foundation for TNCs and other emerging mobility providers to respond to its principles and rules instead of the other way around. It must be the City, through its residents, community representatives, and elected representatives, who should manage the City's public streets. The City needs to develop and leverage policy and other tools to shape how technology can serve San Francisco and not the reverse.

The Planning Department does not expect TNC impacts and issues to go away, especially if AV passenger services become a viable travel option. In many ways, TNCs preview what may come from AV passenger services, as companies seek to use these vehicles for ridesourcing, and recent California law updates allow for their operations. If and when AVs will be widely available, accepted, and used by the public is unknown. Yet, the stakes are high if TNCs are a preview of impacts to come.

Note about COVID-19 pandemic: The Planning Department anticipates TNC trips to return to their pre-COVID-19 pandemic levels as the economy recovers and possibly grow through other emerging ridesourcing technologies, even with recent increases in TNC trip prices.[23] Thus, the Planning Department anticipates the findings and policy options in this study to remain valid, even though the study team largely conducted the research prior to the onset of the pandemic.

What is the San Francisco General Plan and the Planning Code?

The General Plan is the embodiment of San Francisco's vision for the future, serving to guide the City's evolution and growth over time. It provides a comprehensive set of objectives and policies that influence how we live, work, and move about, as well as the quality and character of the City.

The General Plan has several elements, including transportation, air quality, environmental protection, housing, recreation and open space, and others. Each of these elements strive to respond to the many complex and pressing challenges facing San Francisco, including:

- How will we move about the City safely and reliably?
- Where and how much housing will get built? Who will it serve?
- How can we prepare for and mitigate the impacts of coming climate-related and other disasters?
- How can we promote health in communities of color and low-income communities that face higher pollution levels and other health risks?
- How do we cultivate inclusive communities where all members have the resources they need to thrive?

The San Francisco Planning Department is responsible for the development of the General Plan. For more information about San Francisco's General Plan, visit https://generalplan.sfplanning.org/

The **Planning Code** is adopted to "promote and protect the public health, safety, peace, morals, comfort, convenience and general welfare and for the following more particularly specified purposes: (a) To guide, control and regulate future growth and development in accordance with the General Plan..."[24]

The **Zoning Administrator** administers and enforces the City's Planning Code. Amongst other duties, this individual hears and makes determinations on variance applications and provides written interpretations and clarifications of the Planning Code, such as Letters of Determination.

Study Questions

This study addresses the following four questions about TNCs and land use planning.

1. Are some land uses and densities associated with more TNC activity than others?
2. What other built environment features are associated with TNC activity?
3. Do TNCs create new or alter existing land uses?
4. How is the development community reacting to TNCs?

The results from these questions will assist the Planning Department respond to inquiries from the public and officials about the impacts of TNCs (and as possibly an extension, AV passenger services). The last section of this report outlines policy options that the Planning Department and the City can consider and adopt to address those impacts.

Photo by Jeremy Menzies, SFMTA

3. Methodology and Results

Overview

This section summarizes the methodology and results for each study question. More information is available in the appendices, which consists of the technical memorandum prepared for each study question. Analyses and discussion of the findings are provided in Section 4.

The Planning Department worked with multiple partners and used several methods to provide breadth and depth in its research and understanding of the study questions. It contracted with a consultant for research and analysis and consulted with the Transportation Authority and SFMTA on the research questions and conclusions.

The study team (consisting of Department staff and consultant) explored several data sources for its quantitative analysis. As shown in Table 1, the team used data from the "TNCs Today" study for the regression analysis used for Study Questions 1 and 2.[25] The team also collected qualitative data through focus groups with TNC drivers, an online survey for TNC drivers, review of related land use applications submitted to the Planning Department, and individual phone interviews with developers. The team examined and summarized the qualitative data by theme for Study Questions 3 and 4.

Table 1: Research Methodologies

Study Question 1. Are some land uses and densities associated with more TNC activity than others?	Methodology: Regression analysis
Study Question 2. What other built environment features are associated with TNC activity?	Methodology: Regression analysis
Study Question 3. Do TNCs create new or alter existing land uses?	Methodology: Focus groups, online survey, Planning Department research
Study Question 4. How is the development community reacting to TNCs?	Methodology: Interviews

Methodology and Results for Each Study Question

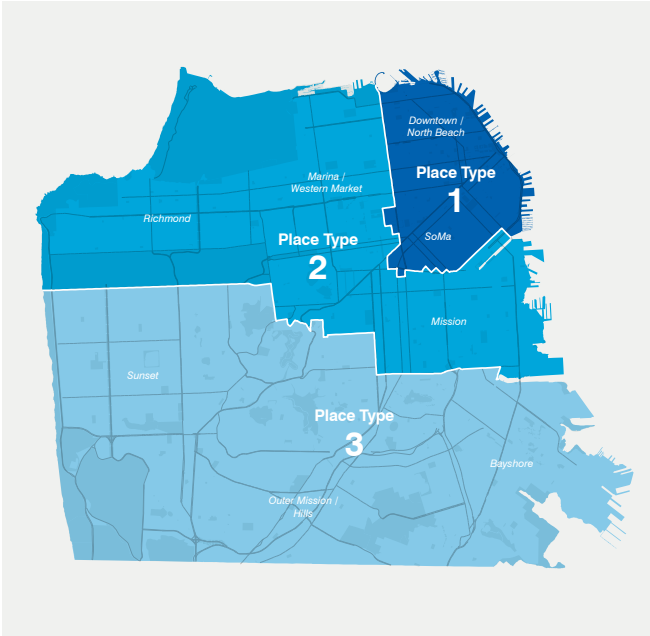
Study Question 1: Are some land uses and densities associated with more TNC activity than others?

The team analyzed if some land uses are associated with more TNC activity than others. The team used data from the "TNCs Today" study (2017) and conducted regression analyses to understand the correlation between TNC activity (a combined measure of pick-ups and drop-offs) and various land use categories. The team used household and employment density as a proxy for different land use categories. For example, the team used concentrations of jobs in retail sectors to represent retail land uses. In total, the team analyzed seven different land use categories, as shown in Table 2.

Table 2: Land Use Categories Used in Regression Analysis

Land Use Category	Metric
Residential uses	Households per acre
Production distribution and repair (e.g., wholesale trade, manufacturing and materials processing, repair)	Production, distribution, or repair jobs per acre
Cultural, institutional, and educational (CIE) uses (e.g., museum, zoo, college, theater)	Cultural, institutional, or education jobs per acre
Office uses (e.g., management, information, and professional activities such as business, legal, public administration)	Management, information, or professional jobs per acre
Retail uses (e.g., shopping, direct consumer services, restaurants, bars)	Retail jobs per acre
Visitor uses (e.g., hotels and other lodging)	Visitor jobs per acre
Medical uses (e.g., medical center, hospital)	Medical jobs per acre

Figure 4. Place Types



Source: SF Planning, Transportation Impact Analysis Guidelines, 2019

The team also analyzed three contiguous geographic areas that share similar mode shares for vehicle use, also known as place types in the Planning Department's Transportation Impact Analysis Guidelines for Environmental Review (2019).

- **Urban High-Density, Place Type 1:** Financial District, South of Market;
- **Urban Medium-Density, Place Type 2:** Mission, Marina, Western Addition, Richmond; and
- **Urban Low-Density, Place Type 3:** Sunset, Outer Mission/Hills, Bayshore.

Figure 4 geographically displays these place types.

The team controlled for land use density on various land uses and vice versa to account for the tendency of certain land uses to be clustered in Urban High-Density areas. Key results are described below.

Visitor, retail, residential, and cultural, institutional, and educational land uses showed significant positive association with TNC activity

Visitor-related land uses, such as hotels and other lodging, were associated with the most significant positive correlation with TNC activity. See Table 3. These land uses are concentrated in the densest areas of the City, namely the northeast quadrant.

The team conducted several iterations of the regression analysis for each land use type to consider time-of-day variations during the weekday (Tuesday, Wednesday, and Thursday) timeframe. The category remained the most significantly correlated with high TNC activity after controlling for land use density.

Table 3: Results from Regression Analysis of Land Uses and TNC Activity (for a 24-hour period)

Variable	Coefficient	T-statistic	P-value is 5% or less
Visitor uses	**224.0**	9.19	Yes
Residential uses	**131.0**	6.62	Yes
Cultural, institutional, and educational uses	**123.0**	4.18	Yes
Retail uses	**97.1**	5.79	Yes
Medical uses	**13.0**	0.37	No
Office uses	**1.76**	1.41	No
Production, distribution, and repair uses	**-24.3**	0.61	No

= positive coefficient, significant
= positive coefficient, not significant
= negative coefficient, not significant

Coefficient: The value by which the variable is multiplied to generate an estimate of TNC activity

T-statistic: A statistical measure of the level of confidence in the coefficient estimate

P-value: A value that tells the level of confidence that each variable has some correlation with the independent variable. A p-value of 0.05 or less signifies that the null hypothesis can be rejected (i.e., that there is no association).

Statistical significance indicates if a research result or research finding is due to the cause or relationship being studied or if it is due to chance. A low level of statistical significance (or insignificance) suggests that a relationship is not likely.

Residential land uses were associated with the second most significant positive correlation with weekday TNC activity across all time periods. When conducting another analysis solely for the evening commute period (3 pm to 6 pm), residential land uses were the third most strongly associated with TNC activity during the weekday evening commute period.

Retail land uses were associated with the third most significant positive correlation with weekday TNC activity across all time periods. Retail land uses were the second most strongly associated with TNC activity during the weekday evening commute period (3 pm to 6 pm), just ahead of residential land uses. Cultural, institutional, and education related uses were the only land use category with significant positive correlation across all weekday time periods but not significant when only considering the weekday evening commute period (3 pm to 6 pm).

The remaining land uses considered in the regression analysis were associated with insignificant differences with TNC activity: office, medical, and production, distribution, and repair.[26]

Higher-density areas showed significant positive association with more TNC activity

The analysis also found that the Urban High-Density place type (which is used in the Department's transportation impact analysis guidelines) had significant positive correlation with TNC activity. The results indicate that the Urban High-Density place type is a suitable indicator for predicting increased TNC activity.

Photo by Jeremy Menzies, SFMTA

Study Question 2: What other built environment features are associated with TNC activity?

The team analyzed if some built environment features are associated with more TNC activity, in addition to employment and household density which were examined in Study Question 1. The built environment refers to physical elements built by people (e.g., housing, offices, stores, etc.).

Using data from "TNCs Today," the team conducted a regression analysis to understand the correlation between TNC activity (a combined measure of pick-ups and drop-offs) and the built environment features shown in Table 4.

Key results are described below.

Higher daily parking costs and lack of access to a vehicle showed significant positive association with more TNC activity

Daily parking costs were associated with the most significant positive correlation with TNC activity. The share of households without a vehicle were also associated with significant positive correlation with TNC activity.

Proximity to a BART station showed slight positive association with TNC activity

Proximity to BART stations was associated with slight positive correlation with TNC activity. Transportation

Table 4: Built Environment Characteristics used in Regression Analysis

Built Environment Feature	Metric	Source
Residential parking ratios	Estimated ratio of the number of residential units divided by the estimated number of residential parking spaces	SFCTA
Non-residential parking ratios	Ratio of non-residential square feet divided by the number of non-residential parking spaces	SFCTA
Share of zero automobile households within 400 feet of the transportation analysis zone centroid	Number of households that do not have access to a vehicle divided by the total number of households	U.S. Census Bureau, American Community Survey 2013-2017 5-year estimates
Daily parking cost in dollars per hour	Estimate of the cost to store a vehicle for a day	SFCTA, Parking Supply and Utilization Study, 2016
Distance in feet to the nearest Bay Area Rapid Transit (BART) station	Estimate of the distance to access the nearest BART station, which provides regional rail service	BART stations shapefile from Caltrans; distance for each TAZ centroid was generated in R
Number of jobs accessible within 45 minutes on transit	Estimate of the number of jobs which can be reached within 45 minutes on public transportation	ConnectSF - estimate generated by SF-CHAMP model, 2018
Share of land zoned for neighborhood commercial transit (NCT) use	Percentage of each transportation analysis zone that has mixed-use districts that support neighborhood-serving commercial uses on lower floors and housing above (San Francisco Planning Code)	SF Planning
Share of land zoned for neighborhood commercial (NC) use	Percentage of each transportation analysis zone that is low- to high-density mixed-use neighborhoods of varying scale established around historical neighborhood commercial centers (San Francisco Planning Code)	SF Planning
Large hotel indicator	Indicator variable that takes a value of one if the transportation analysis zone includes a hotel with over $5 million in annual revenue. The variable's value is zero where annual revenue is less than $5 million.	Dun and Bradstreet, 2019

analysis zones closer to BART stations were associated with a slight increase in TNC activity and zones located further from BART stations were associated with slightly less TNC activity. The study team did not examine proximity to other major transit stations although every BART station in San Francisco, except Glen Park, also serves as a major Muni station. The analysis did not find significant associations with other built environment features and TNC activity.

Study Question 3: Do TNCs create new or alter existing land uses?

The team analyzed if and how land uses are evolving with TNC operations. For the purposes of this study, land uses here are a general reference to the land use definitions found in the San Francisco Planning Code.

The methodologies and results for this study question covered two efforts:

A) TNC driver behaviors and needs because they may indicate a land use demand or need.

B) Review of applications submitted to the Planning Department involving TNCs or AV passenger services.[27]

Survey of TNC driver behavior and needs

To learn more about drivers' behaviors and needs while they are driving for a TNC, the study team used qualitative methods (focus groups and an online survey) to query TNC drivers who drive primarily in San Francisco.[28] The team held two focus groups to get an initial sense of driver behaviors and needs and to inform the development of the online survey questions. Fourteen TNC drivers participated in two focus groups. The online survey included multiple-choice and open-ended questions about driving behaviors (e.g., number of hours worked for a TNC, time of day worked), and 547 people submitted responses. Results are described below.

Most survey respondents lived in the Bay Area

Approximately 96% of respondents lived in the Bay Area, including 29% in San Francisco. (n=388)

These results correspond to the "TNCs Today" study. That study also showed that 29% of drivers are San Francisco residents but showed a slightly higher proportion of TNC drivers living entirely outside the Bay Area (10% compared to 4%).

Most survey respondents also drove in other parts of the Bay Area

In addition to San Francisco, more than half of respondents also drove for TNCs in the East Bay and in the Peninsula (56% and 51%, respectively). (n=547)

Most survey respondents drove more than five days per week and more than seven hours per shift for a TNC

Approximately 77% of respondents drove five or more days a week, with 53% driving six or more days per week. Only 5% of respondents drove one or two days a week. (n=538)

Most survey respondents drove during morning and evening peak hours

Most survey respondents drove during the morning peak hours (6 am-10 am) and evening peak hours (4 pm-8 pm) – 59% and 63%, respectively.

These results align with the "TNCs Today" study, which found that most TNCs trip occurred during morning and afternoon peak periods (pre-pandemic). The number of respondents that drove among other time periods (40 to 45%) were evenly distributed, except fewer drivers indicated they drove between 12 am and 6 am (23%). (n=547)

Some survey respondents spent the night in San Francisco instead of driving home, and some sleep in their cars where parking is available

Twenty-two percent of respondents spent the night in San Francisco, instead of driving home. (n=498, which includes respondents who live in San Francisco) Of those, 44% drove overnight or slept in their car, 35% spent the night at a friend's or relative's home, and 11% spent the night at a hotel, motel, or hostel.

Of the respondents who drove overnight or slept in their car, 85% indicated that they parked on the street or in a parking lot during this period. Survey respondents often indicated specific locations for sleeping in parking lots, which included 24-Hour Fitness (gym), gas stations, airport, Ocean Beach, Safeway (grocery store), or a park.

Survey respondents stop to eat at places where convenience appears to be the main factor

Seventy-seven percent of respondents 77% noted that they stopped for food during the day while they are driving for a TNC. Their choice or reasons where to stop for food varied, with the survey question asking respondents to select all options that applied to them. Forty-seven percent stated location was a factor, and 31% to 36% of respondents indicated that parking availability, cost, and if the restaurant had a drive-thru window were other factors. (n=448)

Most survey respondents do not drive electric vehicles

Only one survey respondent marked that they drive an electric vehicle, while a small number (eight) noted they drove hybrid vehicles. (n = 250)

Where survey respondents fuel or charge their vehicles is unclear

Responses to where survey participants typically purchased gas was unclear, although 30% said they did not do so in San Francisco. (n = 409)

Most survey respondents use TNC driver hubs

TNC driver hubs provided by Lyft and Uber are intended to be resource centers for TNC drivers. Approximately 65% of survey respondents stated they used the TNC driver hubs, and 35% of survey respondents stated they did not. (n=416)

Of those who used hubs, survey respondents went to ask questions and talk to company staff, use the bathroom, get oil changes, take a break or nap, or meet other drivers. Respondents who did not use the driver hubs were asked why. Responses included not knowing of their availability, not knowing where they are located, not having time to use them, or that they were not useful/are generally not needed.

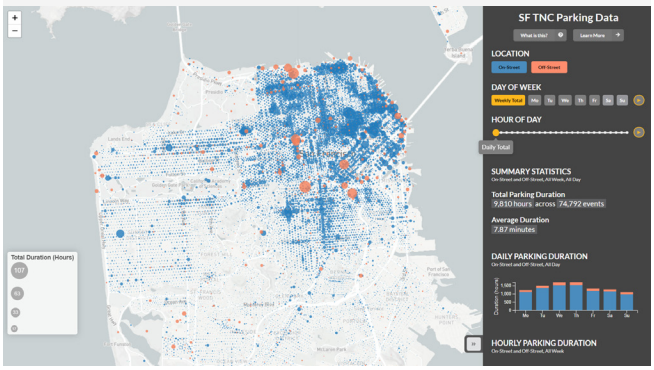
Open-ended responses from survey respondents dealt with publicly available restrooms and loading

Survey respondents frequently noted the need for clean, publicly available restrooms that they could use during their shifts. Other respondents noted the need for places to park and rest. Survey respondents also brought up the need for curb areas to safely idle and to drop off or pick up passengers.

Where TNCs park in San Francisco

The Transportation Authority prepared a visualization tool of "TNCs Today" data in relation to where TNCs park on- or off-street: https://tncparking.sfcta.org/. This tool became available after completion of this study. The following briefly summarizes observations of the data in relation to this paper's study questions and other related work. These observations are not intended to be detailed statistical analyses.

- On-street parking by TNCs appears to correspond with some land uses and densities associated with significant positive association shown in results for Study Question 1: Visitor, retail, and cultural, institutional, and education land uses and higher-density locations. But the data in the visualization tool also shows a lot of TNC on-street parking on specific neighborhood commercial corridors (e.g., Valencia, Polk) that did not show significant positive association for Study Question 2.
- Off-street parking by TNCs appears to correspond with what respondents in the driver survey (Study Question 3) reported about where they stop to eat or sleep, namely areas with parking lots and parking. availability.



Review of Planning Department Applications

The study team researched applications submitted to the Planning Department involving TNCs or AVs, including AV passenger services. (AVs were included in this review as TNCs and mobility companies have cited using such vehicles to provide ridehailing services.[29]) This research included determinations by the City's Zoning Administrator about how to classify land uses associated with TNCs and AVs. The study team intended to identify if and how land uses are evolving with such vehicles and/or the services they provide. The research was not intended to be comprehensive.

Driver hubs operated by TNCs

An existing TNC-related land use includes driver hubs. At the time of this writing, Lyft operates one driver hub or center in San Francisco.[30] It had previously operated a second one in San Francisco, which is currently shut. More information about both are as follows:

- **615 Bayshore Boulevard (currently operational):** Lyft refers to this as a driver center, which includes vehicle service and disinfection.[31] In 2017, the Planning Commission approved a conditional use authorization at this site for change of use from wholesale/retail to auto repair facility within the Production, Distribution, and Repair-2 district[32] and the Bayshore Boulevard Home Improvement Special Use District.[33]

- **2300 26th Street (now closed):** Lyft referred to this location as a driver hub, which included dedicated vehicle service time between 9 and 10 am, snacks, and support center.[34] In 2016, the Planning Department approved a building permit from production, distribution, and repair to general office use at this location.[35]

Uber does not operate any hubs in San Francisco. Its driver hub closest to San Francisco is located in Daly City.

Land uses by TNCs and AV providers create challenges to classify their operations under existing Planning Code definitions

The Planning Department's Zoning Administrator issued a Letter of Determination for each of the following TNCs and/or AV land uses. A Letter of Determination results from requests by property owners, developers, architects, and land use attorneys about the zoning regulations for specific development proposals. These letters offer guidance to requesting parties as to whether a proposed project, such as a new building, an addition to an existing building, or a use change, conform to the Planning Code.

- **1201 Bryant Street/530 10th Street:** GM Cruise LLC, an automobile engineering company that develops AVs, proposed to develop, prototype, and test its AV platform and automobile componentry, including vehicle maintenance and control installation; machine shop and 3-D printing; test production space; showroom; and engineering and development lab at this location. In 2016, the Zoning Administrator determined that Cruise's proposal is classified as Laboratory use under the Planning Code, and more specifically, an engineering laboratory use. As of the letter date, a Laboratory use was principally permitted (or a use permitted as of right) at the site under the Planning Code.[36]

- **333-345 Brannan Street:** GM Cruise LLC proposed to use a portion of its corporate headquarters parking area (25%) at the property to securely park, charge, maintain, and store its fleet of AVs for employee trips. In 2020, the Zoning Administrator determined that Cruise's proposal may be classified as accessory parking under the Planning Code. The Zoning Administrator also determined that if more than 25% of the spaces at this overall site are not used for Cruise's AV parking for employee trips or if Cruise converts the AV program to a commercial passenger service program (e.g., to provide public passenger trips like a TNC), then the use of the

site will be considered a Private Parking Garage under the Planning Code. As of the letter date, a Private Parking Garage required a Conditional Use Authorization at this site under the Planning Code.[37]

- **350 Pacific Avenue:** EVgo proposed to add 25 electric vehicle charging stalls to an existing public parking lot. EVgo estimated five charging stalls would be available to the public, and 20 charging stalls would be reserved for a "private fleet partner" that would operate under a TNC license and provide rides to the public. In 2021, the Zoning Administrator determined that the proposed facility is considered as a Utility Installation under the Planning Code, as the proposed facility will primarily serve private fleet vehicles and will not primarily operate as a retail use serving the ultimate consumer or end user. If the facility were to serve as a retail use through the publicly accessible charging stalls, the Zoning Administrator determined that the proposed facility may be classified as a Gas Station per the Planning Code, as the proposed number of spaces and desire to change over time represent a context beyond what would be considered an accessory use. As of the letter date, both uses were principally permitted under the Planning Code at this site.[38]

In addition, the Department reviewed or is currently reviewing the following applications:

- **201 11th Street:** In 2018, GM Cruise LLC received approval for legalizing a change of use of an existing 29,000 square foot building from Retail to Light Manufacturing for an AV repair facility.[39]

- **1300 Bryant Street:** In 2019, Zoox, a subsidiary of Amazon, received building permit approval for renovation to an existing 42,000 square foot building and change in use from garment warehouse to Light Manufacturing for an AV repair facility.[40]

- **201 Toland Street:** In 2020, Waymo LLC, a subsidiary of Alphabet Inc., received building permit approval for renovation of an existing 30,000 square foot building to change its use from Truck Terminal to Light Manufacturing for autonomous electric vehicle repair and maintenance space and to establish a Private Parking Lot (159 total spaces) for vehicle charging.[41]

- **640-800 Cesar Chavez Street:** GM Cruise LLC is proposing to change the use of a 60,000 square foot building from Warehouse to Light Manufacturing for a new AV fleet maintenance and repair facility and to continue the Private Parking Lot use for vehicle charging.[42]

- **855 Geary Street:** GM Cruise LLC may propose to convert a public parking garage to park and charge autonomous, ridehailing vehicles (75 spaces).[43]

- **2860 16th Street:** EVgo is proposing to add 26 electric vehicle charging stalls to an existing parking lot. EVgo estimated eight charging stalls would be available to the public, and 18 charging stalls would be reserved for a "fleet organization".[44]

- **3865 Irving Street:** EVgo is proposing to add 14 electric vehicle charging stalls to a site with an existing automotive repair shop. EVgo estimated 10 charging stalls would be available to the public, and four charging stalls would be reserved for a "fleet organization".[45]

Lastly, the Planning Department is currently reviewing applications for logistics and parcel delivery facilities.[46] For the purposes of this report, logistics facilities refer to locations that consolidate and store packages from outside of San Francisco or the Bay Area prior to delivery to their destination in San Francisco, such as residences or office buildings. While these packages are currently distributed to end users by standard delivery vehicles, it is possible that TNC drivers or AVs may deliver the packages in the future.

These results show a growing number of permit applications in approximately the last five years seeking to use and/or convert space in San Francisco to functions that involve AV operations, repair, maintenance, and/or storage.

Initial Steps to Classify Charging Sites for Electric Vehicles in San Francisco

In January 2022, San Francisco Mayor London Breed introduced legislation that incorporates electric vehicle charging sites in the Planning Code for the first time ever. The draft legislation would add three new definitions to the Planning Code: "Electric Vehicle Charging Location", "Electric Vehicle Charging Station", and "Fleet Charging." It would also revise zoning control tables to reflect these new definitions.

The Mayor created the proposal to facilitate the adoption of electric vehicles, which is one of the City's Climate Action Plan's goals related to transportation: Increase vehicle electrification to at least 25% of all registered private vehicles by 2030 and to 100% of all such vehicles by 2040. TNCs or AV passenger services proposed as fleets on private property could meet the definition of "Fleet Charging" in the draft legislation, such as proposals described on the previous page for EVgo.

While the draft legislation considers some impacts from TNC and AV passenger services fleets in its zoning control table (e.g., geographies for permissibility of "Fleet Charging"), its scope is not intended to broadly address emerging mobility services and technology. It is also not intended to address some specific impacts from TNC or AV passenger services fleets that operate with or without electric vehicles, such as those impacts described elsewhere in this study.

Photo by Jeremy Menzies, SFMTA

Study Question 4: How is the development community reacting to TNCs?

The study team analyzed if and how TNCs are affecting developers' thinking and plans for development by conducting one-on-one interviews with developers who have built or are building multiple developments in San Francisco. These interviews included representatives from real estate investment and development companies that represent a broad range of characteristics, including local and national firms, for-profit and non-profit organizations; and entities with portfolios of varying sizes across residential, commercial, and mixed-use development sectors (collectively referred to as "developers" for the purposes of this study).

The study team completed 15 interviews with 19 people. (In some cases, multiple people from one development entity participated in an individual interview). The interview format consisted of free-flowing discussion based on pre-established interview questions and other items that may have arisen from the discussion. The interviews focused on if and how developers were responding to issues related to TNCs, their perceptions of TNCs, and what they saw as emerging needs and priorities for the City, including parking areas, pick-up and drop-off space, charging infrastructure, loading and unloading zones, and potential partnerships.[47]

Findings related to this study question are described below.

Developers see positive and negative aspects of TNCs

Developers' perceived positive aspects of TNCs include increased mobility, ease of getting around, lower demand for off-street parking, and increased accessibility to projects that are not close to transit. Developers' perceived negative aspects of TNCs include increased demand for passenger loading areas, unsafe loading activity, congestion outside of their building sites, and increased traffic in the region.

Developers see location as a more important factor than land use in considering impacts from TNCs

Developers noted location as a more important factor when asked which land use/development categories (e.g., office, retail, residential, etc.) are seeing more impacts from TNCs.

Many developers see a reduced demand for off-street parking and/or private vehicle ownership

Many developers perceived a reduced demand for off-street parking and/or private vehicle ownership and perceived the prevalence of TNCs as a key contributor to this decline in demand. They noted this reduced demand, especially in office and multifamily residential developments.

Developers whose firms focus on office developments noted a major shift in the way tenants get to and from work, as they perceived young professionals increasingly making use of new mobility modes, such as TNCs, and driving vehicles much less. Many interviewees noted that AVs will likely further the trend away from privately owned vehicles in the future.

Despite the availability of TNCs, developers noted that a site's location remains an important determinant to parking demand and/or private vehicle ownership, as they perceived that factors such as proximity to transit, increased parking costs, and congestion also coincided with decreased demand and/or ownership.

Most developers plan to build less parking in the future

Most developers stated they plan to build less parking in the next ten years due to their perceived decline in parking demand due to tenants' changing travel behaviors (brought on by factors such as the availability of TNCs) and the City's elimination of minimum parking requirements for new developments. Commercial developers noted that tenants are less likely to require dedicated parking. Some developers said that they would continue to consider parking as a commodity for residential condominium development.

Developers find converting existing parking to other uses to be challenging, but adaptive reuse may be possible for future parking areas

If parking demand decreases, as developers perceived per finding above, most developers noted that converting existing parking to other land uses is challenging due to cost and design constraints and are seeking alternate solutions. These solutions include sharing underused parking with neighboring buildings or renting underused parking to the public through third party companies. Other solutions include converting the parking into retail space, gyms, tenant storage, community spaces, or other types of uses. One developer noted that they plan to build new parking in their buildings and is considering creative adaptive reuse designs that would allow parking to be converted to non-parking uses in the future.

Most developers cited expanded loading areas as the most prevalent and basic solution to accommodate TNCs and other loading activities

Most developers plan to expand loading for new developments as they noted safety and congestion concerns from increased loading operations and limited curb space. Developers generally agreed that off- street loading would be ideal, but they will not always be able to provide it due to lack of space, stringent design requirements, cost, and prioritization of other amenities. Thus, most developers cited expanded on-street loading zones as a desired solution when designing new developments. They mentioned various suggestions for the City to help them convert or design loading zones. One developer suggested they could work with TNCs to identify specific locations where TNCs can load and unload for a given development would increase safety and familiarity for TNC drivers and passengers.

Most developers did not have partnerships or programs with TNCs

Most developers did not have existing partnerships or programs with TNCs. One developer's company provided a subsidy for TNC trips for their tenants to certain locations as part of the amenities for one of their projects. Another developer operated a discounted TNC program as a marketing tool in areas outside of San Francisco.

Some interviewees expressed concerns about partnerships with TNCs, including the ongoing cost to operate a program and vehicle trip generation. Instead, some developers indicated that they intend or preferred to prioritize transportation demand management programs.

Developers noted increased demand for other transportation amenities

Most developers noted that there has been an increased demand for other transportation amenities (e.g., bicycle facilities, electric vehicle charging infrastructure), as they perceive tenants' preferred travel choices changing in recent years. However, developers cited cost and space as barriers, particularly for charging infrastructure for electric vehicles.

Photo by Jeremy Menzies, SFMTA

4. Discussion

This section describes key findings and policy options organized around the San Francisco Planning Department's responsibilities in the City. They are identified as policy options, as the Department and other City agencies will need direction from officials and resources to advance these options with other stakeholders. The policy options are guided by goals set by the City and policy bodies, including the Planning Commission, Environment Commission, and others. In turn, staff from various City agencies prepare plans and policies intended to reach these goals.

These goals include ConnectSF's vision and goals of equity, economic vitality, environmental sustainability, safety and livability, and accountability and engagement.[48] The ConnectSF vision and goals are consistent with the Planning Commission's adopted resolution to center planning on racial and social equity;[49] City-adopted policies like Better Streets,[50] Vision Zero,[51] Transit First,[52] and greenhouse gas emissions targets;[53] and the City's 10 guiding principles for emerging mobility.[54]

The Planning Department unifies various City agencies strategies and policies, such as those above, into the General Plan and, as relevant, into the Planning Code and other reviews. Land use planning can be leveraged to achieve these goals. For example, in 2020, San Francisco's Planning Commission unanimously approved a resolution calling for the Planning Department to center racial and social equity in its work products and processes.

These goals and policies provide direction on what the City wants from TNCs and AV providers. San Francisco must use policy and other tools to shape how technology can serve the City and not the reverse. It must be the City, through its residents, elected representatives, and publicly vetted policies and plans, that manages what happens on its streets, including how TNCs and successor services – as well as the business models they are predicated on – use them. Streets are public resources that should be used to benefit residents, workers, and visitors. To not do so would run counter to City goals, principles, and the public trust.

General Plan

Key Finding 1: Convenience typically wins.

As noted in the Introduction, researchers have largely attributed TNCs' growth to its convenience for the individual user, such as point-to-point services. Here, convenience refers to reliability, total travel time, and cost. Results from Study Question 2 are consistent with this prior research as they indicate the convenience or inconvenience of TNCs compared to other travel options.

- High daily parking costs showed significant positive association with more TNC activity. This result indicates TNCs are more convenient than driving a car where parking costs are high.

Key Findings and Policy Options

1

KEY FINDING

Convenience typically wins.

POLICY OPTION

Maintain General Plan policies that are consistent with the City's Transit First policy and update the General Plan to identify the ways emerging mobility can advance City goals (e.g., climate action, safety, access) and/or take steps to manage and attempt to avoid or minimize conflicts with City goals.

2

KEY FINDING

Demand for curb space is high and will likely increase as emerging mobility usage grows.

POLICY OPTION

Update the General Plan to establish (a) priorities for curb space by land use and (b) policies to address the ongoing loading effects from emerging mobility.

3

KEY FINDING

The Planning Code may not appropriately or fully consider land use impacts by emerging mobility services and companies.

POLICY OPTION

Update the Planning Code to classify land uses involving emerging mobility.

4

KEY FINDING

Ridesourcing could counter some of the benefits of Planning Code provisions that encourage sustainable travel.

POLICY OPTION

Continue to regularly monitor the effectiveness of the Transportation Demand Management Program.

5

KEY FINDING

Developers are challenged to respond to TNCs and anticipated AV passenger services, particularly for existing developments.

POLICY OPTION

Provide guidance for developers in responding to emerging mobility, including TNCs and AV passenger services.

6

KEY FINDING

Environmental review appropriately considers TNC activity.

POLICY OPTION

Align environmental review with any future adopted policy or regulations concerning emerging mobility and monitor and integrate reputable emerging mobility evidence into reviews.

For example, the cost of parking downtown for a few hours may be equivalent to the cost of a taking a TNC for round-trip travel to/from other parts of the City, without the added time to find parking, pay for parking, walking to the destination, and additional maintenance and fuel cost from personal vehicle ownership. In such a situation, people may opt to take a TNC to travel to downtown.

- There was significant positive association between the share of households without a vehicle and more TNC activity. This association indicates that TNCs may be an additional travel option for these people in addition to biking, taking transit, etc. and/or may replace these travel options – if individuals can afford the price, they have a time-sensitive trip, or if the City does not make the necessary investments to make walking, biking, or taking transit convenient and otherwise competitive with TNCs.
- Proximity to a BART station showed slight positive association with TNC activity. This association suggests that people who live and/or work near a BART station may prefer taking TNCs over other modes of transportation and is consistent with

findings from other studies that indicate TNCs compete with transit and other modes and that TNCs contribute to vehicle delay in the downtown core, where many BART stations are located.

The study team did not examine TNC association in proximity to major Muni, Caltrain, or ferry stations and hypothesizes that a similar association with TNC activity could occur in those locations.

These results have serious implications for the City in meeting its ConnectSF vision and goals, especially if TNCs preview the impacts from AV passenger services. The following are examples of these potential implications. They are not intended to be comprehensive or conclusive:

- **Equity:** TNCs and AV passenger services could create a two-tier transportation system, where younger, able-bodied, and/or more affluent people use them. Meanwhile, others would contend with congested, polluted, and less safe streets and slower surface transit, all of which result from additional vehicles in the City.

  The individuals who would most likely suffer a disproportionate amount of these negative effects are people from communities of color, people with low incomes, people with disabilities, and/or essential workers. As an example, the SFMTA's "TNCs and Disabled Access" study (2019) showed that the benefits that have drawn people to TNCs (e.g., ease of payment, cheaper fares, and shorter wait times) are not readily available to individuals with disabilities. Additionally, the study noted that the rapid expansion of TNCs has also degraded the quality and availability of on-demand transportation access for riders who require a wheelchair-accessible vehicle by upending the existing taxi industry.

  To unduly burden persons with disabilities and people who rely on transit is unjust on its own and also runs counters to the City's efforts towards racial and social equity. These negative effects can compound, as reliable, safe, affordable transportation can serve as a pathway to opportunities, services, amenities, as well as connections to family and friends..

- **Economic vitality:** High-capacity vehicles such as public buses and trains are the most efficient way to move large amounts of people. It's a geometric fact. At the same time, it is also a necessity for the City's economic vitality and supports sustainable high-density and mixed-use land use patterns.

  Reliable, easy access to jobs, commerce, and goods movement are critical for San Francisco's economic competitiveness and desirability. Muni has a high economic benefit-cost ratio[55], and the City may lose its economic vitality if access to jobs substantially decreases as a result of more private vehicles on the road as this will delay public transit.

  The City could see substantial car activity in neighborhoods with new emerging mobility facilities. However, these facilities may not generate many new jobs if vehicle automation accelerates. San Francisco could also become a global center for the development of AV technology and lead to further increases in technology and corporate-related office jobs (e.g., engineering).

  Additional economic considerations from their uses are the loss of driving jobs generally due to automation and, although not the focus of this study, land value loss in the City if privately owned AVs make longer commutes more acceptable for people (i.e., sprawl).

- **Environmental sustainability:** Increased VMT from TNCs and AV passenger services increase air and noise pollution and greenhouse gas emissions.[56] Most TNC drivers who responded to the online survey for this study drive gasoline-fueled vehicles. Additionally, with most drivers living outside of San Francisco, their commute to and from the City to drive for TNCs also ramps up VMT, air pollution, emissions, and adds to congestion.

- **Safety and livability:** More car travel creates higher crash exposure.[57] Many people are seriously injured or die on San Francisco's streets every year from crashes. San Francisco saw 30 traffic-related deaths in 2020 and 27 traffic-related deaths in 2021, which are about a 3% increase since 2019 and 11% above the annual average since 2014.[58]

The AV industry has a stated vision of improving road safety. There is reason for optimism that AVs will be able to avoid collisions now caused by speeding and reckless driving. However, to date, there is little agreement on how to measure the comparative safety performance of automated vs. human driving. Moreover, there is little experience from which to identify *different driving errors* that may be caused by automated driving. And there is little agreement about how safe vehicles are expected to be when the human tasks of driving are integrated into the vehicle itself. As a result, it is completely unknown whether there will be any significant change in the relationship between the volume of travel and human injuries and fatalities.

- **Accountability and engagement:** Private industry is generally held accountable by their private boards and shareholders and disclose limited data to local governments, if any. They may not consider the various policy issues an appointed and elected board considers. Additionally, they do not have mandates to provide service to all people, as public agencies do. In fact, research has found that some TNCs discriminate against people of color, people who live in low-income neighborhoods, and women.[59] Additionally, because they are regulated by state agencies, these companies may not recognize or comply with local policies.

Policy Option 1: Maintain General Plan policies that are consistent with the City's Transit First policy and update the General Plan to identify the ways emerging mobility can advance City goals.

The Planning Department could work with stakeholders to consider General Plan policy options that advance the convenience – and desirability – of walking, bicycling, and public transit and specifically advance the convenience of ridesourcing in certain contexts and discourage it in others, such as :

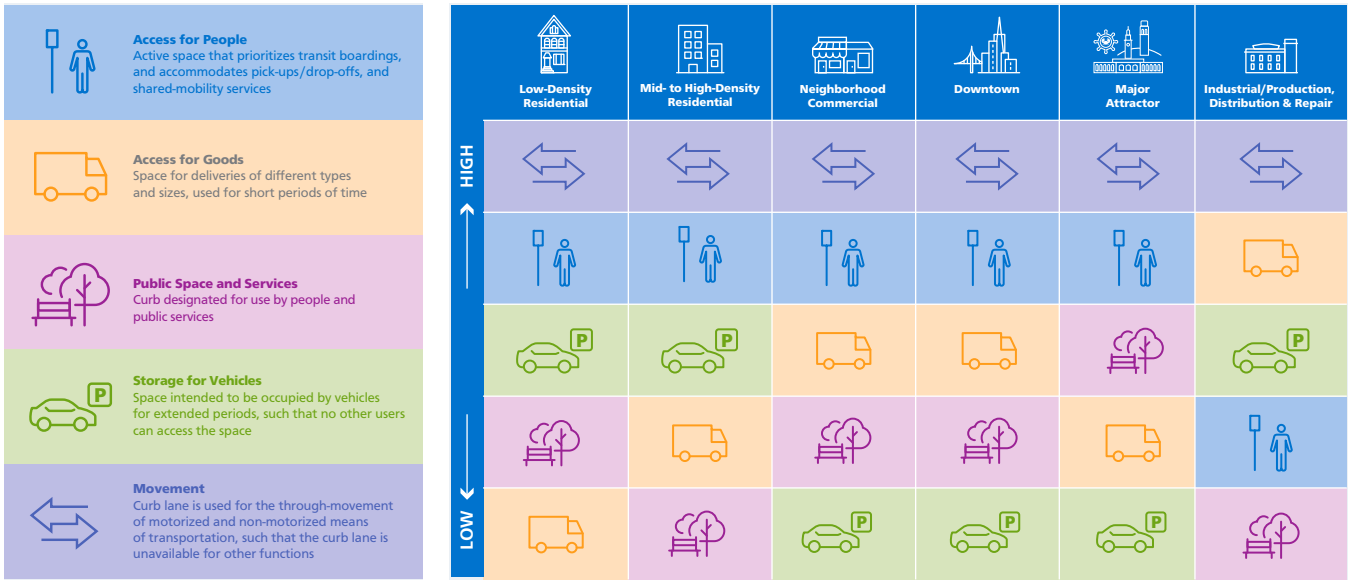
- Policies that identify and encourage investments in high-quality walking, bicycling, and public transit networks. This may include policies that encourage separated, dedicated facilities for people bicycling and riding transit; encourage new funding streams to construct and operate such facilities; and encourage affordability for public transit.

- Policies that identify ways ridesourcing and taxis can advance San Francisco's goals. This may include policies that encourage ridesourcing in situations that improve accessibility and mobility for those who cannot use or access high-frequency or high-capacity transit (e.g., Muni Rapid network, regional rail) due to time-of-day, geographic, or mobility limitations; encourage carpooling to reduce emissions; and encourage safety from TNCs and AV passenger services (e.g., prioritize vulnerable users, low speeds).

- Policies that identify incentives or disincentives to allow for the above bullets, such as improved transportation demand management for existing and new buildings; restrictions on geography, time period, and/or amount of ridesourcing vehicles that can operate on City streets; reduced trip fees for high-occupancy vehicles (e.g., carpools) but not to a point that the cost reduction would compete with public transit fares; increased trip fees for empty passenger vehicles; zero emission vehicles; and technologies that prioritize the most vulnerable road users (e.g., people walking and bicycling).

For this and subsequent policy options, the Planning Department should seek to encourage the tremendous potential the emerging mobility industry has in advancing City goals, including job growth and supporting sustainable living, while regulating the potential for negative impacts. This may require the Planning Department to continue to track applications related to emerging mobility industry, including actual or projected job growth at sites used by emerging mobility providers.

Figure 5. Curb Functions Priorities by Land Use



Source: SFMTA Curb Management Strategy, February 2020

Key Finding 2: Demand for curb space is high and will likely increase as the City grows and new mobility usage increases.

For this study, TNCs drivers and developers consistently noted a desire for more designated on-street curb space for loading and unloading. In addition, results for Study Question 1 showed that TNC activity tended to be higher near certain land uses and in areas of greater land use density. This may indicate a higher demand for on-street loading curb spaces near these land uses and in denser areas. These areas are likely to see more people and travel activity (e.g., pedestrians, bicyclists, drivers).

This demand for on-street loading can create conflicts between people and vehicles in these areas. AVs, when available, will also likely increase demands for on-street areas for drop-offs and pick-ups and that can create tensions with City efforts to redesign streets to allow more room for bicycles and pedestrians.[60]

Demand for curb space, particularly in denser areas of the City. It is also not new for developers to seek public space from the City to facilitate better access

Table 5: Trip Generation from Select Land Uses

Land Use	Daily Motorized Trip Generation[a]	Transportation Sustainability Fee (per gross square feet)[b]
Production, distribution, and repair (PDR)[c]	7	$9.78
Autonomous vehicle facility[d]	17 to 64	$9.78
Logistics facility – parcel delivery portion[e]	13 to 14	$9.78
Non-residential (excluding PDR and hospitals and health services)[c]	25	$23.18 to $26.25 (Varies based on size)

a. Motorized vehicle trip refers to transit and auto trips to and from a land use site. It does not include trip length.

b. San Francisco Planning Code Section 411A, development impact fee register, January 11, 2021, https://sfplanning.org/resource/development-impact-fee-register.

c. Robert D. Spencer, Urban Economics, San Francisco Transportation Sustainability Fee Nexus Study, May 2015, Table A-4, https://default.sfplanning.org/plans-and-programs/emerging_issues/tsp/TSF_NexusStudy_May2015.pdf.

d. A low and high end are provided based on preliminary data for a proposed facility with a wide range to indicate the potential maximum use of the site.

e. A low and high end are provided based on preliminary data for a proposed facility. This range is based on trip counts at existing sites with similar uses as that in the proposed facility and it does not assume AVs.

to their developments. What is new is the City's population is at its highest levels (2019),[61] and the City and businesses have expanded treatments to curbside lanes (e.g., shared spaces).[62] The amount of pick-up and drop-off activity is also at its highest levels, including from TNCs and goods deliveries. This has created greater competition for the finite, shared space that is the curb.

The Planning Department expects this competition for curb space to increase as the City recovers from the effects of the COVID-19 pandemic, as the City and businesses continue to expand treatments to curb-side lanes, and as emerging mobility grows. Studies involving TNCs and AVs often advocate for a greater proportion of the curb be designated for passenger loading.

Policy Option 2: Update the General Plan to identify curb function priorities by land use and operational policies for different land uses and emerging mobility.

The Planning Department could work with partner agencies and other stakeholders to update the General Plan to:

- Incorporate curb function priorities by land use (see Figure 5, which is excerpted from SFMTA's Curb Management Strategy) into policies and code;
- Develop operational policies for land uses, such as a driveway and loading operations plan for new development;[63]
- Identify operational policies for emerging mobility such as geofencing (which directs emerging mobility riders and drivers to specific pick-up and drop-off points), data sharing, and fees for access to the curb, especially if replacing existing parking meter revenue that funds public transit.[64]

The updates should be consistent with the City's Transit First Policy and the various policy options described in Policy Option 1. The General Plan is a comprehensive planning document that guides City decision-making. Thus, the Planning Department could update implementing codes and procedures to align with updated General Plan policy (e.g., environmental review, Planning Code, street design review of new developments). The Department should also consider such policies in the design of neighborhood or area planning processes.[65]

Planning Code

Key Finding 3: The Planning Code may not appropriately or fully consider land use impacts by emerging mobility services and companies.

Emerging mobility development proposals may be inappropriate or inconsistent with existing Planning Code definitions. These proposals may include uses that are common or familiar today (e.g., fueling a vehicle) but do not fit well with numerous Planning Code definitions like Automotive Repair, Gas Station, Laboratory, Private or Public Parking Garages or Lots, Retail Use, Utility Installation, or Vehicle Storage Garage or Lot.

As a result, emerging mobility development proposals may have substantially different impacts than that assumed for existing Planning Code definitions. These impacts could include but are not limited to the following: more vehicle trips in certain neighborhoods; overall or more pollution (e.g., air quality, fuels used for maintenance or repair) than anticipated under existing code; and others. This could lead to these proposals paying less transportation impact fees than warranted. See Table 5. Further, officials may determine, under a new Planning Code definition, that these proposals may require conditional authorizations that have new provisions to address their impacts or officials may determine that they are not permitted at all in the use district (i.e., zoning).

Policy Option 3: Update the Planning Code to classify land uses involving emerging mobility.

The Planning Department could work with stakeholders on the following areas:

- **Land use classification:** Create new (or alter existing) Planning Code definitions for land uses involving emerging mobility, such as TNCs, AV passenger services, and logistics facilities;

- **Performance measures:** Identify appropriate performance-based provisions[66] for the new Planning Code definitions overall and by use district, which should consider geographic, time-of-day, TNC driver needs (e.g., bathrooms), and loading considerations consistent with General Plan policy;

- **Impact fees:** Identify if development impact fees should provide for the new Planning Code definitions in their fee schedules (e.g., transportation sustainability fee) and if such fees should consider factors such as vehicular trip length; and

- **Transportation demand management:** Identify if the Transportation Demand Management Program (see Policy Option 4) should have different requirements for new Planning Code definitions.

The Planning Department should consider the trade-offs of geographic restrictions of such new land uses. These trade-offs include racial and social equity, trip length, and/or delaying or preventing a site from being used for another purpose. As examples:

- **Racial and social equity:** Consolidated parking, charging, maintenance, and logistics facilities could concentrate in locations experiencing higher levels of air and noise pollution and vehicular traffic today. These locations are oftentimes where people of color, low-income households, and other burdened communities live (e.g., Mission and Bayview), raising questions of environmental justice and equitable development. The emerging mobility land use could reduce impacts through performance measures or measures mentioned above (e.g., electric vehicles, time-of-day provisions).

- **Trip length:** Restricting a new emerging mobility land use in San Francisco could increase the trip length when the vehicle is driving around without a passenger if:

  - » Emerging mobility activity will happen regardless of the location of the land use (e.g., TNC drivers or AV passenger service providers will inevitably need to park and receive maintenance or re-fuel, no matter where the facility is located);

  - » Emerging mobility companies establish the uses in an adjacent jurisdiction (e.g., Uber has a driver hub in Daly City); and

  - » Emerging mobility vehicle operations are concentrated in San Francisco.

  In these examples, San Francisco would not be able to collect development impact fees from the use, even although the vehicular impacts would be concentrated in San Francisco. However, allowing a new emerging mobility land use centered on vehicular travel in San Francisco could induce vehicular travel and its associated impacts.

- **Deferral or preclusion of land conversion to future other uses:** Allowing a new emerging mobility land use at an underdeveloped site may preclude the conversion of the site to other uses. For example, allowing a substantial amount of off-street electric vehicle charging spaces at an existing parking lot or garage for use by a TNC or AV passenger services company near a transit hub could defer or preclude conversion of that space to housing.

Key Finding 4: Ridesourcing could counter some of the benefits of Planning Code provisions that encourage sustainable travel.

Many Planning Code provisions encourage sustainable travel by incentivizing such travel (e.g., bicycle parking) or disincentivizing car travel (e.g., auto parking maximums, parking pricing). For example, San Francisco's Transportation Demand Management Program (Planning Code Section 169) is a comprehensive program applicable to most new developments that includes both incentives and disincentives. The program includes 26 measures. Each measure is assigned a number of points that reflect its relative effectiveness to reduce VMT from the new development and is grounded in literature review, local data collection, best practices research, and/or professional transportation opinion.

The program's literature review indicates that more off-street vehicular parking is linked to more driving and that people without dedicated vehicular parking spaces are less likely to drive. The standards assign a reduced parking supply as the second most effective measure to reduce VMT and assigns points to parking pricing. The standards do not include TNC-related measures, as evidence shows TNCs increase VMT.

TNCs, and future AV passenger services, could counter some of the benefits from these Planning Code provisions. Study Question 2 results found that daily parking costs were associated with the most significant positive correlation with TNC activity. The results also found that the share of households without a vehicle were also associated with significant positive correlation with TNC activity. Thus, some residents, employees, and visitors associated with development that have little to no vehicular parking spaces and/or high-priced parking could result in more VMT than assumed by the literature today. For example, some residents may replace their own private vehicle trip with a TNC trip, which on a per-trip basis has more VMT than a private vehicle trip due to TNCs circulating with few or no passengers in them.[67]

Further, developers may seek more partnerships or programs with TNCs or AV passenger services companies. Although most developers interviewed did not have existing partnerships or programs with TNCs, some do, and TNCs may market such ideas to developers.[68]

Lastly, many developers interviewed perceived a reduced demand for off-street parking and/or private vehicle ownership and perceive the prevalence of TNCs as a key contributor to this decline in demand. If this perception is true, it is possible that when people replace their own private vehicle trip with a TNC trip, this could result in less vehicular travel overall. On balance, this scenario could support more sustainable travel pattern, especially if those individuals' TNC trips are not concentrated during peak periods and do not take place along routes well-served by public transit. Currently, this and other studies' findings do not support such a scenario.

Policy Option 4: Continue to regularly monitor the effectiveness of the Transportation Demand Management Program.

The Planning Department should continue to work with the SFMTA and the Transportation Authority to monitor the effectiveness of the City's Transportation Demand Management Program and update it to reflect new research, if necessary. This includes the City further studying the relationship between vehicular parking policies and VMT and potentially private vehicle ownership.

Many policy papers predict a decrease in parking "demand"[69] when AVs become available,[70] like many predicted with TNCs. It is unclear to the Planning Department if parking "demand" will decrease universally because of AVs in San Francisco, as it is unclear that it has occurred because of TNCs.[71] If parking demand does decrease, it is not clear what the consequences may be.

The Planning Department presumes that car manufacturers' motives will be to sell cars and potentially monetize data collected from new technologies. Cars require temporary storage if they are not circulating 24 hours a day, seven days a week. It may be possible that parking demand drops for those who can access such technologies for some trip purposes (e.g., visitor and retail, as indicated in results from Study Question 1 that found certain land uses having significant positive association with TNC activity).

The Planning Department should continue to study these effects and encourage policies that align with City goals (e.g., Policy Option 1), including potentially redirecting developers' cost savings (from not having to build parking spaces) to the City's priority investments if parking demand decreases (Policy Option 3).

Key Finding 5: Developers are challenged to respond to TNCs and AV passenger services, particularly for existing developments.

Developers interviewed noted the potential for reducing parking supply in new developments and providing more loading space, particularly on-street, to respond to TNC usage. .

For existing developments, most developers said that converting existing parking to other land uses is challenging due to cost and design constraints and are seeking alternate solutions. Other ideas included sharing underused parking with neighboring buildings or renting underused parking to the public through third party companies.

Policy Option 5: Provide guidance for developers in responding to emerging mobility, including TNCs and AV passenger services.

The Planning Department could create a guidance document for developers to respond to emerging mobility that considers the following topics:

- Transit First: Centers development and building guidance on the City's Transit-First Policy and identifies how TNCs and AV passenger services can advance this policy and other City goals.
- Loading: Located to avoid conflicts with pedestrians, transit, bicyclists, in compliance with the City's Transit First policy; maximizes reliance of on-site loading spaces to accommodate new loading demand, including passenger and freight vehicles; and ensure that off-site loading activity is considered in the design of new buildings (e.g., Planning Code Section 155(u)), especially to prevent conflicts with pedestrians, bicyclists, and transit vehicles.
- Transportation demand management: How emerging mobility can reduce VMT.
- Parking adaptation: Ways to design existing or new buildings to accommodate other uses besides parking[72], and code requirements concerning conversion of accessory parking to public parking use.

This guidance could take the format of guidelines or other informational document that would be available online or as a hand-out. It could also be used to inform other Planning Code updates (e g., Policy Option 3).

Environmental Review

Key Finding 6: Environmental review appropriately considers TNC activity.

The Planning Department reviews projects for potential impacts on the physical environment, a process known as environmental review. The Department conducts environmental review pursuant to CEQA. As part of environmental review, staff reviews background technical studies, such as transportation impact studies, to assess a project's effects on the physical environment.

To assist in the preparation of transportation impact studies, the Planning Department provides to consultants and City staff a guidance document called the Transportation Impact Analysis Guidelines, which was last updated in 2019.[73] Prior to 2019, the Planning Department previously comprehensively updated the guidelines in 2002. At that time, TNCs did not exist, and the 2002 guidelines did not include quantitative estimates of TNC activity at or near development sites. A lot of other changes occurred between 2002 and 2019, which led the Department to comprehensively update the guidelines in 2019. The update was completed after the commencement of this TNCs and Land Use Study but prior to the team's analysis of the study's results.

In mid-2016, the Planning Department contracted with a consulting firm to develop a methodology for collecting data and updating the travel demand[74] methodology used in the guidelines. The contractor collected and analyzed counts, intercept surveys (i.e., ask passersby in public areas to compete a survey), and commercial and passenger loading at San Francisco development sites in 2016 and 2017 and analyzed 2012 California Household Travel Survey data. The contractor completed its scope in mid-2018.

A major conclusion from the 2019 guidelines update was that the data the Department used to previously estimate trips generally *overestimated* the number of vehicle trips to and from a site, even accounting for the increase of TNCs. For the ways people travel (also known as mode split), taxi and TNC activity comprised a relatively small portion of the overall trip activity at three of four different land use categories during the PM peak period (3 PM to 7 PM), including: residential, office, and retail. Hotel land uses showed a higher portion of the overall trip activity. (See Table 6.)

Table 6: Taxi/TNC Mode Split Data in San Francisco (2019)

	Taxi/TNC Mode Split (%) by Place Type during PM peak period (3 to 7 pm)		
Land Use Category	Urban High-Density	Urban Medium-Density	Urban Low-Density
Residential	6%	4%	4%
Office	6%	11%	2%
Retail	5%	1%	1%
Hotel	20%	16%	7%

Source: San Francisco Planning Department, Transportation Impact Analysis Guidelines (2019)

The 2019 guidelines results cannot be directly compared to the results for Study Questions 1 and 2, given differences in methodology[75]. However, the 2019 guidelines are still useful for estimating TNC activity at development sites because the travel demand and mode split patterns used in the 2019 guidelines are consistent with the findings from this study. For example, this study found that visitor-related land uses, such as hotels, had the highest positive correlation with TNC activity and that TNC activity tended to be higher in higher-density areas. Similarly, as shown in Table 6, hotels exhibited the greatest amount of TNC activity amongst the four land use categories. Additionally, the Urban High-Density place type exhibited the highest percentage of taxi and TNC activity compared to medium- and low-density areas.

One potential difference between the 2019 guidelines data and this study relates to office uses. While the 2019 guidelines suggests that there is a relationship between office uses and TNC activity, particularly in medium- and high-density neighborhoods, some results from this study suggests that office uses do not have a strong association with TNC activity. However, developers interviewed for this study and whose firms focus on office developments noted a major shift in the way tenants get to and from work, as they perceived young professionals increasingly making use of new mobility modes, such as TNCs, and driving vehicles much less.

Policy Option 6: Align environmental review with any future adopted policy or regulations concerning emerging mobility and monitor and integrate reputable emerging mobility evidence into environmental reviews.

The Planning Department could align environmental review with future adopted policy or regulations concerning emerging mobility, such as developing travel demand estimates for new land uses defined in the Planning Code (Policy Option 3). The Planning Department's Environmental Planning division could inform policy or regulations for these new land uses based on their knowledge in reviewing past projects environmental impacts so that future projects can avoid or reduce impacts as part of their project formation (e.g., as the developers are drawing up plans for them), instead of after the fact (e.g., as an imposed CEQA mitigation or alternatives developed later in the project review process).

Additionally, the Planning Department could continue monitoring and integrating reputable emerging mobility evidence into its environmental review, including travel demand estimates and modeling forecasts by land use category; transportation impacts on VMT, transit, and loading; and non-transportation impacts such as energy. New evidence can also inform the City in its approach to other policies herein.

Additional Areas of Interest

This report focuses on key findings and policy options organized around the Planning Department's responsibilities in the City. However, there are other results that may be of interest to the public, other government agencies, and elected officials. This includes additional issues around equity, enforcement, and labor. It was beyond this study's scope to analyze these other issues.

Conclusion

TNCs are a part of the transportation landscape in San Francisco. They provide a direct and convenient mode of transportation for some, while increasing vehicle trips and congestion in the City. This report examines if and how TNCs impact land use planning and the built environment. It showed that certain land uses and densities are associated with more TNC activity than others, particularly in areas that are high-density (e.g., visitor, retail, and residential uses). It also demonstrated that some built environment features are positively or negatively associated with TNC activity – those that make TNCs more convenient for passengers are associated with more TNC activity and those that provide a comparative transportation substitute are associated with less TNC activity.

Land uses may be shaped by TNCs, which may be a prelude to AV passenger services as these services are likely to use a similar app-based, ridesourcing platform that TNCs do. Permitting activity has shown growing demand for converting or using land for ridesourcing operations. Developers stated they are also reacting to TNCs by providing less parking on private property and more loading space in the public right-of-way.

The future of TNCs and emerging mobility is unknown. The longevity and financial sustainability of the current business model for TNCs is questionable, as their convenience comes at a cost, which is higher than the price passengers pay for it; venture capital is not likely a stable long-term funding source; and fair labor practices and conditions have not been established.

Additionally, the externalities of TNCs are costly. Studies find that TNCs generate additional vehicle trips, which increases congestion; and shift people away from other means of travel, including walking, bicycling, and transit, which are less environmentally harmful than how TNCs currently operate.

Despite their unknowns and shortcomings, it is likely that TNCs will remain on the menu of transportation choices in San Francisco. Also likely is that other new transportation technologies will appear and will have similar – as well as different – impacts on the City.

San Francisco welcomes new technology and services. From the building of the Golden Gate Bridge to the invention of television, San Francisco has long been the home of innovation. The City welcomes innovation – as long as it serves the goals of the people in San Francisco and the Bay Area and not the reverse.

However, at the time of this writing, San Francisco is not fully prepared for existing and emerging transportation services and technology, like TNCs and AVs. As such, it is critical for policymakers to assess and prepare for their potential and actual impacts and establish policies to manage their operations. This is imperative to achieve the type of transportation system that would benefit people who live, work, or otherwise spend time in San Francisco.

The City has the opportunity to help shape how people interact with TNCs (and emerging, related technologies) by considering and adopting land use planning policies in conjunction with findings in this report. This includes updating the General Plan and Planning Code to prioritize transit and equity as new mobility options emerge, continuing to monitor congestion through the Transportation Demand Management program, providing guidance to developers on how to prepare for TNCs and AV passenger services, and aligning the environmental review process with new mobility services as they arise.

The Planning Department intends for San Francisco to continue to be a leader in addressing land use, transportation, and related issues. Without further government intervention, it is unlikely San Francisco will meet its various housing, equity, and climate goals. Instead, we will have more cars on the road, which will have dire consequences on air quality, health, economic prosperity, and safety. If technology-based transportation services are primarily available for a select segment of people who can afford to use them, it would compound the socioeconomic divisions and inequities that we see today.

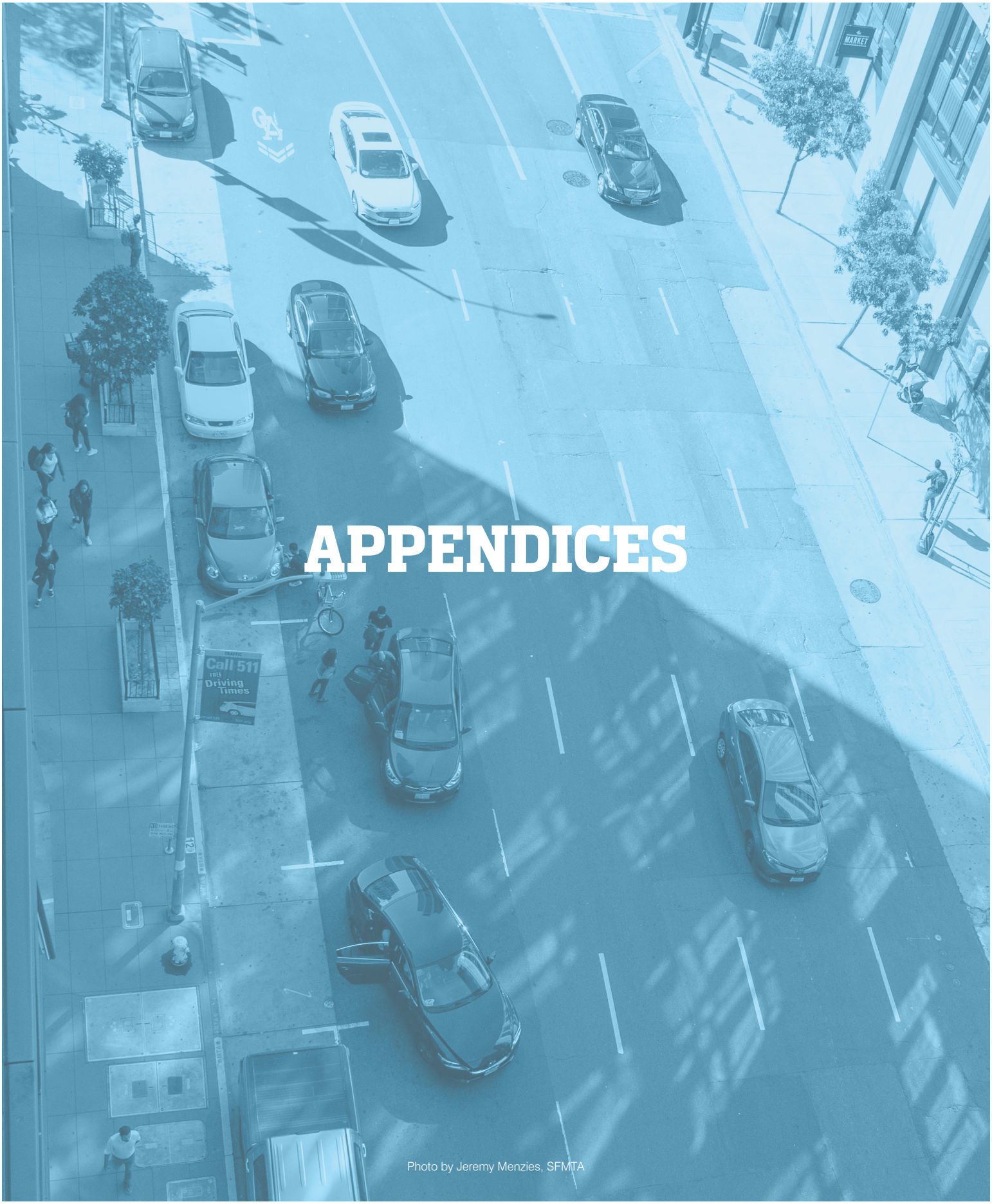
Other cities may have limited to no emerging mobility now. But these technologies will likely come to their cities, and they may find the need to follow San Francisco's lead in planning for the future it wants to see instead of reacting to it.

Photo by Jeremy Menzies, SFMTA

Study Limitations

The study team based its findings and policy options on results from research into the study questions. Those results are based on qualitative and quantitative methodologies that have limitations, like any methodological approach. Those limitations include:

- The data used for Study Questions 1 and 2 was gleaned from the "TNCs Today" analysis. City requests to the CPUC, Lyft, and Uber for data to validate the findings were declined to supplement the analysis in "TNCs Today."
- Findings for the first two study questions were conducted using regression analysis, which can show a relationship – or an association – between two variable and assess the strength of the relationship. Further research with a different methodology would be needed to establish causality or directionality.
- It is not possible to incorporate all the potential factors contributing to changes in congestion. For example, visitor traffic in San Francisco may have increased significantly during the period studied and may have been a factor in increased congestion but was not accounted for in the regression analysis.
- The regression analysis used proxies to estimate the correlation between TNCs and the built environment. For example, areas with high visitor uses (e.g., hotels and other lodging) were represented by visitor jobs per acre. These proxies may not always capture every effect of the land puse category or built environment feature.
- The online survey of TNC drivers was administered at the beginning of the COVID-19 pandemic and retrofitted after the stay-at-home orders were issued. Ridesourcing activity declined substantially for several months at this time. As a result, the study may not have captured a representative sample of TNC drivers or typical pre-pandemic responses.



APPENDICES

Photo by Jeremy Menzies, SFMTA

APPENDIX A.
Summary of Planning Department Policies Related to TNCs

Introduction

The San Francisco Planning Department is responsible for guiding growth and development for the City through processes and policies such as the development of a General Plan, analysis of environmental impacts, and enforcement of the Planning Code. In these efforts, the Planning Department accounts for existing and potential travel demand generation of different transportation modes and plans to coordinate transportation and land use policy and project implementation. Within the last five years, transportation network company (TNC) activity (i.e., ridehailing services, such as Lyft and Uber) has grown substantially. Estimates put TNC trips at about 15 percent of all intracity vehicle trips in San Francisco[76] and at about 50 percent of new traffic congestion on San Francisco streets between 2010 and 2016.[77]

The purpose of this memo is to identify existing and potential future San Francisco Planning Department policies and processes related to TNCs and other forms of emerging mobility services and technology (EMST) within San Francisco. This memo integrates staff input from various Planning Department functions and consultant-led research synthesizing peer cities' efforts to address EMST and their applicability to San Francisco. The combination of internal input sources with consultant review creates a product that represents potential modification to the Planning Department's processes and policies within the context of TNCs and EMST.

The primary focus of this memo is on TNCs. In this service, passengers request a trip using a smartphone. The TNC's software matches a passenger or passengers with a driver either on-demand or for a pre-scheduled trip. This type of service is often referred to as ridehailing or ridesourcing. The service differs from taxi service because TNCs cannot legally pick up passengers that hail from the street and can only pick up pre-arranged passengers as part of a technology application on a smartphone or computer. TNCs also allow for a type of ride-splitting, where the assigned passengers travelling in one vehicle (typically beginning their trip from different locations) split the fare. These TNCs use a distance-based fare system or a flat fee, which are both typically algorithm-generated routes with either point-to-point or fixed-route calculations.

The secondary focus of this memo is on the broader category of transportation and travel behavioral trends known as EMST. This category consists of future forms of mobility that stem from technology improvements and changes (e.g., TNCs, autonomous vehicles), which can alter transportation structures and functions within San Francisco. The category of EMST is meant to encompass incipient and/or unforeseen changes of transportation options in the city, so that the needs regarding infrastructure, zoning, and land use changes and improvements can be better anticipated and planned for.

This memo is organized according to the plans, policies, and processes at the Planning Department that are affected by increased prevalence and usage of TNCs and other forms of EMST. Within the existing policies and processes section, potential policy options related to each topic area and TNCs are discussed. The last section of this memo includes case studies of other jurisdictions that have implemented policies and practices related to TNCs and EMST.

Regulation and TNCs

STATE REGULATIONS: Regulatory jurisdiction related to TNCs can be complex. In California, the California Public Utilities Commission (CPUC) oversees statewide policies for TNCs. This authority is derived from Article XII of the California Constitution and the Charter-party Carriers' Act, California Public Utilities Code sections 5351, et seq., which gives the CPUC regulatory jurisdiction over the transportation of passengers for compensation. CPUC has issued TNC-related regulations involving minimum insurance requirements, background checks for drivers, and vehicle inspections, amongst others. In contrast, taxis are regulated by local municipalities and not the state.

LOCAL REGULATIONS: In addition to state regulations, ridehail companies must adhere to local requirements and jurisdictional authority in San Francisco. This includes business registration requirements by the San Francisco Treasurer and Tax Collector Office and permit registration requirements at San Francisco International Airport. Because they operate on public rights-of-way, TNC drivers are subject to the San Francisco Municipal Transportation Agency's (SFMTA) parking, loading, and unloading requirements; transportation engineering decisions and design; and other initiatives and programs involving City streets. Given TNCs' role in increasing congestion in San Francisco,[87] the City's congestion management agency, San Francisco County Transportation Authority (Transportation Authority), will be involved in understanding traffic patterns affecting congestion and develop programs to manage congestion, including those that could affect TNC operations.[88] The Planning Department's role in developing a Transportation Element for the City's General Plan (as discussed further in Section 1B) codifies policies and regulations involving San Francisco's transportation system, which TNCs are a part of.

The regulatory touch points of these many agencies on TNCs reflect the complexity of managing this type of transportation in San Francisco and speak to the importance of collaboration and coordination amongst these entities.

Long-Range Policies and Plans

CONNECTSF

ConnectSF is the City's long-range transportation planning program launched in 2016 and managed by the Planning Department, Transportation Authority, and SFMTA.

The first phase of ConnectSF included the creation of a 50-year vision for San Francisco which was collaboratively developed by residents and community-based organizations. The vision that was co-created by these groups will guide the subsequent development of long-range transportation projects and policies for San Francisco.

The program subsequently assessed gaps in the transportation system that would prevent San Francisco from reaching this vision. Studies and analyses were conducted to determine what improvements to the city's transit, streets, and freeways were needed to bridge these gaps. These improvements will be included in the regional transportation plan (called the 2050 San Francisco Transportation Plan) and codified in a new Transportation Element within the city's General Plan, which is discussed below.

TRANSPORTATION ELEMENT

State law requires that the General Plan, a document that guides the growth and development of a city or jurisdiction, address seven areas deemed critical to the functioning of a municipality, one of which is circulation (or transportation).

San Francisco adopted its existing Transportation Element in 1995. The existing element addresses regional transportation, congestion management, vehicle circulation, transit, pedestrians, bicycles, city-wide parking, and goods movement. However, the existing element lacks a definition of TNCs and other forms of EMST as well as how they fit into the overall transportation network. Table 1 describes the objectives and policies within the existing Transportation Element that are relevant to TNCs.

The Planning Department has begun the process of updating the Transportation Element. The update will include policy topics that are not explicitly addressed in the existing element. Policy areas in the new element that will likely cover the impact of TNCs

Table 1. Existing Transportation Element Content Associated with TNCs and EMST

Objective	Policy	Relationship to TNCs and EMST
OBJECTIVE 2 **Use the transportation system as a means for guiding development and improving the environment.**	**Policy 2.2** Reduce pollution, noise and energy consumption.	These policies indicate that transportation systems should be developed and operated in a manner that reduces pollution and congestion through the prioritization of transit and non-motorized modes, both of which do not align with TNC vehicle miles travel (VMT). Further, the policies state that the City should not focus investment on driving modes, which TNCs. While mass adoption of electric vehicles could lead to a large number of TNCs using electric vehicles thereby reducing emission, TNCs would still generate VMT and create congestion, which has negative implications for economic vitality, safety, and equity.
OBJECTIVE 11 **Establish public transit as the primary mode of transportation in San Francisco and as a means through which to guide future development and improve regional mobility and air quality.**	**Policy 11.2** Continue to favor investment in transit infrastructure and services over investment in highway development and other facilities that accommodate the automobile.	
OBJECTIVE 7 **Develop a parking strategy that encourages short-term parking at the periphery of downtown and long-term intercept parking at the periphery of the urbanized Bay Area to meet the needs of long-distance commuters traveling by automobile to San Francisco or nearby destinations.**	**Policy 7.1** Reserve a majority of off-street parking spaces at the periphery of downtown for short-term parking.	These policies specify priorities for short-term parking spaces and enforcement of loading zones, but there is no specific language about TNC drivers' curb space needs to pick up and drop off passengers. The growth of TNCs, along with other lifestyle factors, has reduced demand for parking and increased the need for curb uses. TNCs can be used for on-demand delivery services (e.g., DoorDash, UberEats), which also require short-term parking or loading spaces.
OBJECTIVE 40 **Enforce a parking and loading strategy for freight distribution to reduce congestion affecting other vehicular traffic and adverse impacts on pedestrian circulation.**	**Policy 40.8** Provide limited curbside loading spaces to meet the need for short-term courier deliveries/pickup.	
OBJECTIVE 22 **Develop and improve demand-responsive transit systems as a supplement to regular transit services.**	**Policy 22.1** Maintain a taxi service adequate to meet the needs of the city and to keep fares reasonable.	Taxis are required to participate in the San Francisco Paratransit Program and therefore are an integral part of the transit system. There is no content in the Transportation Element as to whether the City considers TNCs as taxis and whether they are to provide the same benefits as taxis.
	Policy 22.2 Consider possibilities for supplementary, privately operated transit services.	The Transportation Element states that private operators may find it profitable to operate between and within districts or neighborhoods and that they should be encouraged to do so. This may be referring to services such as jitneys, commuter shuttles, and other privately operated modes of transportation.
	Policy 22.3 Guarantee complete and comprehensive transit service and facilities that are accessible to all riders, including those with disabilities.	

include safety; mode share; equity; curb management; Complete Streets; autonomy (since they may be a precursor to autonomous vehicles); City collaboration with TNCs (e.g., geofencing pick-up and drop-off locations); and others.

AREA PLANS AND POLICIES

Area plans are created to address planning needs for defined geographic areas within San Francisco. These plans seek to elaborate on the policies in the General Plan and give more detail in terms of how to achieve some of its broad planning goals and objectives.

Area plans address policy and planning needs relevant to different geographic areas of the city, such as Central SoMa or Eastern Neighborhoods, and offer an opportunity for communities in those areas to establish a vision, goals, and objectives to create a neighborhood that meets their needs. Examples of expected results of area plans include job creation, housing production, and improving open space and recreational opportunities. However, much like the General Plan, many of the area plans were adopted before the arrival of TNCs.

BETTER STREETS PLAN

The Better Streets Plan (BSP) is a unified set of guidelines, standards, and implementation strategies that inform the design and program of the city's pedestrian environment. It was codified under Planning Code Section 138.1, which allows the City to require developments that meet certain criteria related to project scale and building program to construct public realm improvements.

STREET DESIGN ADVISORY TEAM REVIEW

The Street Design Advisory Team (SDAT) is an advisory body that provides a regular forum for City agencies to review and comment on proposed changes to the public right-of-way. SDAT is chaired by the Planning Department and composed of members from the SFMTA, San Francisco Public Works, and the San Francisco Public Utilities Commission.

Staff who are part of SDAT review projects to ensure compliance with the guidelines of the BSP. This reviewing body seeks to ensure code compliance, while promoting the functionality of streets as corridors of movement and a holistic community environment. SDAT also reviews all projects that require a transportation impact study, which assesses a project's transportation impacts as part of the California Environmental Quality Act.

SDAT review allows for problem-solving at the site level through discussions with multiple City agencies. For example, by directing projects on corner lots to situate building lobby entrances on side streets, SDAT recommendations can facilitate fewer disruptions to the flow of bike and transit lanes by TNCs.

Planning Code and Zoning Regulations

San Francisco's Planning Code and Zoning Map regulate the use of private land. Every property falls within one or more use districts, each of which principally permit, conditionally permit, and/or prohibit certain uses. Planning Code and zoning regulations related to TNCs and EMST are covered in three areas: car-sharing, the City's Transportation Demand Management program, and loading.

CAR-SHARING

The goals of car-sharing are to reduce the rate of individual car ownership, VMT, and vehicle emissions generated per household associated with a new development. The Planning Code[78] sets requirements and permits the number of parking spaces made available to certified car-share organizations in residential and non-residential buildings. Certified car-share organizations are entities that provide membership-based car-share service that have been determined by the Zoning Administrator to satisfy these three environmental performance goals.

Car-share spaces are often located on private properties. Public access to these spaces has generated complaints from landowners or residents concerned about the security of their buildings or parking garages.

A developing piece of legislation in San Francisco would expand the City's current car-share program to allow certified car-share organizations to place shared, limited-range vehicles in otherwise unused car-share spaces.[79] This legislation lowers the barrier for entry for new short-term vehicle rental programs that were not previously certified by San Francisco, while still ensuring the policy outcomes of the car-share program continue to be met.

Additionally, a key piece to increasing the congruence between car-share programs and forms of EMST is an accurate inventory of car-share designated spaces in the city that remain unused. The Planning Department's inventory was last updated in 2019[80] and includes existing car-share spaces and their locations for buildings required to provide this amenity by Planning Code Section 166. An update to the inventory, tentatively scheduled for 2022, will be expanded to buildings that have voluntarily provided a car-share space(s).

TRANSPORTATION DEMAND MANAGEMENT (TDM) PROGRAM

San Francisco's TDM program helps manage demand on the transportation network by making sure new developments are designed to make it easier for residents, tenants, employees, and visitors to use sustainable travel modes such as transit, walking, and biking. Each measure included in the TDM program is intended to reduce VMT, using an efficiency metric (e.g., per capita, per employee), from new development.

Development projects that meet the requirements specified within Planning Code Section 169.3 (adopted in 2017) must submit a TDM plan and are subject to the program's requirements. The program applies to new development and major changes of use. Developers must meet a points target (which is set based on the amount of on-site parking provided) by selecting from a menu of approved TDM measures.

The program has a proactive approach to compliance monitoring. An interagency team consisting of the Planning Department, Transportation Authority, and SFMTA conducts ongoing research into the efficacy of TDM measures to refine and improve the program over time.

Because TNCs increase VMT, they do not meet the definition of a TDM measure for the purposes of the program. This viewpoint is consistent with SFMTA policy and its Climate Action Plan, which do not consider TNCs to be a sustainable mode of transportation.[81] The TDM Program does include other EMST as TDM measures, such as bike share, scooter share, car share, and electric bicycles.

LOADING

Sections in the Planning Code require or permit specific amounts of off-street freight loading spaces and loading spaces for tour buses and specifies the dimensions of these spaces for future development proposals.[82]

However, the Planning Code cannot necessarily regulate the public right-of-way. Historically, these Planning Code sections have not addressed management of freight and loading spaces for tour buses or passenger loading. However, the Central SoMa Plan codifies a requirement that development projects with more than 100,000 square feet of residential or commercial uses develop a Driveway Loading Operations Plan for review and approval by the Planning Department, in consultation with SFMTA (Section 155(u)).

Environmental Planning

TRAVEL DEMAND UPDATE/LOADING IMPACT ANALYSIS

The Environmental Planning Division recently updated its transportation impact analysis guidelines, which describes the methodology and significance criteria it will use to evaluate transportation impacts under the California Environmental Quality Act. To assess impacts, the prior guidelines approach was to first estimate travel demand. This included estimation of how many trips people in proposed development projects may take, the ways they would travel, and their common destinations based on a series of data sources. The prior guidelines' methodology quantified commercial loading demand for freight and delivery service for a variety of land uses and passenger loading demand for hotel uses only.

In 2016, the department contracted with a consulting firm to develop a methodology for collecting data and updating the travel demand methodology to be used in the guidelines. Based on this data collection effort, the travel demand update resulted in:

- new trip generation rates generally similar to or lower than prior rates
- estimates of people walking, riding transit, and driving
- estimates of people taking for-hire vehicles (taxis and TNCs), private shuttles, or bicycling
- updated boundaries of common origins and destinations within San Francisco, including ability to distribute auto and transit trips across nine San Francisco neighborhoods
- new methodology and estimates for passenger loading for several land uses, which in part reflect the growing demand for curb space from TNCs as well as from increasing commercial delivery uses

VMT IMPACT ANALYSIS

On March 3, 2016, the Planning Commission adopted Resolution 19579, which directed the Environmental Planning Division and Environmental Review Officer to replace automobile delay with VMT criteria that promote the reduction of greenhouse gas emissions, the development of multimodal transportation networks and a diversity of land uses, and to be consistent with proposed and forthcoming changes to the CEQA Guidelines by the Office of Planning Research.

Consistent with this resolution, the new guidelines include screening criteria that identifies whether significant impacts could occur based on the location of a land use project. The analysis approach used by the Environmental Planning Division to determine whether a project meets these screening criteria does not include the distance traveled by TNC vehicles (including the times when the TNC vehicle has a fare-paying passenger inside and when the TNC driver has indicated on the app that they are available to drive a passenger(s)). The Environmental Planning Division will work with the Transportation Authority (the agency responsible for developing and maintaining San Francisco's travel model) to include TNC mileage in future VMT analysis.

Case Studies

A consultant-led research effort was conducted to better understand how other cities in the United States are responding to TNC activity and EMST. The scan resulted in five case studies, which are summarized in this section. The small number of available case studies may signal that cities across the country are in the early stages of grappling with TNCs and EMST and/or may not be facing similar challenges that are affecting San Francisco (e.g., space constraints and rapid proliferation of these technologies).

SEATTLE, WASHINGTON

The City of Seattle released the first version of its New Mobility Playbook in September 2017. Incorporating new and emerging mobility options, Seattle began with a high-level goal- and principle-setting program and developed corresponding action items or "plays." The five plays included:

- Ensure new mobility delivers a fair and just transportation system for all
- Enable safer, more active, and people-first uses of the public right-of-way
- Reorganize and retool Seattle's Department of Transportation to manage innovation and data
- Build new information and data infrastructure so new services can "plug-and-play"
- Anticipate, adapt to, and leverage innovative and disruptive transportation technologies

Each play aligns with a series of high-level strategies to accomplish it. Additionally, the New Mobility Playbook lays out a series of actions for the 18 months following its release to begin accomplishing the City of Seattle's goals. These actions include adoption of high-level policies (such as "adopt a policy framework and permit program that enables electric vehicle charging in the public right-of-way"), programmatic changes (such as "build staff capacity for data analytics, technology investments, pilot delivery, and policy-making"), research (prepare "a Racial Equity Toolkit for the New Mobility program to ensure shared mobility initiatives promote, rather than roll back, equity"), and pilots.

Seattle did not have the same type of data and information available that San Francisco and New York City have regarding their ridehailing systems. Instead, they relied extensively on data from these cities to inform their work while focusing much of their work on increased data gathering, mapping, capacity building, and policy.

CHANDLER, ARIZONA

In May 2018, the City of Chandler, Arizona, proposed an ordinance to amend parking and loading regulations in its zoning code in response to demand for TNCs and autonomous vehicles.[83] The ordinance encourages new developments to include designated drop-off and pick-up areas for autonomous vehicles and ridehailing services. It would also allow the City's Zoning Administrator to have the ability to reduce up to 40 percent of required parking if studies found a reduction in parking demand was directly attributable to an increase in autonomous vehicles or TNCs. The same proposal also allows for a 10 percent parking reduction for each loading zone space for varying uses, up to a maximum of 40 percent.

The City of Chandler also updated its Zoning Code with detailed guidance for various loading zones, including standards for location, dimensions, design, pedestrian amenities (such as shade and benches), and accessibility. The loading zones are not classified as on-street or off-street, but there are requirements for proximity. As the loading zone must be at most 50 feet from the primary entrance (if not closer) and is listed as being changed to respond to TNCs and autonomous vehicles in the future, it will inevitably include on-street standards and will be slightly more detailed than San Francisco's current zoning regulations.

In Chandler, the zoning amendments for parking refer directly to off-street parking. Further off-street parking reductions are available for development utilizing loading zone guidelines, as an incentive. The structure Chandler utilizes is provided below, as an example:

Land Use	Loading standard
Commercial	1 loading zone space per 50,000 sq. ft.
General Office	1 loading zone space per 100,000 sq. ft.
Industrial	1 loading zone space per 200,000 sq. ft.
Institutional and Medical	1 loading zone space per 50,000 sq. ft.
Multiple Family	1 loading zone space per 150 units

LOS ANGELES, CALIFORNIA

The City of Los Angeles' Department of Transportation published "Urban Mobility in the Digital Age" in August 2016.[84] The document focuses heavily on data gathering and contains a five-part strategy for new mobility. While high-level in nature, the strategy sets the framework for data standards and requirements, allowing a feedback loop for shifts in policy as needed.

The City of Los Angeles recently released a draft Mobility Data Specifications (MDS) policy to be utilized by all EMST providers.[85] By gathering data through a unified platform, the City of Los Angeles can more easily access and utilize data to update local plans and programs. The MDS is currently being considered for adoption by other municipalities, including Portland, Oregon.

MINNEAPOLIS AND ST. PAUL, MINNESOTA

The Twin Cities Shared Mobility Action Plan (October 2017) examines areas to promote shared use mobility goals.[86] The goals that were developed were based on population, jobs access, quality of transit, and land use. The plan also sets out goals with associated metrics and annual actions for implementation.

Noteworthy among the plan's goals and actions is the focus on mobility hubs in specific locations, creating shared use common areas, with dedicated loading and unloading zones, micro-mobility locations, and other mobility options for users. The locations identified for mobility hubs are around or near high-quality transit and commercial centers.

APPENDIX B.
Technical Memo for Study Questions 1 and 2 – Findings From Regression Analyses

Executive Summary

The mobility landscape has evolved rapidly over the past decade, with many on-demand services competing for users, including ride-hailing companies such as Uber and Lyft. A recent report from the San Francisco County Transportation Authority (Transportation Authority) titled "TNCs and Congestion" found that transportation network companies (TNCs), accounted for approximately 50% of the change in congestion in San Francisco between 2010 and 2016.[89]

The San Francisco Planning Department plays a central role in guiding the growth and development of San Francisco. It does this through long-range planning, land use regulation, and land use analysis such as transportation review. For this study, the Department sought to further understand the relationship between TNCs and land uses (e.g., office buildings, residences, retail, etc.). Findings from the study could potentially assist the Planning Department's response to inquiries from the public, elected officials, and appointed officials about the impacts of TNCs during the environmental review process and the formulation of appropriate policies and/or mitigation measures.

The Planning Department worked with a consultant as a combined study team to focus on two areas: if some land use types are associated with more TNC activity (specifically, passenger pick-ups and drop-offs)[90] than others; and if other geographic attributes, such as parking availability, could influence TNC activity to and from a land use. The summary of the study's findings are as follows:

Are some land uses and densities associated with more TNC activity than others?

- This study found that locations with concentrated hotels, households, retail, and cultural, institutional, and educational land uses are strongly associated with more TNC activity. This association holds generally consistent across the day, including the PM peak travel period (3 pm - 6 pm). This study did not find strong associations with other land use types (e.g., medical, production/distribution/repair[91]).

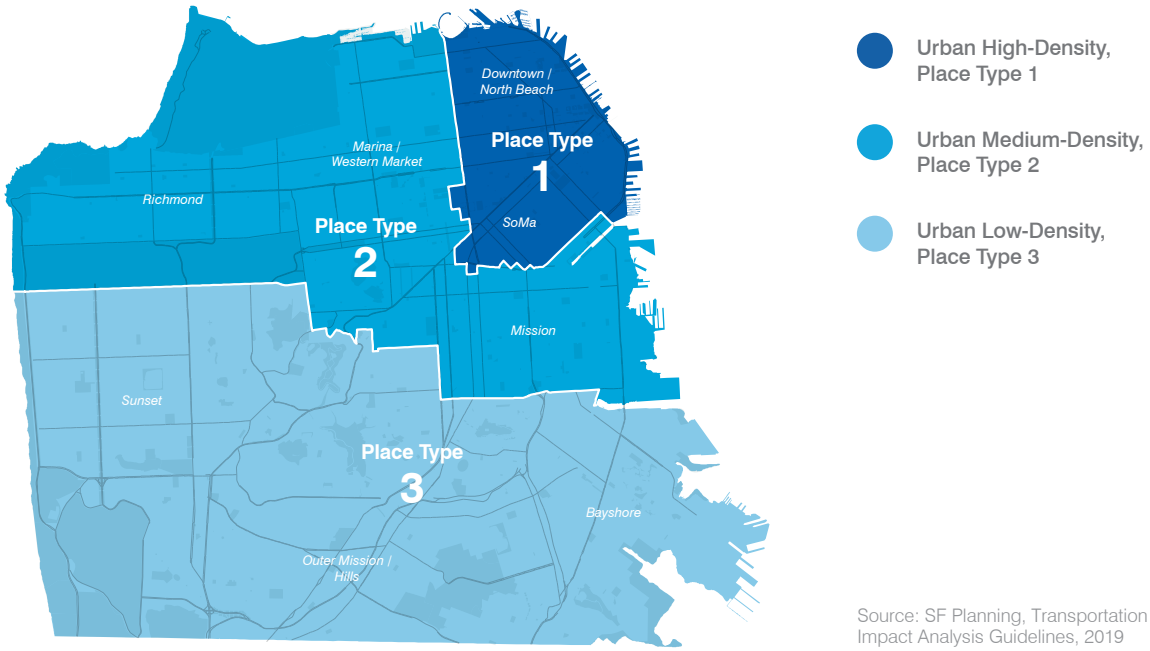
- The Planning Department's Transportation Impact Analysis (TIA) guidelines for transportation impact studies, which were updated in 2019, provides guidance on estimating travel demand. These guidelines group San Francisco into three place types: urban high density, urban medium density, and urban low density. (See Figure B1.) The regression analysis for this study found that the urban high-density place type was strongly associated with higher amounts of TNC activity.

- The 2019 TIA guidelines reasonably estimated TNC activity for the three place types when compared to the estimated TNC activity in this study's results.

What other built environment features are associated with TNC activity?

- Higher densities of cultural, institutional, educational employment; hotels (visitor sector employment); and retail sector employment are associated with more TNC activity.

Figure B1. Place Types



Source: SF Planning, Transportation Impact Analysis Guidelines, 2019

- The study also found that locations with higher daily parking costs and higher amounts of households without a car are strongly associated with more TNC activity. Locations closer to BART stations were associated with slightly increased TNC activity. The study did not find strong associations with other factors.

Results from the study were used to determine whether the Planning Department's transportation review guidelines adequately assess TNC activity. Before 2019, the department did not have quantitative estimates of TNC activity. The Planning Department conducted an extensive data collection effort to update the guidelines, including accounting for TNCs. The results indicate that the Planning Department could:

- Continue to use the department's 2019 TIA guidelines for assessing TNC impacts.
- Assess loading demand and on-street curb space carefully for existing and new land use types associated with more TNC activity.
- Continue research into the vehicle miles traveled effects of transportation demand management measures, such as parking supply and cost, and update policy as needed to reflect research.

Introduction

In response to the rapidly changing transportation landscape and the prevalence of TNCs, the City of San Francisco is developing a series of reports to document the changes affected by app-based ride-hailing services and to inform future planning efforts. In 2017, the San Francisco County Transportation Authority (Transportation Authority) published the first report in the series "TNCs Today", which details characteristics of TNC trips taken in San Francisco and estimates the number of TNC trips by time period and by day of the week.

In collaboration with the Transportation Authority and the San Francisco Municipal Transportation Agency (SFMTA), the Planning Department prepared

a report for this series that focuses on the relationship between TNCs and land uses (e.g., offices, residences, retail, etc.).

TNCs are now common in San Francisco and have a larger operational footprint and larger number of vehicles than the taxi companies that preceded them. As they have been a transportation option for a few years and have the potential to set the stage for passenger services using autonomous vehicles, the Planning Department is interested in ensuring that city land development regulations effectively address the opportunities and impacts of TNC operations.

This technical memorandum pertains to a study that looks at how TNCs potentially affect land use in San Francisco. The Planning Department, the lead agency for this report, is responsible for guiding growth and development for the city through the General Plan and enforcement of the Planning Code. A component of this guidance applies to understanding potential transportation demand generation, including how transportation modes may shift travel behavior given certain conditions, such as the implementation of proposed developments or projects. This study will consider the following questions:

1. Are some land uses and densities associated with more TNC activity than others?

2. What other built environment features are associated with TNC activity?

3. Do TNCs create new or alter existing land uses?

4. How is the development community reacting to TNCs?

This technical memorandum summarizes the findings related to the first and second study questions. It describes the analytical approach that Planning Department staff undertook to understand the relationship between land development and TNC activity. To help address these questions, the Planning Department worked with a consultant (as a combined study team) to conduct a series of regression analyses to explore whether there are correlations between land use and built environment variables and TNC activity. Regression analysis was the preferred method due to the availability of data from the "TNCs Today" study and the ability to test multiple variables.

Background

The Planning Department guides and regulates growth and development in San Francisco. Two aspects of the agency's role in growth and development are described for the purposes of this report: transportation review and transportation demand management policy.

TRANSPORTATION REVIEW

The Planning Department's Environmental Planning division is responsible for conducting environmental review of proposed projects in accordance with guidelines set by the California Environmental Quality Act. In addition, the Department uses the Transportation Impact Analysis (TIA) guidelines, which describe the significance criteria for assessing transportation impacts and the methodology to assess such criteria, including the number, type (mode split), and location of trips to and from a development (i.e., travel demand).

The Planning Department comprehensively updated the TIA guidelines in 2019. Its prior comprehensive update was in 2002. The 2002 TIA guidelines did not include travel demand estimates for TNCs given this legal designation did not yet exist. The 2002 TIA guidelines also excluded significance criteria and methods for vehicle miles traveled (VMT) impacts and methods for passenger loading impacts focused only on hotel land uses.

In 2016, the Planning Department began the TIA guidelines update process. In March 2016, the Planning Commission adopted a resolution to direct the department staff to include VMT significance criteria. The Planning Department also contracted with a consulting firm in 2016 to develop a methodology for collecting data and updating the travel demand data from the 2002 TIA guidelines. The consultant collected and analyzed counts, conducted intercept surveys, measured commercial and

passenger loading activity at sites in San Francisco in 2016 and 2017 and analyzed California Household Travel Survey data. The consultants completed this work in mid-2018, which subsequently informed the travel demand estimates for the 2019 TIA guidelines update.

The 2019 TIA guidelines update estimated the number of people taking for-hire vehicles (e.g., taxis, TNCs), which was the first time this was included in the guidelines. The 2019 update methodology recommended using these for-hire vehicle estimates to assess a project's loading demand at various land uses beyond just hotels and to assess safety and public transit delay impacts. These measurements include the potential for residents, employees, and visitors of the development project to attract TNC activity to the site and the availability of convenient on- or off-street space to accommodate that activity. The 2019 update also included VMT significance criteria and methodology.

The Planning Department developed the research questions for this study prior to completing the 2019 TIA guidelines update. While the Department currently uses the 2019 guidelines in reviewing development projects' transportation impacts, this study allowed staff to compare estimated TNC activity from this study to estimated TNC activity in the 2019 guidelines.

Additionally, this study can assist the Planning Department's response to inquiries from the public and elected and appointed officials about the impacts of these companies during the environmental review process and the formulation of appropriate policies and/or mitigation measures. One such policy is transportation demand management (TDM).

TRANSPORTATION DEMAND MANAGEMENT POLICY

San Francisco adopted a comprehensive TDM program for new development projects in 2017. Its goals are to help optimize San Francisco's transportation system as the city grows and to promote better environmental, health, and safety outcomes, consistent with the state, regional, and local policies. The program requires new development projects to incorporate design features, incentives, and tools to encourage new residents, tenants, employees, and visitors to travel by sustainable transportation modes, such as transit, walking, ridesharing (i.e., carpooling)[92], and biking, thereby reducing VMT associated with new development. The Planning Department partnered with SFMTA and the Transportation Authority to create and implement the program.

The TDM program includes the following main components:

- **Planning Code Section 169:** The applicability and general requirements for projects subject to the program. Most development growth is subject to the program.

- **Standards:** The specific requirements for projects including the points target the proposed development must meet to comply with the program and the TDM menu of options developers can select from to meet those targets. Each TDM menu option is intended to reduce VMT from new development and includes an assigned points value.

  The program requires a developer to meet a higher point target if the development includes substantial vehicular parking than if the development includes little or no vehicular parking. The standards also identify the process for updates to the TDM menu, including to reflect new findings on the efficacy of options in the TDM menu in reducing VMT.

- **Technical justification:** This content reflects years of research to support the points targets and the justification for the selection and assignment of points for options in the TDM menu. The points target was tied to vehicular parking because research indicated that areas with more vehicular parking are associated with more overall vehicular traffic than areas with less vehicular parking. For this reason, the vehicular parking supply option on the TDM menu also is a high point value (i.e., if a development provides no vehicular parking).

  TNCs were excluded as an option in the menu because literature did not provide evidence that TNCs reduced VMT. Research on this topic was limited at the time of program adoption.

The Planning Department is working on different research efforts locally and across the state to learn more about the efficacy of options in the TDM menu in reducing VMT. The research thus far has focused on the relationship between VMT and parking supply.

Research Questions

This memo addresses two research questions:

1. Are some land uses and densities associated with more TNC activity than others?

2. What other built environment features are associated with TNC activity?

This document describes the analytical approach that the Planning Department took to understand the relationship between land development and TNC activity. To help address these questions, the study team conducted a series of regression analyses to explore whether there are correlations between land use and built environment variables and TNC activity. Regression analysis was the preferred method due to the availability of data from the "TNCs Today" study and the ability to test multiple variables.

Methodology

The study team assessed if different TNC driver data sources could answer the research questions. This included obtaining data samples from mobile application companies that TNC drivers could use to track mileage and expenses and to find hot spots for passenger pick-ups. The study team determined that the best available TNC data was the data used to inform a prior San Francisco report, "TNCs Today", and not data from an app company.[93] Appendix A summarizes issues with mobile app data for the purposes of this memo.

The following section provides more detail regarding the data from "TNCs Today" and the methodology applied for this memo.

Measuring TNC Activity

In 2016, researchers at Northeastern University obtained data from the application programming interface (API) used by TNCs in San Francisco. Using this data, the researchers and the Transportation Authority generated a robust picture of TNC activity in San Francisco.[94] This memo used this same data (referred to as the "TNCs Today" data), which has the following features:

- TNC activity was geocoded to each of San Francisco's 981 travel analysis zones (TAZs);[95]
- TNC activity was averaged from data collected in October and November 2016;
- Average activity is segmented into day of week and five time periods during the day.[96]

The study team used linear regression to analyze travel data from "TNCs Today". Linear regression is a common statistical technique that quantifies correlations between a single dependent variable (TNC activity in this case) and independent variables (e.g., density of office development). Consider the example mathematical equation shown below:

TNC Activity = K + A * (Residential Housing Units) + B * (Commercial Floor Space)

This equation attempts to estimate TNC activity using information on residential housing units and commercial floor space. To create a linear regression model, equations are developed like this one, and statistical software is subsequently used to solve for the best set of coefficients (A and B in this example). The software attempts to size K, A, and B such that the predicted TNC activity using the right-hand side of the equation matches the observed TNC activity.

The results from the regressions from this study are summarized in tables and include values for the coefficient, the "t-statistic", and "adjusted R-squared".

- **Coefficient:** The value by which the variable is multiplied to generate an estimate of TNC activity. For example, to generate an estimate of the amount of TNC activity in each TAZ, the variables

for that zone (e.g., households per acre) can be multiplied by the variable-specific coefficients (e.g., the coefficient on the households per acre variable) and then summed. This sum is the regression model's estimate of TNC activity.

- **T-statistic:** A statistical measure of the level of confidence in the coefficient estimate. This is informed by how useful each variable is in predicting TNC activity in each TAZ. Variables that are consistently useful generate coefficients with high t-statistics.

- **Adjusted R-squared:** A statistical measure of how well the entire model — all the coefficients — fits the observed data. If the model fits perfectly, the R-squared is 1.0. If the model has no predictive ability, the R-squared value is 0.0. Because adding any variable to the regression model will improve the model fit (i.e., any variable is very likely to help match the observed data for at least one or two observations), the "adjusted R-squared" takes into account the number of variables used in the model. As such, adjusted R-squared "rewards" formulations that fit the data with the fewest necessary variables.

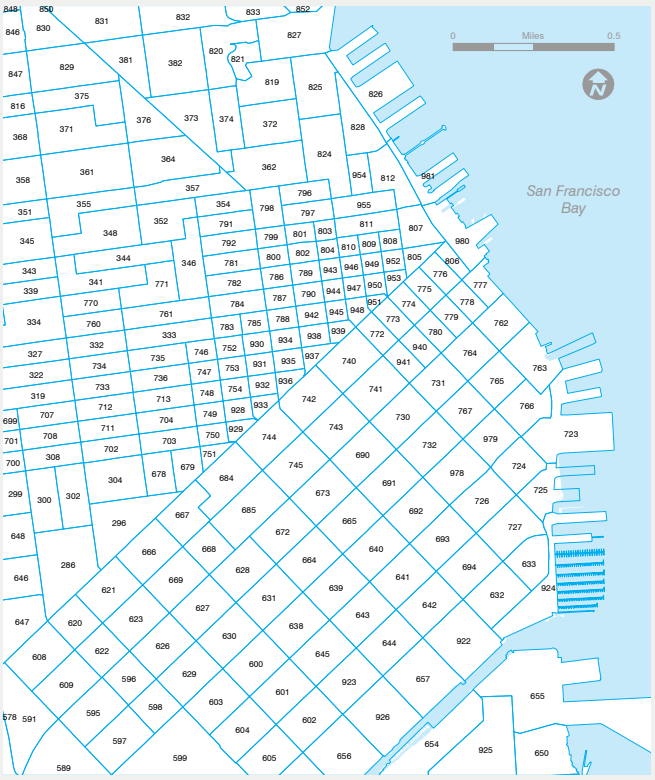
DEPENDENT VARIABLE

The goal of the regression analysis is to understand the relationship between TNC activity and land use. Achieving this goal is challenging in many parts of San Francisco because the location where a TNC trip starts or ends may not be the same as the location where the TNC passenger is traveling to or from. For example, a TNC user may walk from a meeting at Davis and Sacramento streets in downtown San Francisco, north of Market Street, and may be headed to a destination south of downtown. The TNC user may direct the TNC driver to pick them up south of Market Street, if that location allows them to leave downtown faster than being picked up by their meeting location north of Market Street.

The "TNCs Today" data imputes the pick-up location based on where the driver accepts the ride. The drop-off locations from the "TNCs Today" data are more accurate in terms of approximating the actual drop-off locations since the spatial data was gathered when the vehicle becomes available after dropping off that passenger. While there is a high level of confidence in the spatial accuracy of the drop-off location, it does not provide information on where the passenger is actually going to (i.e., the physical address of where they intend to go). This limitation requires the assumption that the location of the TNC pick-up/drop-off is near the location of the activity which motivated the traveler to use a TNC.

In the current study, the study team transformed the dependent variable to be the amount of TNC activity that occurs in each TAZ (see Figure B2) as well as in TAZs within 400 feet of the subject TAZ (measured from the activity center point or "centroid" of each TAZ). This method partially addressed the shortcoming in the data of not knowing where the TNC passenger is going to or coming from. The distance of 400 feet was chosen because the average city block in the northeast part of the city is about 800 feet long. Additionally, the project team wanted to address issues where there may be high TNC activity in one TAZ and little to no TNC activity in an adjacent TAZ due to how TAZ boundaries are

Figure B2. Travel Analysis Zone (TAZ) Boundaries in Downtown San Francisco



drawn. By using the overlapping 400 feet radius, the team was accounting for any potential abnormalities in TNC demand across TAZs that are adjacent to one another.

INDEPENDENT VARIABLES

The study team assembled data for the independent variables shown in Table B1. The independent variables were selected because they could inform the research study questions. Employment and job data were placed in six categories because of their general alignment with land use designations in the San Francisco Planning Code:

- **Production distribution and repair:** Wholesale trade, manufacturing and materials processing, repair;
- **Cultural, institutional, and educational (CIE):** Cultural, institutional, or educational places, such as a museum, zoo, college, or theater;
- **Office:** Management, information, and professional activities such as business, legal, and public administration;
- **Retail:** Shopping and direct consumer services, restaurants, and bars;
- **Visitor:** Hotels and other lodging; and
- **Medical:** Any medical use such as a medical center or hospital

The study team summarized the data for the independent variables at the TAZ level to be consistent with the "TNCs Today" data, which is also summarized at the TAZ level. For this analysis, it is the characteristics of land or the built environment at the TAZ level that predicted the amount of TNC activity.

A second challenge in working with spatial data is that linear regressions require observed data records be independent. Consider the linear regression equation from before:

TNC Activity = K + A * (Residential Housing Units) + B * (Commercial Floor Space)

If this model was used to make predictions of TNC activity in every TAZ in San Francisco, the error or "residuals" of the model could be derived by computing the right-hand side of the equation and comparing the result to the observed TNC activity (from "TNCs Today"). If these differences were plotted, an understanding of the errors are spatially correlated could emerge, meaning whether or not locations where the model overestimates or underestimates the model are in the same neighborhoods. An example plot is shown in Figure B3.

If there are clusters of the same color and size close together in the above residual plots, then the model could be improved. For example, if all of the errors in the South of Market neighborhood are of similar size and direction (i.e., positive or negative), there is something about the South of Market neighborhood that the model is not able to predict. Because the study team constructed the independent variable to be activity within 400 feet of the subject TAZ, errors will be spatially correlated. This aggregation addressed the shortcoming in the data of not knowing the exact location of where TNC passengers are going to or coming from but has the drawback of not allowing the study team to identify features of individual TAZs in dense areas that may be causing or is associated with more or less TNC activity.

Table B1. Independent Variables and Data Sources

Variable	Description	Source and year	Study Question Number (1, 2, or both)
Number of households	Number of households in a TAZ; land use allocation was a process undertaken by the Metropolitan Transportation Commission and refined by the Planning Department	Planning Department, 2017	1, 2
Household density	Households per acre	Planning Department, 2017	1, 2
Number of jobs by sector (e.g., office, medical, retail, etc.)	Number of jobs in a TAZ; land use allocation was a process undertaken by the Metropolitan Transportation Commission and refined by the Planning Department	Planning Department, 2017	1, 2
Employment density	Jobs per acre	Planning Department, 2017	1, 2
Place type according to the department's TIA guidelines	Geographic area that shares a similar mode share for vehicle use. The 2019 TIA guidelines identified three place types to estimate mode splits of development projects in those place types (see Figure 4 in results section): • urban high density: Financial District, SoMa • urban medium density: Mission, Marina, Western Addition, and Richmond neighborhoods, and • urban low density: Sunset, Outer Mission/Hills, and Bayshore neighborhoods	Planning Department, 2019	1
Residential parking ratios	Ratio of the number of residential units divided by number of residential parking spaces	Transportation Authority	2
Non-residential parking ratios	Ratio of non-residential square feet divided by the number of non-residential parking spaces	Transportation Authority	2
Share of zero automobile households	Number of households that do not own a vehicle divided by the total number of households	U.S. Census Bureau, American Community Survey 2013-2017 5-year estimates	2
Daily parking cost in dollars by TAZ (adjusted to 2017 dollars)	Estimate of the cost to park a vehicle	Transportation Authority Parking Supply and Utilization Study	2
Number of jobs accessible within 45 minutes on transit	Estimate of the number of jobs which can be reached within 45 minutes on public transportation	ConnectSF - estimate generated by SF-CHAMP model, 2018	2
Share of land zoned for neighborhood commercial transit (NCT) use	"Mixed-use districts that support neighborhood-serving commercial uses on lower floors and housing above" (San Francisco Planning Code);	Planning Department	2
Share of land zoned for neighborhood commercial (NC) use	"Low- to high-density, mixed-use neighborhoods of varying scale established around historical neighborhood commercial centers" (San Francisco Planning Code)	Planning Department	2
Large hotel indicator	Indicator variable that takes a value of 1 if the TAZ includes a hotel with over $5 million in annual revenue, zero otherwise	Dun and Bradstreet, 2019	2
Distance to nearest Bay Area Rapid Transit (BART) station	Locations of BART stations in San Francisco	BART stations shapefile from Caltrans; distance for each TAZ centroid was generated in R	2

Figure B3. Example Residual Plot (Orange is Negative, Blue is Positive)

ANALYSIS TOOLS

The study team performed a series of regressions for each study question. This included testing different combinations of the independent variables to determine which independent variable consistently influenced increased TNC activity, as shown by the t-statistics produced.

For some regressions, the study team adjusted the time period of the TNC activity to determine if there were differences between TNC activity throughout the day and TNC activity during a specific time period. In this case, the time period of interest is the evening peak period on weekdays. The 2019 TIA guidelines were informed by data gathered on weekdays (i.e., Tuesday, Wednesday, and Thursday) and therefore, the dependent variable was set to the same days for consistency.

The study team used the R statistical programming language for analysis and Tableau Desktop for data visualization. R was used to assemble the data, execute the regression model, and estimate the regression coefficients. Tableau was used to visualize the data with maps and charts, particularly the residuals. Residuals are the differences between the model estimates and the observed "TNCs Today" data. As noted above, one challenge in estimating regression models on spatial data is dealing with spatial correlations. To address this, the study team used Tableau to visually assess the degree of spatial correlation in the residuals for each estimated model.

Findings

Study Question 1: Are some land uses and densities associated with more TNC activity than others?

The first regression, Regression A, assessed if any land use categories attract more TNC activity than others. Results for Regression A are shown in Table B2. The dependent variable in this case was TNC drop-offs and pick-ups during typical weekdays (i.e., Tuesday, Wednesday, and Thursday) for all time periods measured at the TAZ geography, using a 400-foot buffer distance from each TAZ centroid to aggregate data from nearby TAZs. T-statistics that suggest it is very likely that the estimated coefficient was different from zero are highlighted in **bold** in Table B2 and subsequent tables. See Figure B4 for the spatial pattern of the data.

In addition to employment sectors, the study team also included indicator variables for each of the 2019 TIA guidelines place types (Figure B1). For example, a dependent indicator variable specific to Place Type 2, Urban Medium Density, would take on a value of 1.0 for every TAZ in Place Type 2 and a value of 0.0 for every TAZ not in Place Type 2. When these indicator variables are introduced into the linear regression, the estimated coefficients revealed statistical correlations between TNC activity and the place types.

The coefficients in Table B2 suggested that, after controlling for place type, land uses that provided retail and tourism-oriented services (e.g., hotels), cultural, institutional, and educational (CIE) jobs, and high housing density were strongly correlated with TNC activity.

Figures B5 and B6 show the spatial distribution of retail and hotel employment. The coefficients further suggested that, after controlling for employment, land uses in TIA Place Type 1 had far more TNC activity than Place Type 2, which, in turn, received far more TNC activity than Place Type 3, although only TIA Place Type 1 was strongly correlated with increased TNC activity based on t-statistics and the r-squared statistic.

The second regression, Regression B, assessed if TNC activity related to land use categories varies by time of day. The dependent variable was TNC drop-offs and pick-ups only during the evening commute period (3 pm to 6 pm) on typical weekdays (i.e., Tuesday, Wednesday, and Thursday) measured at the TAZ geography, using a 400-foot buffer distance from each TAZ centroid to aggregate data from nearby TAZs. Regression B built off Regression A, which measured TNC activity for all time periods.

Results for Regression B are shown in Table B3. The results were consistent with Regression A: locations of intense hotel employment, residential land use, and retail employment are associated with higher amounts of TNC activity.

Based on the results (coefficient and t-statistic), Place Type 1 may serve as a useful predictor of TNC activity, suggesting that it reflects other aspects of the built environment not captured by employment density by sector and residential density.

Study Question 2: What other built environment features are associated with TNC activity?

The last set of regressions (Regressions C, D, E, and F) assessed if attributes of the built environment beyond employment and household density influence the frequency and/or intensity of TNC activity. The built environment consists of human-made structures or systems (rather than the "natural environment"). Examples include houses, schools, shoppping centers, and streets.

The dependent variable for this line of inquiry was TNC drop-offs and pick-ups during all time periods (i.e., 24 hours) on typical weekdays (Tuesday, Wednesday, and Thursday) measured at the TAZ geography, using a 400-foot buffer distance from each TAZ centroid to aggregate data from nearby TAZs. The Place Type indicator variables used in Regressions C, D, E, and F are listed below. (Their source and year of data collection can be found in Table B1.) These indicator variables were used to describe aspects of the built environment that the Place Types (Figure B1) serve as proxies for.

Table B2. Regression A – Outcomes for Weekday during all Time Periods (Study Question #1)

Variable	Coefficient	Standard Error	T-statistic
Constant	35.6	654.3	0.05
Households per acre	131.0	19.7	**6.62**
Cultural/Institutional/Education jobs per acre	123.0	29.4	**4.18**
Management/Information/Professional jobs per acre	1.76	1.41	1.41
Retail jobs per acre	97.1	16.8	**5.79**
Visitor jobs per acre	223.8	24.4	**9.19**
Medical jobs per acre	13.0	35.0	0.37
Production/distribution/repair jobs per acre	-24.3	48.5	-0.5
Urban High Density Place Type indicator	3765.6	*	**5.50**
Urban Medium Density Place Type indicator	825.0	666.4	1.24
Urban Low Density Place Type indicator	-5.73	663.0	-0.01

Adjusted R-squared: 0.603

Bold T-statistic indicates coefficient is significantly different from zero at 95 percent confidence level

*Standard errors values not computed due to missing values

Figure B4. TNC Activity Data by Travel Analysis Zone

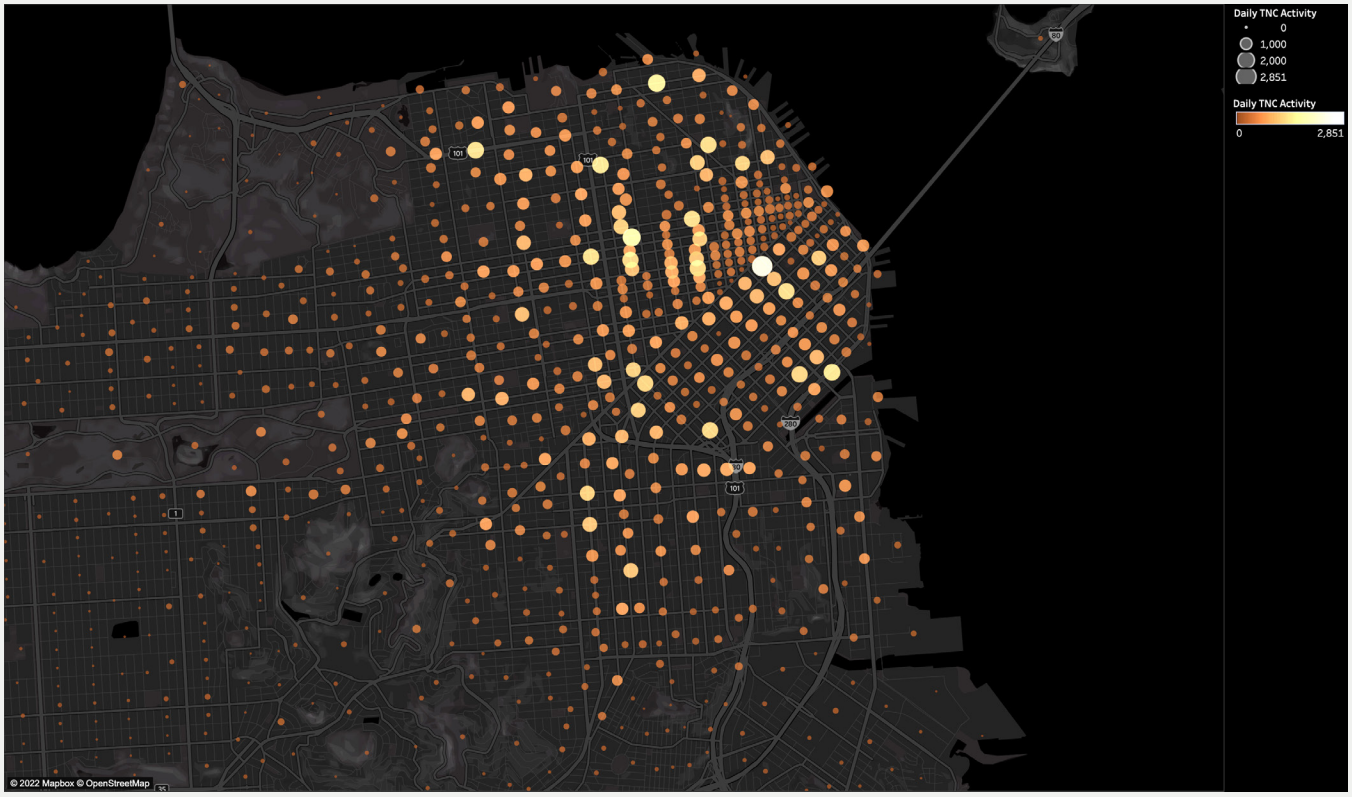


Figure B5. Retail Employment Density by Traffic Analysis Zone

Figure B6. Visitor Employment Density by Traffic Analysis Zone

Table B3. Regression B – Outcomes for Weekday Evening Commute (Study Question #1)

Variable	Coefficient	Standard Error	T-statistic
Constant	2.34	79.3	0.30
Households per acre	17.4	2.4	**7.29**
Cultural/Institutional/Education jobs per acre	5.56	3.6	1.56
Management/Information/Professional jobs per acre	0.114	0.2	0.75
Retail jobs per acre	15.0	2.0	**7.38**
Visitor jobs per acre	27.6	*	**9.34**
Medical jobs per acre	0.260	4.2	0.06
Production/distribution/repair jobs per acre	6.06	5.9	1.03
Urban High Density Place Type indicator	83.1	*	**4.9**
Urban Medium Density Place Type indicator	78.3	80.8	1.0
Urban Low Density Place Type indicator	80.4	-0.09	0.93

Adjusted R-squared: 0.578

Table B4. Regression C – Outcomes for Study Question #2

Variable	Coefficient	Standard Error	T-statistic
Constant	62.7	292.4	0.21
Households per acre	46.8	20.3	**2.31**
Cultural/Institutional/Education jobs per acre	71.7	*	**2.58**
Management/Information/Professional jobs per acre	0.28	1.2	0.24
Retail jobs per acre	51.1	16.1	**3.17**
Visitor jobs per acre	168.0	23.2	**7.26**
Medical jobs per acre	-68.1	32.9	**-2.07**
Production/distribution/repair jobs per acre	42.7	45.1	0.95
Number of technology jobs	-0.899	1.1	-0.85
Residential parking ratio	-113.0	251.0	-0.45
Non-residential parking ratio	-65.4	75.4	-0.87
Share of households with no vehicle	4366.0	502.8	**8.68**
Daily parking cost in dollars per hour	102.0	9.2	**11.12**
Distance in feet to nearest BART station	-0.0827	0.03	**-2.62**
Number of jobs accessible via 45 minutes on transit	0.203	0.2	0.87
Share of land zoned for neighborhood commercial transit	2.81	5.2	0.54
Share of land zoned for neighborhood commercial	-0.705	0.4	-1.73
Large hotel indicator	-151.0	350.4	-0.43

Adjusted R-squared: 0.655

Bold T-statistic indicates coefficient is significantly different from zero at 95 percent confidence level

*Standard errors values not computed due to missing values

Table B5. Regression D – Outcomes for Study Question #2

Variable	Coefficient	Standard Error	T-statistic
Constant	-137.0	*	-0.79
Households per acre	42.6	19.9	**2.14**
Cultural/Institutional/Education jobs per acre	78.1	25.8	**3.03**
Retail jobs per acre	53.0	15.6	**3.40**
Visitor jobs per acre	164.0	22.9	**7.16**
Medical jobs per acre	32.7	*	**-2.06**
Share of households with no vehicle within 400 feet	4439.0	485.3	**9.15**
Daily parking cost in dollars per hour	107.0	8.8	**12.1**
Distance in feet to BART station	-0.0743	-2.5	**-2.47**

Adjusted R-squared: 0.656

Bold T-statistic indicates coefficient is significantly different from zero at 95 percent confidence level

*Values not available in regression results due to missingness

- **Residential parking ratios:** The ratio of the number of residential units divided by number of residential parking spaces;
- **Non-residential parking ratios:** The ratio of non-residential square feet (square feet that are not dwelling units) divided by the number of non-residential parking spaces;
- **Share of zero automobile households within 400 feet of the TAZ centroid:** The number of households that do not have access to a vehicle divided by the total number of households;
- **Daily parking cost in dollars per hour:** An estimate of the cost to store a vehicle for a day;
- **Distance in feet to the nearest BART station:** An estimate of the distance to access the nearest BART station, which provides local and regional rail service;
- **Number of jobs accessible within 45 minutes on transit:** An estimate of the number of jobs which can be reached within 45 minutes on public transportation;
- **Share of land zoned for neighborhood commercial transit (NCT) use:** "Mixed-use districts that support neighborhood-serving commercial uses on lower floors and housing above" (San Francisco Planning Code);
- **Share of land zoned for neighborhood commercial (NC) use:** "Low- to high-density, mixeduse neighborhoods of varying scale established around historical neighborhood commercial centers" (San Francisco Planning Code); and
- **Large hotel indicator:** Variable that takes a value of one if the TAZ includes a hotel with over $5 million in annual revenue, zero otherwise.

As in the previous regressions, the coefficients on dense residential, retail employment, and hotel employment were significant and positively associated with TNC activity. After accounting for detailed representations of the built environment, the presence of dense CIE employment showed a mild, positive correlation with TNC activity and medical employment showed a mild, negative correlation with TNC activity.

Figure B7. Residuals for Regression D

Figure B8. Residuals for Regression D (for Downtown)

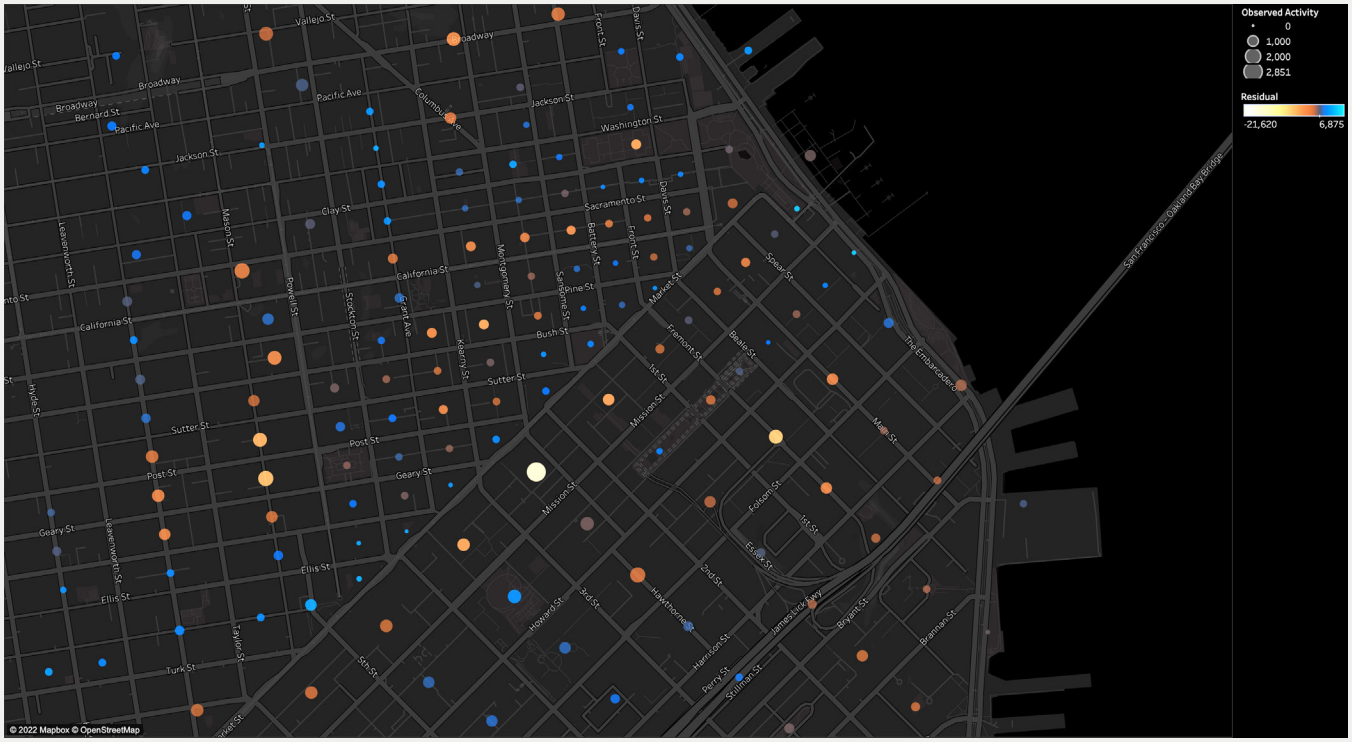


Table B6. Regression E – Outcomes for Study Question #2

Variable	Coefficient	Standard Error	T-statistic
Constant	-180.0	17.1	**-10.5**
Households per acre	19.53	3.4	**5.76**
Cultural/Institutional/Education jobs per acre	16.2	4.7	**3.47**
Management/Information/Professional jobs per acre	0.551	0.2	2.81
Retail jobs per acre	16.7	2.7	**6.15**
Visitor jobs per acre	23.6	3.9	**6.07**
Medical jobs per acre	5.82	5.5	1.05
Share of households with no vehicle	1120.0	79.4	**15.1**
Daily parking cost in dollars per hour	56.9	3.0	**19.2**

Adjusted R-squared: 0.820

Bold T-statistic indicates coefficient is significantly different from zero at 95 percent confidence level

Table B7. Regression F – Outcomes for Study Question #2

Variable	Coefficient	Standard Error	T-statistic
Constant	-249.0	34.7	**-7.17**
Number of households	-16.5	5.0	-3.27
Number of Cultural/Institutional/Education jobs	-23.5	7.4	-3.18
Number of Management/Information/Professional jobs	48.9	9.1	**5.35**
Number of Retail jobs	2.00	8.1	0.247
Number of Visitor jobs	55.7	8.0	**6.95**
Number of Medical jobs	1.00	7.1	0.140
Share of households with no vehicle within 400 feet	1340.0	80.0	**16.7**
Daily parking cost in dollars per hour	61.0	3.1	**19.5**

Adjusted R-squared: 0.809

Bold T-statistic indicates coefficient is significantly different from zero at 95 percent confidence level

Aside from these land uses, the variables that had the greatest association with TNC activity included areas with high numbers of households that do not own vehicles and areas with high parking costs. There was also a slight positive association with TNC usage in areas in close proximity to BART stations (i.e., more TNC activity in areas close to BART stations). Each of these variables suggested that, all else being equal, households without cars and areas where it is challenging to store cars attracted TNCs. Although BART stations present an alternative to TNCs, it is possible that TNC trips serve as first- and last-mile trips to get to and from BART stations. However, more investigation would need to be conducted to understand the factors that influence more TNC activity closer to BART stations.

The above formulation was reduced to include only the variables with coefficients statistically different from zero, and this was tested in Regression D. These outcomes are summarized in Table B5. The coefficients remained stable, which suggested the remaining coefficients were robust.

Figures B7 and B8 plot the residuals for the model estimates. The "residual" was the error between the linear regression model's predictions of TNC activity and observed TNC activity. Figure B7 sets the size of the bubbles to the observed TNC activity (i.e., a larger bubble indicates more TNC activity) and the color to the residual, with orange being TAZs in which the model overestimated TNC activity and the blue being TAZs in which the model underestimated TNC activity. The random-appearing distribution of orange and blue suggests low levels of spatial correlation in the residuals, which indicates the model was likely able to understand the variability in the data. Darker shades of orange or blue indicate larger discrepancies or residuals. There were few TAZs with dark orange or dark blue bubbles in Figures B7 and B8, indicating that there were only a few TAZs where the model was not a good fit.

Regression E was a minor variation on Regression D and is shown in Table B6. This regression included each of the employment categories but removed the variable for proximity to BART stations. This regression was different from other regressions for this study question in that the geographic distance for TNC activity was expanded: All TNC activity in TAZs within 0.5 mile of a TAZ centroid are included. TNC activity was weighted by the surrounding TAZs' distance to centroid (i.e., TAZs that are closer are weighted more heavily than TAZs that are further from the TAZ centroid). Although this buffer is much larger than the buffers used for other regressions, this half-mile buffer approach was an attempt to capture the possibility that TNC passengers may be interacting with TAZs adjacent to where they get picked up or dropped off. The key findings remained stable and the fit of the model (as measured by the adjusted R-squared) improved.

A complement to Regression E is Regression F, summarized in Table B7. Total jobs for each land use category were used rather than job density measures (i.e., jobs per acre). The size of the TAZs vary, and thus the findings were more challenging to interpret. Consider, for example, two zones with the same number of households and jobs. If one zone occupied 10 acres and the other 1,000 acres, the built environment of these two places would be very different. Even though the fit of Regression F is comparable to the fit of Regression E, Regression F was difficult to parse because the varying size of the TAZs renders the coefficients abstruse, confounded by the land use activity that occurred at different densities.

Discussion

The analysis improved the Planning Department's understanding of the interaction between land use and TNC activity. The results suggested that retail land uses and hotels are associated with more TNC activity than others. These findings should be corroborated over time by comparing the model's estimates to empirical data, as described below.

Areas for Further Consideration

Travel Behavior Data

San Francisco could regularly collect, monitor, and analyze land use and travel activity longitudinally to better understand the transportation impacts of development. All options described are dependent on improving upon the modeling completed herein with more empirical data, especially as transportation systems in cities evolve and TNCs may set the stage for autonomous vehicles used for ride-hailing (i.e., passenger services). This data may include the number, type (mode split), and location of trips to and from different land use types and geographies.

This information can be costly and/or challenging to obtain at the site level and may not capture what is happening on a citywide level. TNC data is especially challenging to obtain given that the City does not have an established data-sharing agreement with these companies. TNCs are regulated by the California Public Utilities Commission, and the City has been unsuccessful in obtaining data directly from TNCs or CPUC for study or review (as of the time that this report was written).

Transportation Review

The 2019 TIA guidelines update was the first time that the Planning Department comprehensively accounted for TNCs in its analysis, including travel demand estimates. This study's regression analysis demonstrated that place types are useful in predicting TNC activity and, as a result, the Planning Department should continue using the 2019 TIA guidelines to assess TNC impacts. This study helps affirm that the 2019 TIA guidelines reasonably estimated TNC activity for the three place types (Figure B1).

To develop a statistical model that can forecast TNC activity (e.g., at a development site), the City would have to conduct further studies. The purpose of this study was to determine whether there are relationships between land use and built environment variables and TNC activity. The findings from the regression analysis show certain land uses are associated with increased TNC activity. These regressions are not the same as predictive modeling. The Planning Department could collect, monitor, and analyze empirical data to refine the relationships shown herein, such as passenger loading demand with differing levels of land use density.

Transportation Demand Management Policy

The City could further explore if factors such as parking availability and cost substantially affect TNC activity, particularly for its TDM program. The TDM program is based on years of research to frame the points target on vehicular parking and to provide a high point value if a development provides no vehicular parking. This study found that certain built environment factors, including high parking costs and low availability of parking, was associated with more TNC activity. Further studies could assess the relative VMT of development sites with and without off-street vehicular parking, accounting for TNC activity.

Limitations

There are two key areas in which the Planning Department could improve its regression analysis.

Use detailed source data. The publicly available version of the "TNCs Today" data aggregated pick-ups and drop-offs to TAZs. This aggregation is somewhat arbitrary regarding TNC activity (i.e., the aggregation was not done along the revealed contours of TNC activity). This study's regressions could be improved by starting with the individual records of TNC pick-ups and drop-offs. This would open up a number of analytical avenues, all of which are intensive and complex. Examples include:

- Aggregating the TNC activity to TAZs but aggregating it for the actual locations that are within X feet of the centroid (rather than the current approach of collecting activity from other centroids that are within X feet of the subject centroid);

- Aggregating the TNC activity into the spatial clusters that the data itself forms (i.e., build TAZ-like spatial units using the TNC activity data as a guide); and

- Using the land characteristics of collections parcels, rather than TAZs, as dependent variables (i.e., employment in parcels within 100 feet of a spatial cluster centroid).

Aside from obtaining more detailed data on TNC activity, there is also a need to obtain more up-to-date data for the explanatory variables pertaining to land use and the built environment. For example, data on monthly and daily parking costs by TAZ were from a previous research effort conducted by the Transportation Authority. This data was in 1989 dollars and had to be adjusted for inflation to 2017 dollars. While it is challenging to obtain such granular-level data, it is also important to understand these trends to better understand TNC activity, especially since pricing and availability of parking is strongly associated with one's decision to drive or take a TNC ride.

Account for spatial correlation. It is common for practical linear regression models (particularly those using spatial data) to violate the assumption that the dependent variable's observations are independent. The R programming language, which the Department used to conduct the analysis, has a package with methods to assist in this investigation (available at https://rspatial.org/raster/analysis/7-spregression.html).

Attachment B1.
Efficacy of Using SherpaShare Data for Study Involving TNCs and Land Use Planning

Background

The Planning Department purchased vehicle trajectories from SherpaShare of what was assumed to be largely TNC drivers to inform an analysis of driver behavior in San Francisco (Study Question 3). With the data on hand, the study team wanted to investigate the data's efficacy to stud if TNC activity (i.e., passenger pick-up and drop-offs) was associated with land use and density (Study Question 1).

To inform Study Question 1, the SherpaShare data needs to have a robust signal of passenger drop-offs and pick-ups. The SherpaShare product is not designed to provide this signal. The data demarcates "trips" using accelerometer information provided by the smartphone. When the car stops for a significant period of time, a trip end is recorded. Engagements with TNC passengers are not available in SherpaShare's app and therefore do not inform the "trip" definition.

Given the ambiguity of the SherpaShare data, this document compares it to a known sample of TNC passenger activity obtained by the San Francisco County Transportation Authority and referred to as the "TNCs Today" data. The following compares the SherpaShare and "TNCs Today" data across dimensions relevant to investigation of Study Question 1.

Comparisons

Table B8 summarizes the three data sets obtained and compared as part of this investigation. SherpaShare delivered vehicle trajectories for all vehicles passing through city boundaries (including San Francisco International Airport) during the date range. The data was segmented into movements that started and ended in San Francisco in order to directly compare it to the data from "TNCs Today", which only includes movements that start and end in San Francisco.

The most striking feature of the SherpaShare data sets summarized in Table B8 was their small size. The "TNCs Today" data contains over a million records compared to just over 22,000 SherpaShare records for the comparable time period in 2016. The size of the 2018 data (less than 10,000 records) suggested that the SherpaShare product did not gain large numbers of customers between 2016 and 2018.

The key items of interest to the Planning Department were the temporal and spatial distributions of the SherpaShare data relative to the "TNCs Today" data. Figures B9 and B10 summarize the temporal distribution of drop-offs (actual drop-offs in the "TNCs Today" data and inferred drop-offs in the SherpaShare data), both by time of day (for weekdays) and day of week. The temporal comparisons show comparable drop-off hourly distributions for the two 2016 data sets and an illogical distribution for the 2018 SherpaShare data. The weekly distributions were less important to the research for Study

Table B8. Data Set Overview

Data set	Measure	Value
"TNCs Today"	Date Range	Nov 12 to Nov 19, 2016; Nov 28 to Dec 22, 2016
SherpaShare 2016	Date Range	Nov 12 to Nov 19, 2016; Nov 28 to Dec 22, 2016
SherpaShare 2018	Date Range	Oct 1 to Nov 1, 2018
"TNCs Today"	Spatial Range	Trips starting and ending in SF
SherpaShare 2016	Spatial Range	All vehicles that are observed in SF during Date Range, though below comparisons use a subset of movements that start and end in SF
SherpaShare 2018	Spatial Range	" "
"TNCs Today"	Spatial Resolution	Travel Analysis Zones*
SherpaShare 2016	Spatial Resolution	Latitude/longitude
SherpaShare 2018	Spatial Resolution	Latitude/longitude
"TNCs Today"	Temporal Resolution	Hourly*
SherpaShare 2016	Temporal Resolution	Second
SherpaShare 2018	Temporal Resolution	Second
"TNCs Today"	TNC Passenger Trips	1,213,249
SherpaShare 2016	Inferred TNC Passenger Movements**	22,743
SherpaShare 2018	Inferred TNC Passenger Movements	9,793
"TNCs Today"	Unique Drivers	Unknown*
SherpaShare 2016	Unique Drivers	697
SherpaShare 2018	Unique Drivers	484

* In the version provided to the consultant

** The consultant processed the SherpaShare data to infer a passenger movement by discarding very short, close proximity, and very long movements

Question 1. Nevertheless the SherpaShare data did not consistently demonstrate the expected heavier usage on Friday and Saturday night that was reflected in the "TNCs Today" data. This finding suggested that the data was less representative than would be useful to examine Study Question 1.

Spatial distribution from the SherpaShare data set was also examined. The spatial comparisons were completed at the neighborhood level, as the size of the SherpaShare data did not support comparisons at TAZ geographies, which were the smallest unit made available for the "TNCs Today" data. As with the time-of-day distribution, the spatial distribution of the 2018 data is inconsistent with expectations.

The spatial pattern of the "TNCs Today" and SherpaShare 2016 data sets were similar at the neighborhood scale, with both data sets indicating the South of Market and Financial District neighborhoods have high levels of demand. See Figures B11 and B12. The SherpaShare 2016 data suggested high demand for travel in the Outer Sunset as well, a pattern more apparent in the 2018 data set mapped below. See Figure B13.

Figure B9.
Temporal Distribution (by hour, where 0 is midnight)

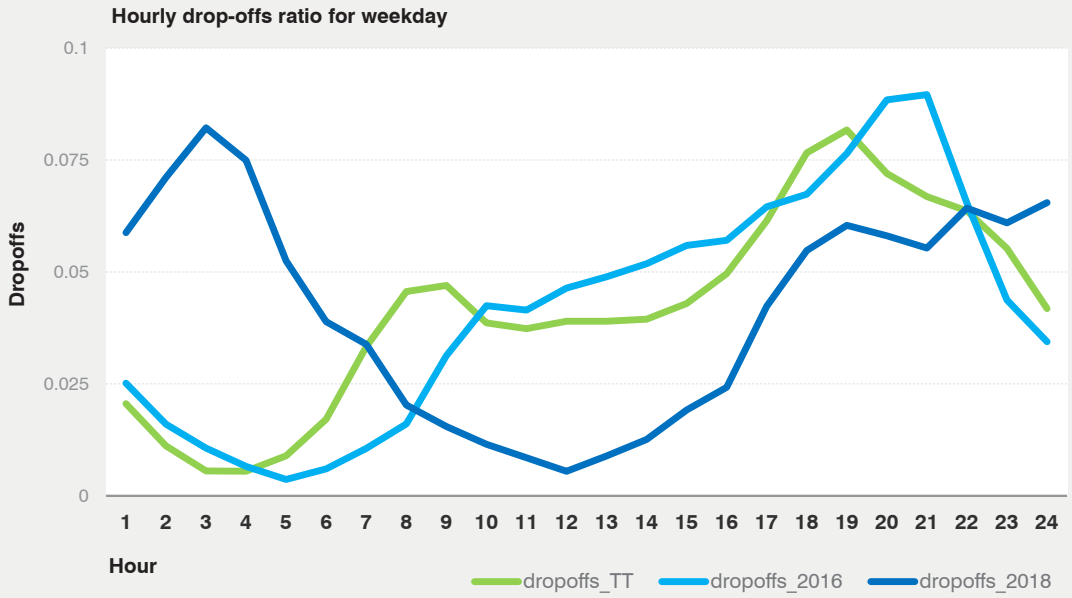
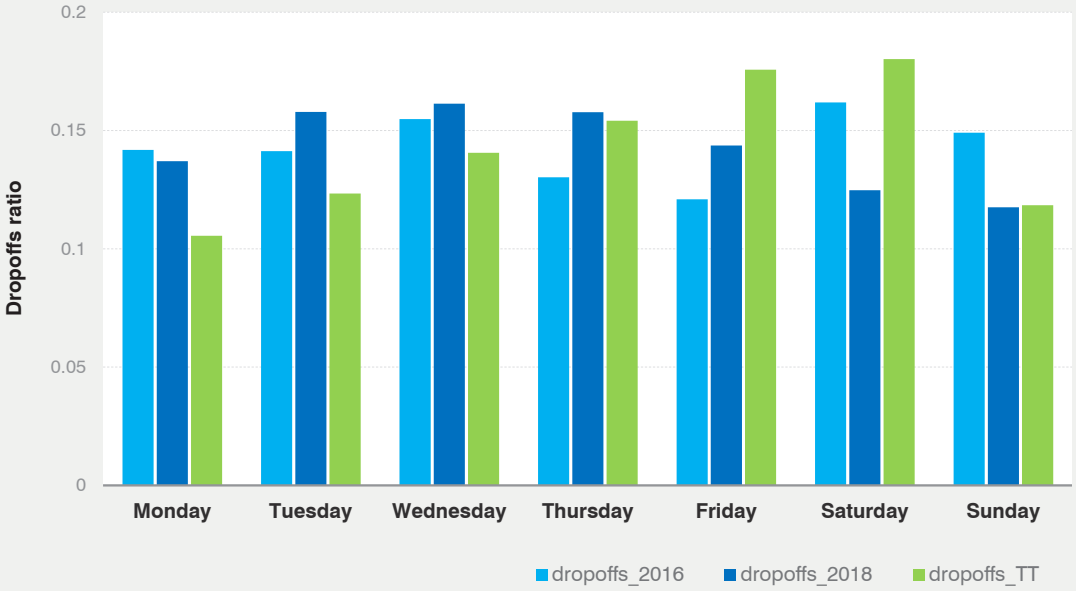


Figure B10.
Temporal Distribution (by weekday)



Conclusion

Not looking beyond the size of the SherpaShare data, it is clear that the "TNCs Today" data is a better candidate for the spatial analysis of TNC's impacts on land development. Because the SherpaShare data contains the full trajectory of (assumed) TNC vehicle movements, it is a better data set for the Task 4 driver behavior analysis, as it allows an understanding of what TNC vehicles are doing when not serving passengers. The SherpaShare data may also have value as a monitoring tool given what is available on a recurring basis (the "TNCs Today" data is not). However, it could be required of SherpaShare to provide explicit quantities of unique driver records prior to subsequent data purchases.

Figure B11.
Normalized Spatial Distribution of SherpaShare 2016 Drop-offs

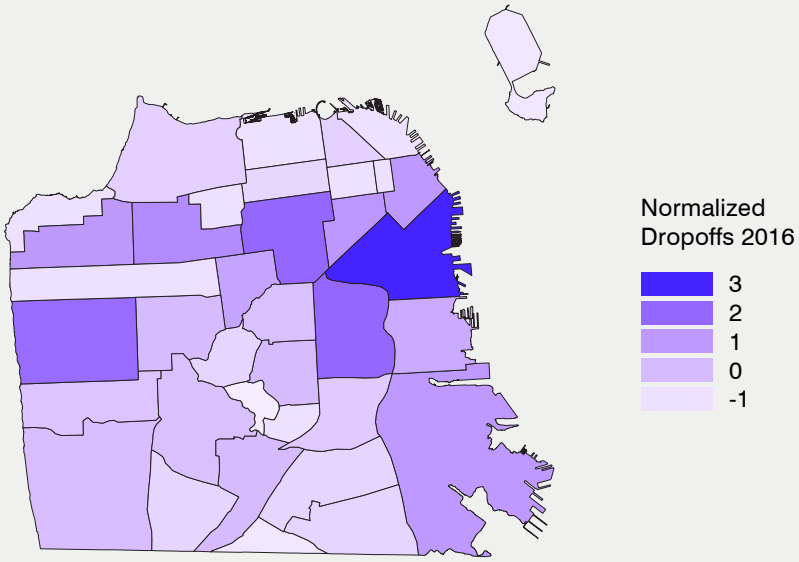


Figure B12.
Normalized Spatial Distribution of Drop-offs from "TNCs Today"

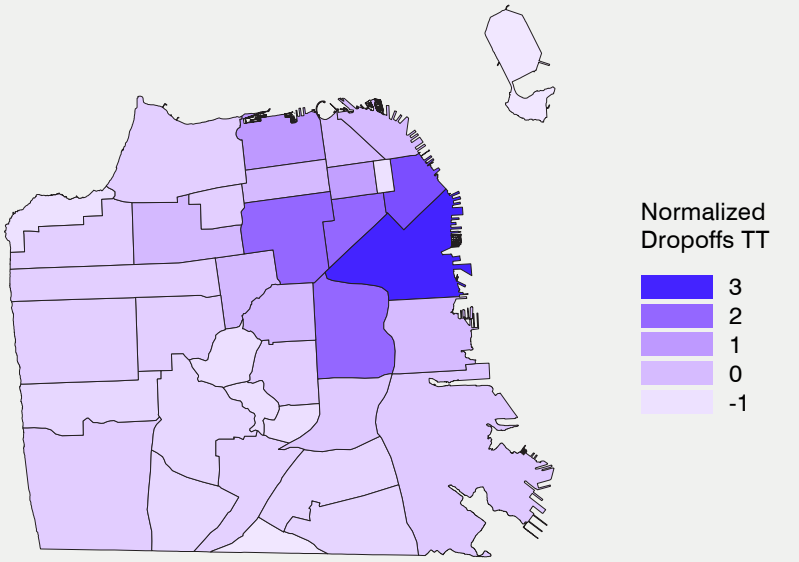
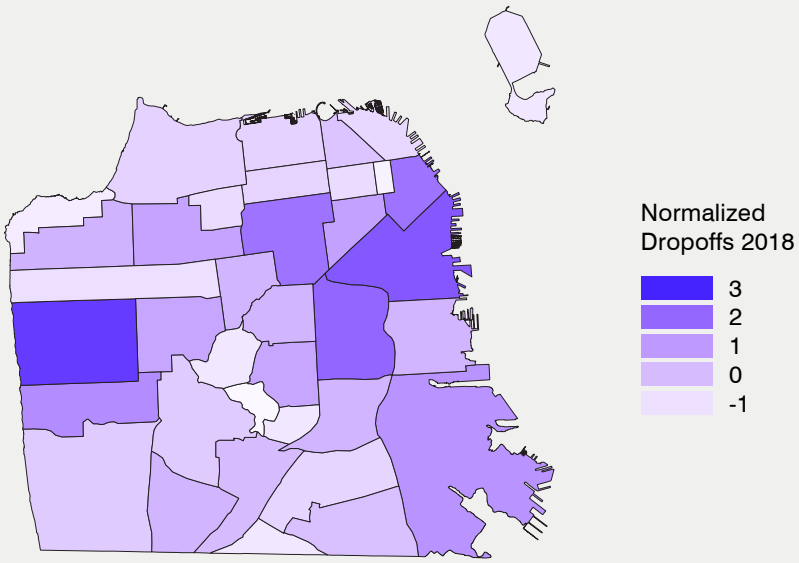


Figure B13.
Normalized Spatial Distribution of SherpaShare 2018 Drop-offs



APPENDIX C.
Technical Memo for Study Question 3 – Findings From Focus Groups with TNC Drivers

Introduction

In years prior to the COVID-19 pandemic and likely in coming years, transportation network companies (TNCs, also known as ridesourcing or ridehailing) have grown notably in San Francisco. A 2017 study found that on a typical day, TNCs make more than 170,000 trips within San Francisco, representing 15 percent of all intracity vehicle trips.[97] Additionally, the study estimates that, during weekday peak periods, TNCs comprise 20 to 26 percent of vehicle trips in the downtown and South of Market areas of San Francisco. The study also estimates that TNCs drive more than a half million miles within San Francisco alone each day, accounting for 20 percent of all local daily vehicle miles travelled.[98]

In light of these numbers, the City is eager to understand the potential impacts of TNCs. The current study, which this technical memorandum pertains to, looks at how TNCs affect land use in San Francisco and examines the following questions:

1. Are some land uses and densities associated with more TNC activity than others?
2. What other built environment features are associated with TNC activity?
3. Do TNCs create new or alter existing land uses?
4. How is the development community reacting to TNCs?

This technical memorandum summarizes the findings from two focus groups with TNC drivers that were held to respond to the third study question. The focus groups were convened to help develop questions for an online survey of TNC drivers. (See Appendix D for a discussion of the methodology and findings of the online survey.) The findings described in this Appendix C are based solely on the results of the focus groups.

Methodology

Focus group participants were recruited through a mixed-method approach of advertising on online driver forums and social media; requests to driver groups (e.g., Gig Workers Rising) to distribute the information to their networks; and handing out postcards to drivers at TNC hotspots in San Francisco. Focus group participants were offered a $75 Visa gift card for their participation.

The aim of recruitment was to seek a general population of drivers to participate in the focus groups. However, due to the lack of driver demographics from TNCs, it is not possible to know if participants reflected a general population of drivers. Additionally, the focus groups were conducted in English and therefore may underrepresent the views of non-English speaking drivers.

The two focus groups (ranging in size from six to eight participants) were held at the Potrero Hill Public Library in San Francisco. Both focus groups were structured around a discussion guide (see Attachment C1) designed to gain insight on drivers' experiences and behaviors, such as length of driving days; frequency and location of breaks; types of facilities used while on breaks; and ancillary services and land uses drivers may seek, such as the presence of electric vehicle (EV) charging, rest facilities, restrooms, food options, and others. Prior to commencing the focus groups, participants were asked to complete a questionnaire (see Attachment C2).

Findings

PARTICIPANT DEMOGRAPHICS

In an anonymous, pre-focus group questionnaire, participants were asked to provide demographic data including their age, race/ethnicity, gender, highest level of educational attainment, employment status, and household income. The demographics of focus group participants are aggregated in Table C1.

Driver demographics from TNCs are not publicly available. As such, comparisons between focus group participants and a general population of TNC drivers is not possible. Table C1 includes general population census data for San Francisco. Additionally, the small sample size of 14 focus group participants may not be representative of the general population of drivers.

In general, the focus groups may have underrepresented female drivers compared to the general population. Although data on TNC driver demographics were unavailable from the companies, it is believed that female drivers comprise a very small percentage of TNC drivers.[99]

Generally, focus group participants tended to have lower levels of educational attainment and lower household incomes than the overall population of San Francisco. A few participants indicated that they were either between jobs or looking for additional employment. These statistics may contribute to the generally lower incomes of the focus group participants.

Thirty-six percent of focus group participants responded that they lived in the City of San Francisco compared to 50 percent in the greater Bay Area. Twenty-nine percent of them resided in Alameda County, 14 percent resided in San Mateo County, and seven percent resided in Marin County. Two participants noted that they drive from Sacramento and Placer Counties on a weekly basis to drive in San Francisco from Thursdays to Sundays.

While there was a diverse representation of driver ages, the focus group sample was slightly skewed toward Generation X (people born between the years 1965 to 1976) and younger Baby Boomer (people born between the years 1954 to 1964).

In addition to basic demographics, the pre-focus group questionnaire also asked participants information on the apps the drivers drove for, whether they also delivered packages using a TNC app (or another courier network service), and the vehicle propulsion type driven by the drivers. The vast majority of focus group participants drove for Lyft (93 percent) and/or Uber (86 percent). In addition to these larger TNC platforms, three drivers (21 percent) also drove for Ziro.

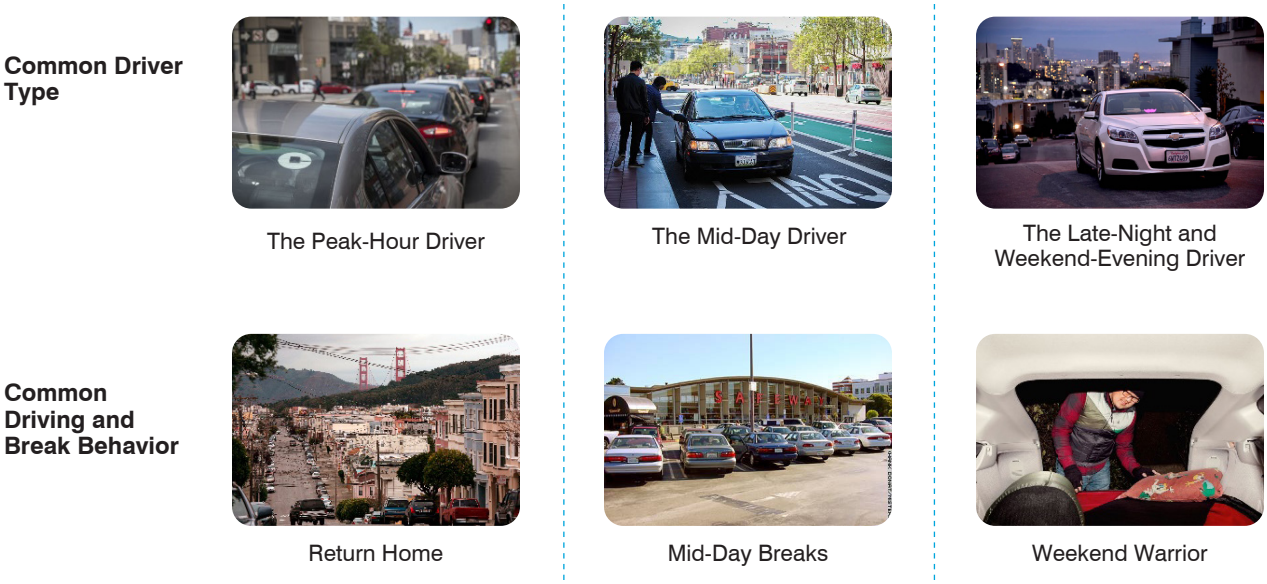
Table C1. Focus Group Participant Demographics

	Demographic Characteristics	Focus Group Participants (n=14)	San Francisco Population (n= 864,263) [A]
Gender	Female	29%	51%
	Male	71%	49%
	Other	0%	-
Age	18-29	14%	17%
	30-39	21%	20%
	40-49	21%	14%
	50-59	36%	12%
	60-69	7%	11%
	70 years or older	0%	11%
	Median age	45	38
Highest Level of Educational Attainment	Grade School	0%	8%
	Some high school	0%	5%
	Graduated high school or equivalent (GED)	0%	11%
	Associate degree	14%	5%
	Some college	50%	15%
	Bachelor's degree	21%	33%
	Graduate or Professional degree	14%	22%
Level of Employment	One job, full-time driving (40 hrs/week) for TNCs	64%	-
	One job, part-time driving (40 hrs/week) for TNCs	21%	-
	Multiple jobs, working 40 hrs/week, including driving for TNCs as part-time source of employment	7%	-
	Multiple jobs, working less than 40 hrs/week, including driving for TNCs as part-time source of employment	0%	-
	Other: Full-time Student/Parent	7%	-
Companies Driven for	Uber	93%	-
	Lyft	86%	-
	Ziro	21%	-
	Other	14%	-
Race/Ethnicity	White/Caucasian	36%	47%
	Black/African-American	7%	5%
	Asian	21%	34%
	Hispanic or Latino	7%	15%
	Native Hawaiian/Pacific Islander	0%	0.4%
	American Indian/Alaskan Native	0%	-
	Two or more races	21%	5%
	Other	7%	-

	Demographic Characteristics	Focus Group Participants (n=14)	San Francisco Population (n= 864,263) [A]
Household Income	Less than $15,000	0%	11%
	$15,000 to $24,999	14%	7%
	$25,000 to $34,999	21%	5%
	$35,000 to $49,999	21%	7%
	$50,000 to $74,999	21%	11%
	$75,000 to $99,999	21%	10%
	$100,000 to $149,999	0%	17%
	$150,000 to $199,999	0%	11%
	$200,000 and above	0%	21%

A 2013-2017 American Community Survey 5-Year Estimates

Figure C1. Common TNC Driver and Break Typologies



Twenty-nine percent of the focus group participants also delivered packages for app-based delivery services (e.g., UberEats, Caviar). Fifty-seven percent of participants said they drove gasoline vehicles, compared to 29 percent and 14 percent who drove hybrid vehicles and plug-in EVs, respectively.

Finally, the pre-focus group questionnaire sought feedback on recruitment methods to help inform the survey phase of this study. In general, online recruitment was the most successful outreach method with the majority of focus group participants learning of the study through a variety of social media connections (e.g., blogs, Facebook, UberPeople, and other driver forums). A couple of participants heard of the focus group through word of mouth from other drivers. Only one focus group participant was recruited through an intercept methodology, where City staff handed out postcards to drivers at perceived TNC hot spots.

TYPICAL DRIVER TRAVEL PATTERNS

Of the 14 focus group participants, half indicated that they drove an average of five to seven days per a week. The other half of participants indicated they generally drove two to five days per a week, with some variation in frequency depending on the day of the week, traffic, and rates. In general, many drivers indicated that there is a less of an incentive to drive due to changing rates set by TNCs that reduce drivers' take-home pay. Many of these drivers said that they do not drive as frequently as they used to, and when they do drive, that the work is becoming more of a "part-time gig."

When asked about the time of day focus group participants typically drove, drivers generally described one of three driving profiles or "vignettes" (Figure C1). Broadly, these can be described as: 1) the peak-hour driver; 2) the mid-day driver; and 3) the late-night and weekends driver. Each of these driver profiles are described below, followed by a discussion of the insights about land use gleaned from the participants' experiences and behaviors.

THE PEAK-HOUR DRIVER

Peak-hour drivers generally live in San Francisco or in the Peninsula. These drivers were usually motivated by short trips (e.g., 10-15 minutes within the city to/from the Financial District to nearby residential neighborhoods) with surge pricing. They generally preferred to return home to eat, use the restroom, or take breaks.

For this group, the most typical travel behavior was described as picking up passengers in predominantly residential San Francisco neighborhoods (e.g., Sunset, Richmond, Marina) and driving these passengers to employment centers in the Financial District or South of Market (SoMa). At their drop-off points, the drivers described an overabundance of TNC drivers with empty cars and limited riders. Rather than wait for a pick-up in these high employment centers, the drivers said they would immediately return with an empty vehicle (commonly referred to as "deadheading") to the residential neighborhoods for additional pick-ups.

These drivers would repeat this behavior during the weekday morning peak and then return to their residence. In the afternoon, they would engage in a similar pattern in the reverse: picking up passengers in the Financial District and SoMa, driving them to residential neighborhoods in the city, and then deadhead back to these employment centers for additional pick-ups. These drivers generally described shorter driving periods (approximately two to three hours in the morning and the evening).

THE MID-DAY DRIVER

Mid-day drivers typically described themselves as parents with children or spouses. They drive four to eight hours during the day for supplementary income. Many of these drivers said they resided in other Bay Area counties and compared their driving to "banker's hours:" driving into the city at the tail end of the morning commute and returning home at the very beginning of the evening commute (about 9 am to 4 pm or 10 am to 5 pm).

A few of these drivers said they start at the Oakland airport and wait for a ride that will bring them directly into San Francisco or by way of downtown Oakland.

These drivers generally described themselves as motivated by the convenience and time of day driving, rather than surge pricing. Additionally, many of these drivers noted that an additional benefit to mid-day driving was lower traffic volumes and easier pick-up and drop-offs (e.g., less curb congestion, easier to identify riders, etc.). Generally, these drivers said they typically took a break once or twice during the day to eat and use the restroom.

THE LATE-NIGHT OR WEEKEND-EVENING DRIVER

Late-night and weekend-evening drivers described themselves as driving into San Francisco mostly from outside the Bay Area and as far as Placer and Sacramento Counties to work on a Thursday or Friday evening through Sunday. There were a few participants who live in San Francisco that work these times, expressing a preference to work late at night to avoid traffic.

A few of these drivers described themselves as working extended hours (e.g., eight to 12 hours of driving) on their first night in San Francisco, checking in at a motel or AirBnB early, sleeping during the day, and then going out and driving the next night. Some drivers try to stay with a friend who lives in the city. Many evening and weekend evening drivers work through the night and return home in the morning.

A few drivers in this category indicated that they have occasionally slept in their vehicles late at night or in the morning as well as other times during the day, due to the high cost of lodging in San Francisco and the immediate vicinity. Drivers who take breaks or sleep in their vehicles usually look for free parking locations on the street, grocery stores, coffee shops, fitness centers, Crissy Field, or residential neighborhoods that were seen to be safe. Focus group participants said that the most common location drivers sleep at in the nighttime is at commercial land uses that are well-lit with a lot of parking, have low levels of activity, or are completely closed.

Late-night and weekend-evening drivers also indicated the greatest difficulty with taking breaks, both due to the length of their driving period and time of day. In addition to finding a place to sleep, common

challenges included finding food and restroom facilities open late at night. These drivers said that 24-hour grocery stores, coffee shops, and drive-thrus were viable options but relatively limited in number in the city. Some of the drivers noted that they would leave San Francisco to find a drive-thru for food and then return to continue their TNC driving. A few drivers also noted that they used the locker rooms at fitness centers that are open 24 hours to relax and shower.

ACTIVITIES DURING DRIVERS' DAY

As noted previously, participants noted that typical driving lengths ranged from four to six hours to 10 to 12 hours. Some drivers said they drove highly consistent schedules whereas others drove more variable schedules.

Break Activities

Most focus group participants said they took relatively short breaks – usually one 10- to 30-minute break throughout their typical driving day. Many drivers emphasized taking short breaks to get back on the road and earn fares. For longer breaks, most drivers said they went home, including drivers that returned to Alameda County to take a nap if there wasn't too much traffic.

Focus group participants said the following destinations were preferred locations to use the restroom:

- Grocery stores (e.g., Safeway, Trader Joe's, Whole Foods, Gus' Community Market, gourmet markets, and others)
- Starbucks and other coffee shops
- Big box retailers and shopping malls
- Gyms or fitness centers
- Gas stations

One female participant noted she overwhelmingly prefers to use a hotel restroom and will ask the valet or bell hop to use the restroom if she is picking up or dropping off a passenger staying at that hotel. Additionally, a few drivers said they use various apps that have restroom locations and unlock codes to guide them to available facilities.

Focus group participants indicated the following destinations as preferred locations to sleep:

- Grocery store parking lots
- Big box retailer and shopping mall parking lots
- Gyms or fitness center parking lots
- On-street parking on collector streets in residential neighborhoods

Generally, focus group participants emphasized that they avoid areas of high tourist activity or where there are many people experiencing homelessness due to concerns for personal safety and vehicle safety (e.g., someone breaking a vehicle window and taking something). Almost all focus group participants, whether taking short or longer rest breaks, indicated that they prefer locations without unhoused individuals, and many preferred to park their vehicles in upper-income neighborhoods due to perceived safety concerns. Many drivers said they remove their trade dress at night because they feel that Lyft and Uber identifiers may make them a target for crime. Generally, drivers said they would appreciate a safe place to use the restroom, nap, and recharge their phones.

Eating Facilities

Many drivers noted that eating (and in particular healthy food) options with parking, late-night/off-peak hours, or drive-thrus were very limited in San Francisco. Many drivers sought to take food breaks during off-peak driving times (e.g., mid-afternoon and during the late night). A few drivers expressed the desire to get out of their vehicle during food breaks so as not to bring food odors in their vehicles.

Eating facilities with free and easy-to-find parking were desired by many drivers. A number of drivers said they will drive to Daly City and Millbrae to use late-night and more auto-oriented facilities, such as McDonalds or In-N-Out with a drive-thru or parking facilities. Drivers expressed a greater desire for quick grab-and-go food options in San Francisco with

drive-thrus or parking. Drivers also expressed more options for late-night dining options.

VEHICLE RENTALS

Drivers were asked if they rented a vehicle while driving a TNC to assess the potential need for carsharing or car-rental facilities for drivers. Two focus group participants said that they currently or previously rented a vehicle from Lyft. A third driver uses peer-to-peer carsharing[100] because their vehicle was in a collision. TNC drivers were somewhat interested in affordable vehicle rentals, but they also expressed concern about the cost.

REFUELING AND ELECTRIC VEHICLE CHARGING

Focus group participants were also asked about access to gas stations and EV charging. The majority of participants whose TNC work shifts started from from outside San Frnacisco would start their shift with sufficient fuel to make it through their driving day and preferred to refuel outside of the city due to lower gas prices.

For drivers that use EVs, taking a nap and using the restroom were the most common activities drivers would engage in while charging their vehicles.

A number of focus group participants noted challenges associated with EV charging in San Francisco. One driver who previously owned a Chevrolet Bolt would take a nap while charging at a fast-charge station. However, this driver ultimately gave up their EV due to the lack of charging infrastructure (i.e., the limited number of charging locations and the need to wait for available charging points).

Drivers of EVs also noted a high level of range anxiety to make trips across the Bay Area, find a charging location, and return home. Additionally, drivers also expressed a high level of frustration over the lack of EV charging enforcement in San Francisco. These drivers said that due to limited, high-cost parking, it is not uncommon for a driver who is not charging to park at a charger. Additionally, drivers also expressed frustration that the EV charging that does exist is often in dark, desolate areas, which raises safety concerns. A number of drivers expressed the need not only for more fast-charging locations as well as lighting, cameras, and emergency call boxes at all charging locations.

TNC DRIVER FACILITIES

Existing Facilities

Drivers were also asked about their experience with existing driver facilities provided by Uber and Lyft. Many drivers described their experiences at these facilities similar to that of going to the Department of Motor Vehicles offices (e.g., limited hours, long lines, and insufficient parking). Many drivers said these facilities were not comfortable and more conducive for submitting grievances or to drop left items at the lost-and-found services.

Drivers were also asked about the interest in cell phone waiting lots (similar to airports) to wait for their next ride. In general, many drivers did not like the concept of a waiting parking lot and preferred to deadhead in their vehicle before picking up their next ride. However, drivers also noted that the "class" of TNC service they provide can impact driver behavior. They said that drivers of larger and premium vehicles were more likely to pull to the side of the road and wait in their vehicles for a less frequent, higher-paying fare than drivers of standard or pooled services with more frequent ride requests.

Proposed Facilities

Focus group participants were asked about their interest in either the public or private development of multi-purpose facilities that serve TNC drivers. For example, a driver clubhouse known as the Groove offered a lounge where drivers could take breaks get coffee, use WiFi, purchase food, and take restroom breaks for a $30 monthly membership fee. Participants were asked to describe services that would attract them to use such facilities, such as a place for TNC drivers to eat, use the restroom, sleep, shower, and charge their vehicles and electronic devices. A number of drivers expressed interest in services available for a small fee, such as the ability to pay for a restroom or access to a shower facility that was cleaned regularly by a custodian. Places to use a microwave, sleep, and network with other

drivers were also of interest. Drivers described these facilities similar to the YMCA with similar amenities.

Many drivers expressed the need for two different sections or types of facilities – one that targets local drivers and another for out-of-town drivers, such as shower and longer rest facilities.

Other facilities that drivers expressed interest in included reasonably priced gasoline, a car wash and cleaning facility (particularly for late-night drivers), and car maintenance facilities.

A few participants expressed the desire for these facilities to give an opportunity to foster a sense of community among drivers, including being a place to meet their peers and socialize. For security and parking reasons, drivers expressed a strong interest in verifying that only drivers had access to these facilities.

Drivers expressed interest having these facilities spread out across the city, such as the Marina, Embarcadero, North Beach, Mission, and the airport. Drivers said that there needed to be strong support from government for these facilities due to potential opposition from residential neighborhoods.

These drivers also expressed the need for security due to concerns about perceived or actual racism against immigrant and minority drivers. Finally, a few drivers expressed concern that the need for these facilities will soon be obsolete with autonomous vehicles (AVs) on the horizon. These drivers expressed the need for flexible facilities that could be transitioned to support AV ridehailing services (e.g., transitioning TNC parking to parking for AV ridehailing vehicles that included EV charging stations).

CURB SPACE

A number of drivers indicated that they periodically or previously drove for an app-based courier service[101] (e.g., UberEats, DoorDash, etc.). These drivers noted that there were a lot of deliveries downtown but that there were few locations for drivers to safely pull over, stop, and unload packages and food for delivery. For this reason, many of these participants said that they either no longer take deliveries or only do so periodically due to the notable difficulty of parking or stopping their cars at their delivery destination. A few drivers who still engage in app-based food deliveries noted that picking up food from restaurants provided them with the opportunity to use the restroom and/or to pick up food for themselves at the same restaurant.

Drivers expressed a strong interest in improving safety and sharing the road among all users. They expressed a strong interest in enforcement for dangerous behaviors, such as jaywalking and bicycles and scooter users that run red lights.

Drivers expressed frustration over issues related to curb spaces and how they are managed, ranging from being ticketed while sleeping in vehicles to the inability to easily read parking and loading zone signs or understand prohibited pick-up and drop-off locations. There was also a feeling among participants that the City targets TNCs for double parking while loading and unloading but not other vehicles, such as delivery trucks.

Drivers also expressed strong interest for the City to work with TNCs to geofence areas that are prohibited for pick-ups and drop-offs. Focus group participants unanimously expressed interest in mandatory pick-up and drop-off locations in areas of high TNC activity (e.g., Financial District, SoMa). In particular, drivers said that they frequently felt safer deadheading (driving without a fare-paying passenger) while waiting for a fare-paying passenger rather than waiting in a stationary location in dangerous and/or congested areas of the city.

Attachment C1:
Discussion Guide for Focus Groups with TNC Drivers

Facilitator: Before beginning, summarize the purpose of this study, which is to:

- Help the City understand how TNCs like Lyft and Uber affect land use (e.g., the types of businesses, shops, and other facilities needed to support TNCs) as a part of their operations.
  - » How are you as drivers using space?
  - » What effects on things [such as where people eat, sleep, etc.] are Lyft and Uber having as a result of their services?
- Potentially develop policy options that could address some of these effects.

"Your input will be valuable in helping ensure drivers' needs are considered when the City makes plans and policies."

Advise participants that all responses are confidential and that they do not have to answer any questions that they do not wish to.

When participants arrive, have them complete the pre-discussion questionnaire.

DISCUSSION

Introductions (15 minutes)

Moderator introduction and purpose of focus group (see above)

Moderator to emphasize that the key topic of interest is about land use.

"*There are issues of labor (e.g., pay, working hours, etc.) that are important to this group. But given our limited time together, we need to keep our conversation related to where and when you are doing things as part of your day as a Lyft/Uber driver."*

"Sometimes I will be referring to Lyft and Uber as 'TNCs,' which means transportation network companies. This is just so you know what I mean when I say TNC."

Repeat to participants that all responses are confidential and that they do not have to answer any questions that they do not wish to.

Participant introductions: "Please take two minutes to introduce yourself and tell the group how long you have been driving for Lyft and Uber in the San Francisco Bay Area and the most unusual place you have picked up or dropped off a passenger at."

Current Travel Patterns: 20 minutes

1. How often do you drive to San Francisco for Lyft or Uber? (How many days a week?)
   - » During what times do you drive to San Francisco?
   - » During what times do you drive home?

2. By a show of hands, how many people have also delivered packages for Uber or another app-based delivery company? Do you still deliver packages? Why or why not?
   - » Do you pick up/drop-off passengers and pick up/drop off deliveries in the same location? If not, where do you do either activity?

Driver's Typical Day Services: 40-50 minutes

In the next set of questions, we'd like to know what your "typical day"/an average day looks like for you when you are driving for a TNC.

3. How long do you drive per day on average?
   - » Is this consistent or does it vary?
   - » Is it the same whether you are driving passengers or delivering packages?

4. What do you typically do while waiting for a passenger pick-up? *(Facilitator to allow participants to offer answers before mentioning options)*
   - » Do you drive the streets/circle the block waiting for a rider?
   - » Do you go to common taxi hot spots and wait (e.g., hotels, SFO, etc.)?
   - » Do you wait in loading zones or red zones?
   - » Do you wait in private parking lots/driveways?

5. Do you take breaks during your driving day?
   - » Where do you take breaks? *(neighborhood and land use)*
   - » Do you take breaks at the same location? Or does this vary? What factors impact where you take breaks?
   - » What do you do on your breaks? (e.g., eat, sleep, recharge/refuel, use the restroom, etc.)?
     - Does this vary by the days of the week and/or the time of day you drive?
     - Does this vary by how long you drive?
     - How often do you take breaks?
     - How long are your breaks?
     - Do you take regular breaks on a set schedule? (e.g., meals, after driving a certain amount of time, etc.)?

6. Do you sleep during your driving day? When and where do you sleep?

7. Do you sleep in your vehicle? When and where do you sleep? How often do you sleep in your vehicle?

8. Are there TNC offices or lounges that you go to complete paperwork, take breaks, or for other purposes?
   - » If yes, which ones? What do you typically do there?
   - » If no, why not?

9. What types of services do you seek out while taking breaks (if any)?
   - *Begin discussion about needs and services drivers might seek out*
     - When/where/how often eat
     - When/where/how often do you use the restroom
     - When/where sleep
     - When/where/how often they get gas

10. Are there facilities you would like to have but are lacking in San Francisco? Where should these facilities be located?
   - Restrooms
   - Parking/cell phone waiting lots
   - Loading zones
   - Facilities or services to guide passengers to vehicle loading areas, assist travelers with disabilities, etc.
   - Facilities of services to handoff packages/food between building tenants and drivers
   - Drop-off lockers for packages/food
   - Vehicle maintenance facilities
   - Gas stations/EV charging stations
   - Other

Curb Space Access: 5-10 minutes -- *Only if there is time*

11. Do you have any issues picking up or dropping off passengers, or delivering packages?

12. Is access to the curb sufficient? Are there any improvements you would like to see?

13. Are there any other building or tenant operations improvements that would make picking up or dropping off passengers or deliveries more efficient for you (e.g., pick up/drop off lockers, active building management assistance, etc.)?

14. Do you encounter any potential conflicts with other (transportation) modes such as bicycles, pedestrians, or transit vehicles? If yes, what do you think are improvements that would reduce these potential conflicts?

Closing: 5 minutes

15. Is there anything else you would like to share with us related to land use?

16. In the next part of our study, we are going to conduct a survey to get feedback from even more drivers. What do you think are the best ways to outreach to drivers to fill out the survey?

Attachment C2:
Pre-Discussion Questionnaire for Focus Group Participants

(Distributed to participants prior to the focus group)

This is a short survey about your driving history with Uber/Lyft as well as some questions about demographics so that we can better understand who is driving for Uber and Lyft.

All answers are completely confidential.

1. Which companies do you drive for?

- ☐ Lyft
- ☐ Uber
- ☐ Other. Please specify: _____

2. Do you also deliver packages for app-based services?

☐ YES ☐ NO

3. Is your vehicle gas-powered, hybrid, or electric/plugin hybrid?

- ☐ Gas
- ☐ Hybrid
- ☐ EV/Plug-In Hybrid

4. What is your home zip code? _____

5. What is your gender?

- ☐ Female
- ☐ Male
- ☐ Other. Please specify: _____
- ☐ Prefer not to say

6. What is your age? _____ years

7. What is the last level of school that you completed?

- ☐ Grade school
- ☐ Some high school
- ☐ Graduated high school or equivalent (GED)
- ☐ Associate's degree
- ☐ Some college
- ☐ Bachelor's degree
- ☐ Some graduate school
- ☐ Master's degree
- ☐ Ph.D. or higher

8. What is your current level of employment?

- ☐ One job, full-time driving (40 hours/week or more) for Lyft, Uber, or another TNC
- ☐ One job, part-time driving (less than 40 hours/week) for Lyft, Uber, or another TNC
- ☐ Multiple jobs, working 40 hours/week or more, including driving for Lyft, Uber, or another TNC as a part-time source of employment
- ☐ Multiple jobs, working less than 40 hours/week, including driving for Lyft, Uber, or another TNC as a part-time source of employment
- ☐ Other _____

9. Are you looking for work outside of driving for Lyft or Uber?

- ☐ Yes, searching for work and for Lyft and Uber on an interim basis until I find a full-time job in another field
- ☐ No, I am not searching for employment and drive for Lyft and Uber as a periodic source of income.
- ☐ Other _____

10. What is the race or ethnicity with which you most closely identify? (Please choose one)

- ☐ White/Caucasian
- ☐ Black/African-American
- ☐ American Indian/Alaska Native
- ☐ Asian
- ☐ Hispanic or Latino
- ☐ Native Hawaiian/Pacific Islander
- ☐ Two or more races
- ☐ Other. Please specify: _____
- ☐ Decline to answer

11. What was your household's 2018 income, before taxes?

- ☐ Under $15,000
- ☐ $15,000 to $24,999
- ☐ $25,000 to $34,999
- ☐ $35,000 to $49.999
- ☐ $50,000 to $74,999
- ☐ $75,000 to $99,999
- ☐ $100,000 to $149,999
- ☐ $150,000 to $199,000
- ☐ $200,000 and above
- ☐ Decline to answer

Thank you very much for completing this questionnaire!

APPENDIX D.
Technical Memo for Study Question 3 – Findings From Online Survey of TNC Drivers

Introduction

The San Francisco Planning Department is working with the San Francisco Municipal Transportation Agency (SFMTA) and the San Francisco County Transportation Authority (Transportation Authority) on a series of studies that will answer key questions about transportation network companies (TNCs) and their effects in San Francisco. Previous studies in this series about TNCs (also known as ridesourcing or ridehailing services) include:

- "TNCs Today" describes the current characteristics of ride-hail companies in San Francisco, including the number, location, and timing of trips. Released: June 2017.
- "The TNC Regulatory Landscape" provides an overview of existing state and local TNC regulatory frameworks across the country and within California. Released: December 2017.
- "TNC's and Congestion" provides the first comprehensive analysis of how TNCs have affected roadway congestion in San Francisco. Released: October 2018.
- "TNCs and Disabled Access" provides an overview of opportunities and challenges faced by people with disabilities using TNC services in San Francisco. Released: April 2019.

The current study, which this technical memorandum pertains to, looks at how TNCs affect land use in San Francisco and examines the following questions:

1. Are some land uses and densities associated with more TNC activity than others?
2. What other built environment features are associated with TNC activity?
3. Do TNCs create new or alter existing land uses?
4. How is the development community reacting to TNCs?

This technical memorandum summarizes the findings related to the third study question, which includes the following corollary issues: If TNC activity does create or alter existing land uses, what are the implications and impacts of these changes (e.g., associated peak period and occupancy for those land uses)?

This task consisted of an online survey of TNC drivers, distributed in various languages and built off a series of focus groups with TNC drivers. The detailed methodology can be found below. The findings described in this document are based solely on the results of the online survey.

The Planning Department is the lead agency for the overall study. It is responsible for guiding growth and development for San Francisco through policies within the General Plan and enforcement of the Planning Code. A component of this guidance applies to forecasting and understanding potential transportation demand generation – in other words, how will transportation modes shift in San Francisco given certain conditions, such as the implementation of proposed developments or projects.

Within the last five years, TNC activity has grown to 15% of all intra-San Francisco auto trips.[102] Given the prevalence of TNC operations in San Francisco prior to the COVID-19 pandemic, the study team wanted to examine if and how the presence of a large number of TNC drivers could affect land use. Actual TNC operations in coming years remain unknown, given the uncertainty of how society will co-exist with the pandemic, how travel behavior and technologies will evolve (such as automated vehicles), as well as regulations and TNCs' reactions to the regulations. It is likely, though, that app-based travel or delivery services provided by human drivers will remain for some time. This merits review of understanding these drivers' needs and behaviors and how they may affect land use.

Methodology

Survey Development

Prior to the COVID-19 pandemic limiting in-person gatherings, the study team, in collaboration with the Transportation Sustainability Research Center at the University of California, Berkeley, conducted two focus groups with TNC drivers in fall 2019. (See Appendix C for a discussion of the methodology and findings of the focus groups.) Through these focus groups, questions were developed and refined for a broader-based survey of TNC drivers that was administered online.

The online survey questions (shown in Appendix D) were developed to address Study Question 3 above. They were also designed to be answered in a short time frame, recognizing the preference of participants to answer surveys that require limited time. The survey, conducted via Survey Monkey, an online survey platform, consisted mostly of multiple-choice questions, with some open-ended space for additional details as appropriate. The survey was released and advertised prior to the COVID-19 pandemic.

To promote the online survey, the study team prepared and printed postcards. They included a description of the survey and instructions for participation in English, Spanish, Portuguese, Chinese, and Arabic. Postcards also informed potential participants that six $100 gift cards would be awarded at random to eligible respondents, once the survey officially closed.

Outreach

The survey launched shortly before a shelter-in-place (SIP) order was issued in the San Francisco Bay Area and was originally set to close on March 31, 2020. Outreach efforts included distributing postcards in person at San Francisco International Airport's TNC parking lots and popular locations for TNC activity, as identified in the aforementioned focus groups with TNC drivers; emails to focus group participants; and online postings on Craigslist and driver forums on Facebook. Staff also reached out to groups affiliated with TNC drivers (e.g., Gig Workers Rising, Rideshare Drivers United, Rideshare Guy) to ask them to send information about the survey to their networks of TNC drivers.

The number of TNC rides in San Francisco diminished significantly after SIP took effect, and few responses were gathered in March 2020. As a result, the study team extended the timeline for the survey until June 30, 2020, and re-doubled outreach efforts. The study team re-posted announcements on Craigslist in all of the languages that the surveys were translated in, posted messages on Facebook driver forums and re-contacted people they knew at TNC driver-affiliated groups about sending another message to their networks. New outreach efforts in this second round included postings on Reddit forums and paid advertisements on Facebook and Craigslist.

Survey Content

The survey began with a short explanation of the survey background, goal, and a qualification

question. This qualification question asked if the respondent drives in San Francisco for a TNC given the study's geographic focus area. Drivers who responded no to this question were informed that they did not meet the eligibility criteria for the survey, were thanked for their time, and directed off the survey page by the Survey Monkey software.

When the survey end date was changed and the outreach campaign relaunched, some questions were changed slightly to reflect the difference in pre-COVID behavior and current behavior. Questions were re-worded to capture pre-COVID behavior. For example, the question "What TNC companies do you drive for?" was changed to "Prior to the current pandemic, which TNC companies did you drive for?"

Survey Responses

When the survey closed at the end of June 2020, 694 responses had been received. One hundred and forty-seven respondents (21% of the 694 responses) were disqualified because they did not drive for TNCs in San Francisco. The survey results reported in this memo focus on the responses of the remaining 547 participants.

To randomly select recipients for the gift card, the 547 survey respondents were filtered to include only respondents who provided their contact information. Each survey respondent was assigned a survey ID number. To determine gift card winners, winning numbers were selected using an online random number generator. Winners of gift cards were each sent gift cards totaling $100, using first class-mail that required a signature as proof of delivery.

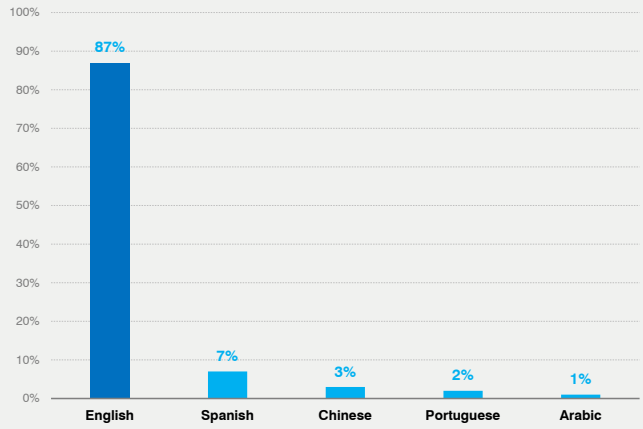
Findings

While the respondents provided varied personal experiences and concerns, a few common themes emerged through the survey aggregation and analysis:

- Drivers often drove for multiple TNCs, five or more days a week, and often more than 40 hours a week.
- Drivers were frustrated by pick-up and drop-off limitations and constraints, including the lack of infrastructure where they can safely wait for passengers, pick up passengers, and drop off passengers, and the potential threat of fines when using existing facilities not designated for TNC drivers (e.g., bike lanes, bus-only lanes, or no parking areas).
- Very few drivers drove or used electric vehicles. Those who did were not concerned with charging infrastructure, as they generally charged their vehicles at home or during hours they were not working.
- Drivers wanted access to more amenities, specifically clean restrooms, quick and convenient food sources, and safe places to rest.
- Drivers noted the need for more facilities and locations for pick up, drop off, and idling. Both the focus group participants and the online survey respondents demonstrated driver frustration with loading zones, curb space, and parking.

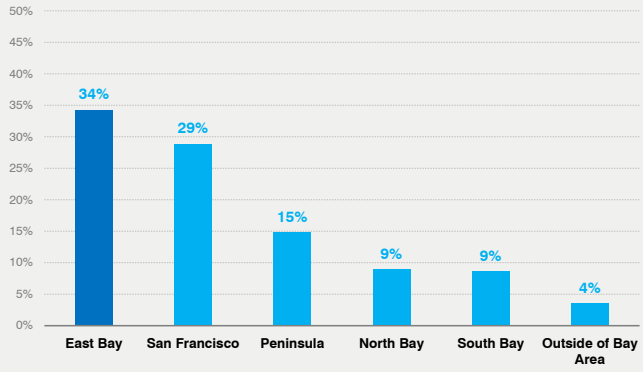
These themes will be discussed in the following pages.

Figure D1. Language of Respondents



N = 547
Percentages may not add up to 100% because of rounding.

Figure D2. Respondents' Home Zip Codes



N = 388
Percentages may not add up to 100% because of rounding.

Table D1. Respondents' Home Counties Outside of the Bay Area

County	Number of Respondents
Fresno	1
Lake	1
Los Angeles	1
Mendocino	1
Placer	1
Sacramento	5
San Joaquin	2
Stanislaus	1
Tulare	1

Respondents' Languages

The survey was provided in multiple languages. Most survey-takers responded in English (87%). Seven percent responded in Spanish, three percent responded in Chinese (3%), two percent responded in Portuguese (2%), and one percent responded in Arabic (1%). See Figure D1.

Other than knowledge of driver hubs (discussed further below), there were no noticeable differences in themes or response patterns by respondents based on language.

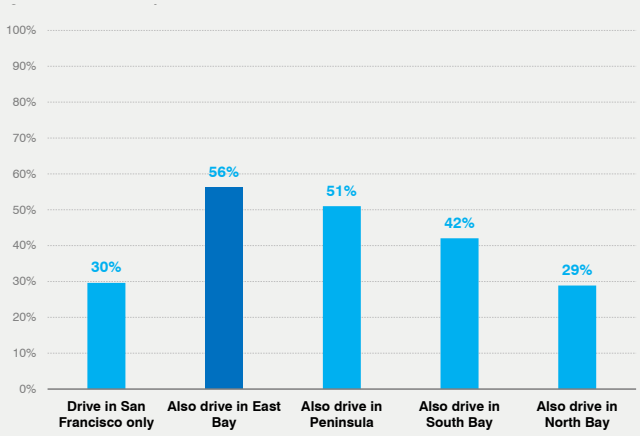
Respondents' Home Zip Codes

To determine their general home locations, survey-takers were asked for their home zip codes. Three-hundred and eighty-eight respondents provided this information. Results showed that most survey-takers lived in the Bay Area (96%), with more than one-third in the East Bay (34%). The next largest proportion lived in San Francisco (29%), followed by the Peninsula (15%), the South Bay (9%), and the North Bay (9%). See Figure D2. The remaining respondents (4%) came from all over the state, including as far south as Los Angeles and as far north as Mendocino. See Table D1.

This finding indicates that a large number of TNC drivers who drive in San Francisco are from the Bay Area and that beliefs that large numbers of people are driving from outside of the Bay Area to work in San Francisco as TNC drivers may not be entirely true.

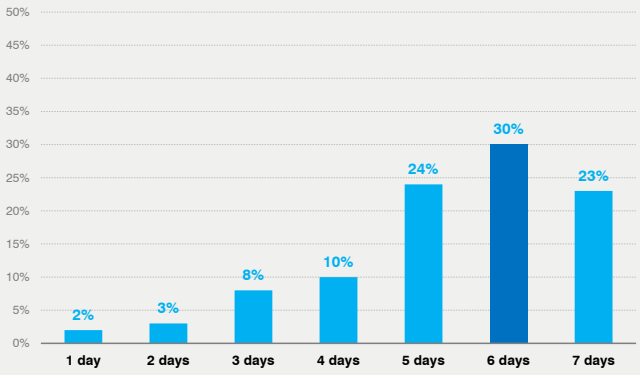
These results are similar to the "TNCs Today" study, which also showed that 29% of drivers are SF residents but showed a slightly higher proportion (10% vs 4%) coming from entirely outside the Bay Area.

Figure D3. Where Respondents Drove for TNCs



N = 547
Survey-takers were requested to base their responses on their pre-COVID behavior.
Percentages may not add up to 100% as respondents were able to select more than one answer option.

Figure D4. Number of Days TNC Drivers Drive Per Week



N = 538
Survey-takers were requested to base their responses on their pre-COVID behavior.
Percentages may not add up to 100% because of rounding.

Where Respondents' Drive for TNCs

As the survey was focused on respondents who drove in San Francisco, survey-takers were asked where they drove for ride-hailing companies in addition to San Francisco. Of the 547 respondents who said they drove in San Francisco, more than half also drove in the East Bay and in the Peninsula (56% and 51%, respectively) for TNCs. See Figure D3.

TNCs and Delivery Platforms that Respondents Work For

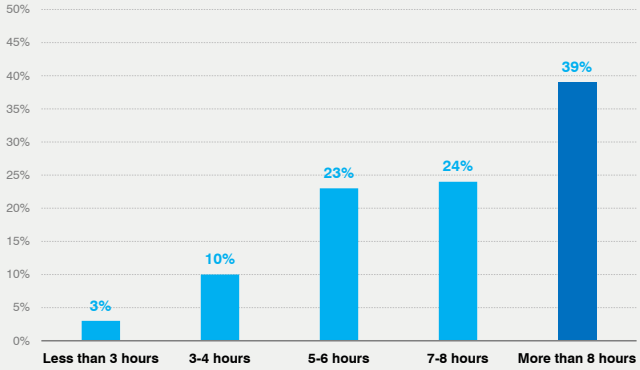
Respondents drove for a variety of TNCs and app-based services, with Lyft and Uber being the most popular platforms used by drivers. Of the 547 respondents, 403 (74%) drove for Lyft and 344 (63%) drove for Uber. Of those 403 drivers, 216 (54%) used both applications, while 187 (46%) drove solely for Lyft and 128 (32%) drove solely for Uber. Only 13 of the 547 respondents (2%) drove for Ziro, and 10 of those 13 also operated through Lyft and Uber. Fifty of the 547 respondents (9%) drove with "Other" companies, which were app-based delivery platforms outside of TNCs (e.g., Caviar, DoorDash, Grub Hub, Instacart). Sixteen of those 50 respondents only drove with these "Other" companies. The remaining 34 respondents also worked for Uber, Lyft, and/or Ziro.

These responses indicate that many drivers work through multiple apps, both for TNCs and for other app-based delivery services. It is possible that these numbers have changed during the pandemic, as the public's use of app-based delivery services (e.g., takeout with delivery) increased and usage of TNCs

Driving Frequency and Driving Time

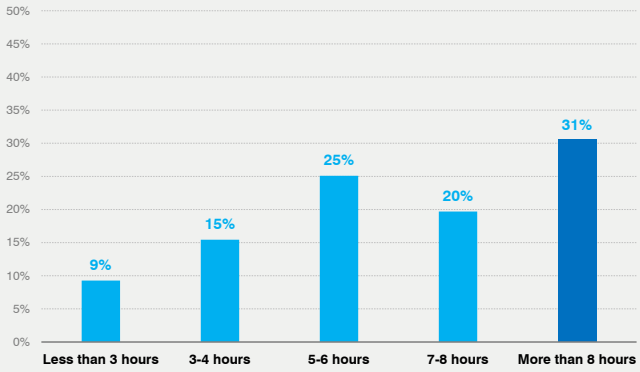
Several questions were asked to determine when and how often respondents drove for TNCs. Results strongly indicate that most respondents essentially worked as TNC drivers on a full-time basis, generally driving for more than 40 hours per week. When asked how many days they drove during a typical week prior to COVID, a large majority (77%) marked that they drove five or more days a week. See Figure D4.

Figure D5. Number of Hours TNC Drivers Drive in a Typical Shift



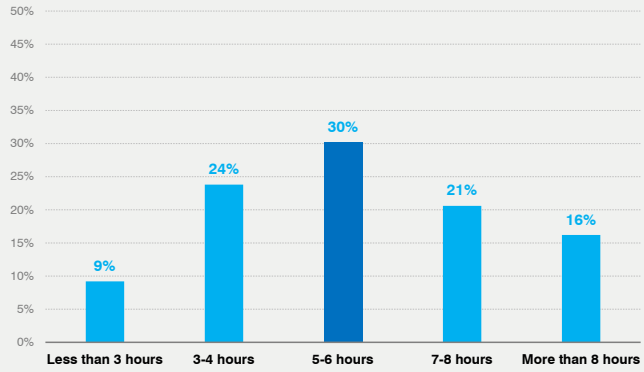
N = 533

Figure D6. Number of Hours TNC Drivers Spend in Driver Mode During a Typical Shift



N = 518

Figure D7. Number of Hours TNC Drivers Spend Actively Driving Passengers During a Typical Shift



N = 500
Survey-takers were requested to base their responses on their pre-COVID behavior.
Percentages may not add up to 100% because of rounding.

When asked about their typical shift length, most respondents indicated that they drove for five or more hours per shift (87%). Of that group, 39% drove for more than eight hours per shift. (See Figure D5.)

Cross-tabulations indicate that many of the respondents are working long hours on many days of the week. For example, of the 124 respondents who drove seven days a week (see Figure D4), 98% of them drove for five or more hours per shift.

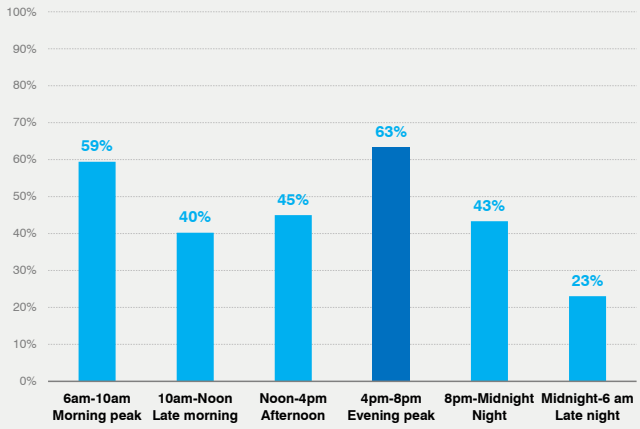
A series of survey questions were asked to find out how much time TNC drivers wait for their next passenger and how much time they were actually driving passengers – with the latter being the only time that drivers actually get paid by TNCs. (See page 93 for an explanation of driver mode and active passenger driving time).

The study team had hoped to find out how much time drivers spent in driver mode (i.e., waiting for their next passenger) (Figure D6) versus actually driving a passenger (Figure D7) as an approximate percentage of their total driving time (Figure D5). Unfortunately, the respondents' answers were internally inconsistent. For example, 18 respondents marked that they typically drove for less than three hours a day, and 46 respondents indicated they actively drove passengers for less than three hours a day. Similarly, 53 respondents marked that they drove for a total of three to four hours a day on a typical shift, and 119 respondents indicated that they have passengers for three to four hours on their shift. Inconsistencies such as these suggest that the questions could have been better worded or that respondents misunderstood them. Rather than make assumptions about what respondents meant, the raw numbers are shown in Table D2.

Table D2.
Number of Hours TNC Drivers Drive in a Typical Shift; Hours Spent in Driver Mode; and Hours Spent Driving Passengers

	Number of Hours TNC Drivers Drive in a Typical Shift	Number of Hours Spent in Driver Mode	Number of Hours Actively Driving Passengers
Less than 3 hours	18 respondents (3%)	48 respondents (9%)	46 respondents (9%)
3-4 hours	53 respondents (10%)	80 respondents (15%)	119 respondents (24%)
5-6 hours	124 respondents (23%)	130 respondents (25%)	151 respondents (30%)
7-8 hours	130 respondents (24%)	102 respondents (20%)	103 respondents (21%)
8+ hours	208 respondents (39%)	158 respondents (31%)	81 respondents (16%)
TOTAL	533 respondents	518 respondents	500 respondents

Figure D8. Time of Day that Respondents Drive for TNCs



N = 547
Survey-takers were requested to base their responses on their pre-COVID behavior.
Percentages may not add up to 100% as respondents were able to select more than one option.

Despite the uncertainty in the data, given the patterns in responses, some preliminary findings may be made. During a typical shift, the majority of respondents are driving for TNCs for five or more hours (86%; see Figure D5) and spending five or more hours in driver mode waiting for a fare-paying passenger (76%; see Figure D6). However, a smaller percentage of respondents get paid for five or more hours during a typical shift (67%; see Figure D7), as they only get paid when they are driving a passenger.

Most respondents drove for TNCs during the morning peak hours (6 AM-10 AM) and evening peak hours (4 PM-8 PM), or 59% and 63%, respectively. This corresponds with findings from "TNCs Today," which found that most TNCs trip occur during existing AM and PM peak periods.The other survey responses were relatively evenly distributed among late morning, afternoon, and night, with fewer drivers indicating that they drove late-night shifts. This implies that there is more demand for TNC services during peak commute hours. In addition, drivers typically drove for five to eight hours, meaning they drove during multiple time periods. For example, a driver may drive for a few hours in the morning, rest or return home, and then drive again in the evening. See Figure D8.

TNC "Driving Time"

TNC drivers' actual driving times can be quite nuanced. Descriptions of the time periods this study uses are included in the table below. For reference purposes, the definitions used for TNC driver time by the California Public Utilities Commission (CPUC)[A] are also included as well as information about how many vehicle miles are traveled by TNCs in 2018. The latter was estimated to be 4.2 billion miles in 2018.[B]

Table D3: Types and Characteristics of TNC Driving Times

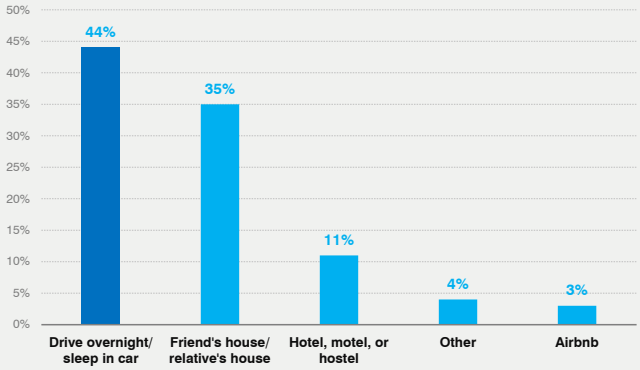
Time period	Description	Comparable CPUC time period and definition	Percentage of Vehicles Miles Traveled by TNCs during this time period[C]	Is the TNC driver getting paid during this time period?
Time in "driver mode"	When a TNC driver turns on "driver mode," it indicates to the app that the driver is available to drive a passenger(s), so that the software can match the driver with a passenger.	Period 1: The duration of time after a driver logs into a TNC app but is not yet matched with a passenger. During this time period, the driver awaits a ride request through the TNCs. Period 2: Driver mode also includes what the CPUC refers to as Period 2, which starts when a match is made and accepted by the driver, but before the passenger has entered the vehicle. During this period of time, the driver is en route to pick up the passenger.	Period 1: 28% Period 2: 11%	No
Time spent actively driving a passenger(s)	This is the duration that the TNC driver is actually transporting a passenger(s) to their destination.	Period 3: This period begins when a passenger has been picked up and is an occupant of the TNC driver's vehicle. This period of time lasts until the driver completes the transaction (via the app) or until the ride is completed, whichever is later.	Period 3: 61%	Yes
Total time spent driving:	This is the total period of time that a TNC driver spends driving, whether it be in a day or week. It includes driving to the city where they will look to be paired with a TNC passenger and times driving while waiting to be matched with a passenger.	No CPUC definition	N/A	No

A The CPUC regulates TNC operations in the state.

B California Air Resources Board. SB 1014 Clean Miles Standard: 2018 Base-year Emissions Inventory Report (December 2019). Vehicle miles traveled (VMT) measures the amount of travel for motorized vehicles, or in this case, the number of miles that TNC drivers drive when working for a TNC.

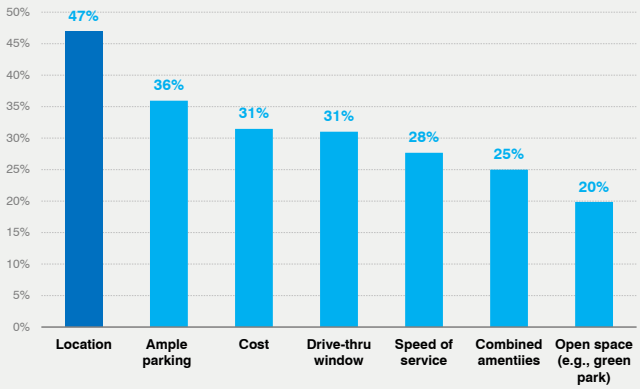
C ibid.

Figure D9. Where Drivers Spend the Night, If They Don't Drive Home



N = 113
Survey-takers were requested to base their responses on their pre-COVID behavior.
Percentages may not add up to 100% as respondents were able to select more than one option.

Figure D10. Reasons for Choosing a Place to Eat



N = 448
Survey-takers were requested to base their responses on their pre-COVID behavior.
Percentages may not add up to 100% as respondents were able to select more than one option.

Rest and Food

A series of questions sought information on where drivers take breaks, sleep (overnight), and eat. Twenty-two percent of 498 survey-takers marked that they spent the night in San Francisco instead of driving back home. When asked to specify where, the most commonly reported places were working throughout the course of the night or sleeping in their car (44%) and at a friend's or relative's house (35%)[103]. See Figure D9.

Of the 46 respondents who slept in their car, 85% indicated that they park on the street or in a parking lot during this period of time. Specific locations that were often noted for drivers who slept in parking lots included 24 Hour Fitness (gym), a gas station, the airport, Ocean Beach, Safeway (grocery store), or a park.

A large majority of respondents (77%) noted that they stopped for food during the day while they drive for ride-hailing companies. Drivers' rationale for choosing where to eat varied, with respondents being asked to choose all the options that applied to them. Nearly half of the respondents stated that location was a significant influencing factor. More than one-third of respondents stated that they considered parking availability, cost, and whether the restaurant had a drive-thru window when deciding where to stop for food. See Figure D10.[104]

Fueling and Charging Infrastructure

When asked about where drivers charge or fuel their vehicles, many respondents indicated that they did not purchase gas in San Francisco. An open-ended question asked where the respondent had last purchased gas in San Francisco, which garnered 146 responses. Of these respondents, 30% said they did not purchase gas in San Francisco, 18% gave unclear answers (e.g., "N/A" or "anywhere"), 8% noted Costco, and 7% Shell. When respondents did answer, they cited convenience and price as main considerations.

In general, responses regarding where drivers typically filled their vehicles were limited in information (e.g., addresses or cross streets) and demonstrated no trends or patterns for specific locations for purchasing gas.

Most respondents did not drive electric vehicles, while a small number (8) noted they drove hybrid vehicles. Of the few who responded that they drove an electric vehicle, only one respondent specified that they looked for chargers while driving, while others indicated they did not typically charge their cars in San Francisco.

Driver Hubs

A subset of questions asked drivers about their use of driver hubs provided by Lyft and Uber. These locations are intended to be resource centers for TNC drivers, where they can go to register their vehicles and/or have their vehicles inspected, ask TNC staff questions, etc. Responses varied greatly on the use of driver hubs, with 65% (270 respondents) stating that they made use of the driver hubs or support centers provided by Uber or Lyft, and 35% (146 respondents) stating that they did not.

The main hubs used were Lyft hubs in Potrero Hill (2300 26th Street), Bayshore, and Oakland, and the Uber hub in Daly City. Drivers primarily used hubs to ask questions and talk to company staff (42%). However, a few drivers also cited the following reasons: using the bathroom (18%), getting oil changes (9%), taking a break or nap (7%), or meeting other drivers (7%).

Common reasons that respondents cited for not using the hubs included: not knowing of their availability, not knowing where they are, not having time to use them, or that they were not useful/are generally not needed. Survey responses indicated that in order to promote the use of the hubs, it would be helpful if there was more information in languages other than English, as many of the non-English speakers noted that they did not know where or what the hubs were.

Other Challenges

The survey concluded with open-ended questions, asking the respondents what their main challenges were when driving for a TNC in San Francisco and any other thoughts they wanted to share. The open-ended questions received various types of responses, including complaints about the companies (Uber and Lyft), a general apprehensiveness or fear of enforcement, being cited or harassed by police and the pay structure of driving for TNCs.

The main challenges relevant to SF Planning or other City agencies include parking or other types of facilities for TNC drivers to wait for, pick up, and drop off passengers; resting; and publicly available restrooms. Many respondents cited the need for clean and available restrooms during their shifts as a major concern.

Attachment D1: Online Survey Questions

The San Francisco Planning Department is conducting a short, anonymous survey to get feedback from Lyft and Uber drivers. Your feedback will help us better understand your challenges and wants while driving for these ride-hailing companies.

After completing the survey, please enter your email address and phone number if you would like to be entered in a drawing to win 1 of 6 Visa gift cards for $100. Your name and contact information will not be associated with your responses to the questions.

Thank you for taking the time to complete this survey.

1. What ride-hailing companies do you drive for? Select all that apply.

- ☐ Lyft
- ☐ Uber
- ☐ Ziro
- ☐ Other. Please specify: _____

2. Where do you primarily drive when driving for a ride-hailing company? Select all that apply.

- ☐ San Francisco
- ☐ East Bay (e.g. Oakland, Berkeley, Alameda, etc.)
- ☐ Peninsula (e.g. Palo Alto, San Mateo, Mountain View, etc.)
- ☐ South Bay (e.g. San Jose)
- ☐ North Bay (e.g. Marin)
- ☐ Other. Please specify: _____

If response did not include San Francisco:
Unfortunately, you do not meet our eligibility criteria for completing this survey. Thank you for your interest.

3. On average, how many days a week do you drive for ride-hailing companies?

- ☐ 1 day
- ☐ 2 days
- ☐ 3 days
- ☐ 4 days
- ☐ 5 days
- ☐ 6 days
- ☐ 7 days

4. For each day that you drive for ride-hailing companies, what is the total amount of time that you usually drive (i.e., total amount of driving time for all companies in one day)?

- ☐ Less than 3 hours
- ☐ 3-4 hours
- ☐ 5-6 hours
- ☐ 7-8 hours
- ☐ More than 8 hours

5. On your most recent day that you drove for a ride-hail shift, how long did you keep yourself in driver mode (not the amount of time spent driving, but the amount of time you are able to receive requests)?

- ☐ 1 -2 hours
- ☐ 3-4 hours
- ☐ 5-6 hours
- ☐ 7-8 hours
- ☐ More than 8 hours

6. Is this the usual number of hours that you spend driving passengers?

- ☐ Yes
- ☐ No

7. On your most recent day that you drove for a ride-hailing company, how much of that time did you spend actively driving passengers (i.e. having passengers in your car)?

- ☐ 1-2 hours
- ☐ 3-4 hours
- ☐ 5-6 hours
- ☐ 7-8 hours
- ☐ More than 8 hours

8. Is this the usual number of hours that you spend driving passengers?

- ☐ Yes
- ☐ No

9. What are the times of day that you typically drive? Select all that apply.

- ☐ Morning rush hour – 6am to 10am
- ☐ Late morning – 10am to 12pm
- ☐ Afternoon – 12pm to 4pm
- ☐ Evening rush hour – 4pm to 8pm
- ☐ Night – 8pm to midnight
- ☐ Late night – midnight to 6am

10. If your primary residence is not in San Francisco, do you ever spend the night in San Francisco (instead of driving back home)?

- ☐ Yes
- ☐ No
- ☐ Not applicable

11. Where do you sleep? Please select all the options that you've slept at in the past.

- ☐ Friend's house/ relative's house
- ☐ Airbnb
- ☐ Hotel, motel, or hostel
- ☐ Drive overnight/sleep in car
- ☐ Other. Please specify: _____

12. If you rest or sleep in your vehicle, where do you park?

_____

13. After you have finished a ride, what do you typically do when you are waiting for the ride-hailing app to notify you about your next passenger? Please rank all that apply in order of frequency (how often you do this, with 1 being least often and 5 being most often).

- ☐ Drive to a known spot where a lot of people request Uber and Lyft rides
- ☐ Continue to drive and circle around
- ☐ Pull over and wait in a residential permit parking area
- ☐ Pull over and wait in a metered parking spot
- ☐ Pull over and wait in a nearby facility, like a gym, library, community center, park, etc.

14. Do you stop for food during the day while you drive for ride-hailing companies?

- ☐ YES
- ☐ NO

15. What kind of characteristics do you look for when selecting a place to eat? Select all that apply.

- ☐ Ample parking
- ☐ Drive-thru window
- ☐ Speed (fast food, but not drive through)
- ☐ Location (close to where I am)
- ☐ Open space (near park or place to eat outdoors)
- ☐ Combined amenities (ex: gas station, to fill up and get food at once)
- ☐ Cost
- ☐ Other. Please specify: _____

16. Where did you most recently purchase gas in San Francisco? (e.g. list gas station name and neighborhood)

_____

17. Is this where you typically purchase gas in San Francisco?

- ☐ YES
- ☐ NO

18. Where do you typically purchase gas in San Francisco?

_____

19. If you drive an electric vehicle, where did you last charge your vehicle in San Francisco?

_____

20. Is this where you typically charge in San Francisco?

- ☐ YES
- ☐ NO

21. Where do you typically charge your car in San Francisco?

_____

22. Do you ever make use of the driver hubs or support centers provided by Lyft or Uber? (for example, Lyft Hub at 2300 26th Street in San Francisco)

- ☐ YES. Which one(s)? _____
- ☐ NO. Please specify why not. _____

23. What are the main reasons you make use of the hubs/support centers? Select all that apply.

- ☐ Ask questions/talk to company staff
- ☐ Oil change
- ☐ Use the bathroom
- ☐ Get a car wash
- ☐ Take a break or nap
- ☐ Meet other drivers
- ☐ Other. Please specify: _____

24. What is your main challenge when driving in San Francisco, related to space and amenities (availability of public bathrooms, parking, locations of eating establishments, etc.)? Please describe.

_____

25. Please provide us with any additional feedback about your experience driving for Lyft and Uber.

_____

26. What is your home zip code? _____

27. What is your gender?

- ☐ Female
- ☐ Male
- ☐ Prefer not to say

We appreciate your time. Thank you for completing the survey.

If you would like to be entered into the gift card raffle, please provide your contact information below.

Name _____
Address _____
City/Town _____
State _____
ZIP code _____
Email address _____
Phone number _____

Attachment D2: Sample of Outreach Materials

Postcard (front)

Calling all Lyft and Uber Drivers!

Take a survey about your driving experiences and be entered in a raffle to win one of six $100 Visa gift cards.

www.surveymonkey.com/r/SFdriversurvey

دعوة الى جميع السائقين لدى ليفت وأوبر
شاركوا في استبيان عن تجربتكم في القيادة واحصلوا على فرصة للفوز بواحدة من ست بطاقات فيزا هدية قيمة كل منها 100$

全體 Lyft 和 Uber 司機注意！
填寫駕駛體驗調查，參加抽獎，有機會贏取一張 $100 Visa 禮品卡（共六張）。

Chamando todos os motoristas da Lyft e Uber!
Responda a uma pesquisa sobre suas experiências como motorista e participe de um sorteio para ganhar um dos seis vale-presentes Visa de US$ 100.

¡Atención, conductores de Lyft y Uber!
Llene una encuesta sobre sus experiencias cuando maneja para estas compañías y participe en un sorteo para ganar 1 de 6 tarjetas Visa de regalo de $100.

San Francisco Planning

Postcard (back)

The City of San Francisco wants to learn more about your needs and services you seek when driving with Lyft and Uber. Please take this anonymous survey and let us know about your experiences.

www.surveymonkey.com/r/SFdriversurvey

Once you complete the survey, you'll be entered in a raffle for a chance to win 1 of 6 $100 Visa gift cards.

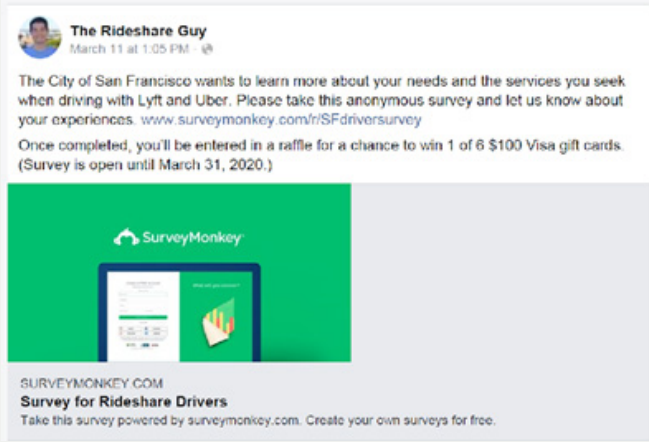
The survey will be open until June 30, 2020. A city employee will email and/or call raffle winners after the survey closes.

中文詢問請電: (415) 575-9010
Para información en Español llamar al: (415) 575-9010
Para sa impormasyon sa Tagalog tumawag sa: (415) 575-9010

San Francisco Planning

Posting on TheRideshareGuy.com's Twitter Account

Posting on TheRideshareGuy.com's Facebook Page



APPENDIX E.
Technical Memo for Study Question 4 – Findings From Interviews With Developers

Introduction

The San Francisco Planning Department is working with the San Francisco Municipal Transportation Agency (SFMTA) and the San Francisco County Transportation Authority (Transportation Authority) on a series of reports that will answer key questions about transportation network companies (TNCs, also known as ridesource or ridehailing services) and their effects in San Francisco.

This technical memorandum pertains to a study that looks at how TNCs potentially affect land use planning in San Francisco. The Planning Department, the lead agency for this study, is responsible for guiding growth and development in the city through the General Plan and enforcement of the Planning Code. A component of this guidance applies to understanding potential transportation demand generation, including how transportation modes may shift travel behavior given certain conditions, such as the implementation of proposed developments or projects.

This study will consider the following questions:

1. Are some land uses and densities associated with more TNC activity than others?

2. What other built environment features are associated with TNC activity?

3. Do TNCs create new or alter existing land uses?

4. How is the development community reacting to TNCs?

This technical memorandum summarizes the findings related to the fourth study question. To answer this question, a series of interviews were conducted with companies working on development projects in San Francisco to determine the impacts TNCs are having on their proposed projects, if any, and to find out if TNC activity is influencing what they are building or will be building in the future. The key findings described herein are based solely on these interviews.

Methodology

The study team conducted interviews with developers to understand if and how developers are adjusting their development plans in response to TNC service.

An email invitation from the Director of the Planning Department was sent to individuals at 20 real estate investment and development companies to participate in a telephone interview (see Attachment E1). The invited companies were selected based on whether they have built or are building developments in San Francisco. Interviewees from these companies were selected based on whether their position allows them to influence project design and development type. Effort was made to select interviewees that represented a range of development types.

The invitation noted that responses by interviewees would be kept anonymous. The invitation included the list of interview questions as an attachment. Planning Department staff sent follow-up emails and/or made telephone calls regarding the invitation as needed.

Of the 20 companies contacted, 15 interviews were completed with 19 people (in some cases there were multiple people in an individual interview) between November 29th and December 21, 2018. Two of the 19 individuals were from two development companies that are currently not taking concrete steps in their work because of TNCs at the time they were interviewed. As such, the findings in this document are based almost entirely on the 13 discussions conducted with the 17 other interviewees.

The interview format consisted of free-flowing discussion based on pre-established interview questions as well as other items that may have arose from the discussion. (See Attachment E2 for the list of interview questions.) This document presents key findings, primarily qualitative information, based solely on what was discussed in the interviews and does not include findings from other studies or data sources.

The interviewees represented a range of development companies, including local and national firms; firms with small project portfolios and large project portfolios; and for-profit and non-profit developers. The development types built and planned by the interviewees' companies included multi-family residential, commercial, office, and mixed-use developments. The interviewees represented firms with projects built all over San Francisco, including the urban core and outlying areas. About half of the companies have national portfolios, and the other half are focused on the west coast. About one-third of all companies interviewed have development projects only in the Bay Area.

Findings

The following is a qualitative analysis highlighting key findings and supporting information gathered from the 17 interviewees. For the purposes of this analysis, the findings from the interview discussions were grouped into relevant topics, rather than by interview question. Findings are summarized as key themes that emerged during the interviews and do not include direct quotes from the interviewees. All findings are specific to San Francisco, unless noted otherwise.

Overarching Thoughts on TNCs

Interviewees were first asked to provide their personal and/or company's broader thoughts on TNCs and their potential effects on urban spaces.

Interviewees generally agreed that TNCs are part of a larger shift away from privately owned vehicles, although there was much uncertainty regarding when the shift will reach critical mass. There was a general consensus that a number of trends contribute to the mode shift away from privately owned vehicles: the emergence of last-mile services (including TNCs), an increase in bicycling, traffic congestion, limited supply of parking, and rising parking costs. Many interviewees noted that autonomous vehicles will likely further the trend away from privately owned vehicles in the future.

Positive aspects of TNCs mentioned by interviewees include increased mobility, ease of getting around, lowered demand for off-street parking, and increased accessibility of projects that are not close to transit.

Negative aspects of TNCs mentioned by interviewees include increased demand for passenger loading areas, unsafe loading activity, congestion outside of their building sites, and increased traffic in the region.

The main impacts of TNCs for companies are on parking and passenger loading zones. Each of these two topics are discussed below. Uncertainty about the future, traffic congestion, and ensuring that their buildings are accessible were also cited as challenges for companies related to TNCs.

When asked which development types (e.g., office, retail, residential, etc.) are seeing more impacts from TNCs, several interviewees stated that the location of the development is a more important factor than development type. Important characteristics related to location were proximity to jobs, key destinations, the downtown core, and transit. Some interviewees speculated that residential developments are likely to see higher impacts than other development types.

Office development companies are also observing a major shift in the way that their tenants get to and from work. People working in San Francisco are increasingly using TNCs to get around, especially younger, tech-oriented office tenants.

Demand for Parking

Many companies that develop office and multi-family residential buildings see TNCs as a key contributor to a decline in demand for off-street parking. Companies are building and planning to build less parking due to this decline in demand and the City's elimination of minimum parking requirements.[105] Many interviewees also noted proximity to transit as a key contributor to lowered parking demand. Tenants that are currently driving the demand for office space require less off-street parking than the average tenant from around 10 years ago. Recent tenant employers are less likely to provide dedicated parking for their employees.

Most interviewees are planning to build less parking in the next 10 years. These interviewees mentioned the decline in demand for off-street parking and the City's lowered parking requirements as positive aspects, as building parking is expensive.

A few interviewees commented that there will always be demand for private off-street parking, especially for condominium developments. One developer remarked that parking is becoming such a limited resource that they are unconcerned about the decline in demand for off-street parking and that building new parking is still a good investment. They mentioned that the scarcity is due to existing parking being converted to other uses and that new buildings are being built with less parking than in the past. A couple of interviewees mentioned that they have opened up their parking garages to the public through third-party companies.

Interviewees that have experience with affordable housing development stated that the lack of off-street parking leads to a spillover effect where tenants use on-street parking on adjacent streets or neighborhoods. Interviewees identified the lack of off-street parking due to lowered parking requirements for affordable housing as a challenge, since these developments are generally multi-bedroom and occupied with families who own more than one vehicle.

In general, most interviewees had not noticed a change in demand for on-street parking in the recent past. This may be due to the fact that on-street parking is outside of interviewees' control and is not an aspect that they are concerned with, rather than an indication that demand for on-street parking has not changed.

Passenger Pick-up and Drop-off

The increase in pick-up and drop-off activity from TNCs is a major concern for interviewees for existing and planned buildings, across development types. Nearly all companies interviewed noted a marked increase in demand for passenger loading space as a result from TNCs and are looking at various solutions. They also noted that other activities that compete for the limited loading space are private commuter buses, delivery vehicles (discussed further below), and tenants moving in and out of the building.

Increasing the size of loading zones outside of their developments was the most prevalent and basic solution mentioned by interviewees. Most interviewees stated that they are planning to incorporate expanded loading zones, when possible, in the design of new buildings. Curb space is often limited, and there usually is not enough space for passenger loading.

The safety of tenants and visitors when loading/unloading from TNCs is a primary concern among interviewees. A few noted that lack of passenger loading areas results in TNCs stopping in travel lanes, which results in congestion and is unsafe for TNC passengers and bicyclists. One interviewee suggested that working with TNCs to identify specific locations for a given development where TNCs can load/unload would increase safety and familiarity for TNC drivers and passengers.

Some companies are considering off-street loading solutions. They generally agreed that off-street loading areas are ideal, but they cannot always provide them due to lack of space, stringent design requirements, cost, and prioritization of other amenities, such as bike parking. Despite these constraints, some companies have built or are planning to build, off-street loading areas.

Several interviewees identified major challenges due to a considerable increase in package and meal deliveries. The primary concerns are the constraint on existing curb space and traffic congestion due to delivery vehicles stopping outside their buildings. Interviewees also mentioned a lack of space within their buildings to hold delivered packages and are looking at various solutions.

Traffic Congestion

Many interviewees observed that TNCs are having a negative impact on traffic congestion, both proximate to their developments and in general. Circulating TNC vehicles, double parking for passenger loading/unloading, and increased vehicle trips are concerns mentioned, especially for new developments. Some interviewees also noted that from their experiences, ridehail drivers are commuting to San Francisco from long distances to drive for TNCs. A related concern that was expressed is the potential safety and congestion impacts as a result of erratic driving from drivers who are unfamiliar with the City's geography and transportation patterns and who rely on mobile app-based navigation.

Programs or Partnerships with TNCs

Most companies do not currently have any partnerships or programs with TNCs in San Francisco but are open to the possibility as either a transportation demand management (TDM)[106] measure and/or marketing tool. One interviewee's company provides a subsidy to their tenants for TNC trips to certain locations. Another developer operates a discounted TNC program for service to areas outside of San Francisco as a marketing tool.

With the exception of these two programs, TNCs are not generally part of interviewees' marketing efforts. A few interviewees remarked that proximity to transit and bicycle amenities are more important factors for attracting tenants in San Francisco.

Concerns related to potential partnerships with TNCs include the ongoing cost to operate a program and vehicle trip generation.

Existing and Future Parking Areas

Many companies are thinking creatively about adaptive reuse of future parking areas. Interviewees are looking at ways to design parking in future projects so that it can be adapted for a wider range of uses, should the parking no longer be needed. Common design approaches to ease conversion to other uses include increasing the height of the parking area above what is normally needed for vehicles and to design flat floors with the ramps outside of the structure. One developer is designing a building where the top floor of underground parking could be converted to other uses by being combined with the first, at-grade floor.

The most commonly cited strategy to address unused private parking is to open it up to the public and/or neighboring buildings. Interviewees also mentioned a range of other potential uses for future converted parking, including office, residential, retail, tenant storage, gym, community space, delivery staging, and fleet parking. A few interviewees mentioned parking technologies that enable more vehicles to be parked on a smaller footprint and/or be more easily converted to other uses. One developer is considering the potential to convert on-street parking adjacent to their development to loading areas as demand changes.

Few interviewees are currently considering converting existing parking areas to other uses due to cost and design constraints. Below-grade parking is especially difficult to convert, as is building above existing parking garages.

In addition, affordable housing developers are less concerned with a surplus of parking since they

already build parking spaces at a relatively low ratio[107] compared to for-profit residential and office buildings.

Electric Vehicle Charging and Autonomous Vehicles

Most companies are seeing demand for and building electric vehicle charging infrastructure. Challenges to building the infrastructure include the large upfront cost and space needed for chargers.

Many companies are thinking about autonomous vehicles, but there is uncertainty about what impacts they will have and when they will occur. One potential effect being considered is a decreased demand for private vehicle ownership. One interviewee noted that autonomous vehicles can increase the capacity of parking structures by up to 20% because they can be parked closer together. There was some concern about where autonomous vehicles would be stored and their potentially negative impact on traffic congestion.

TNCs and Other Transportation Modes

A few interviewees expressed the importance of having quality transit service complemented by TNCs. One developer noted that TNCs enable their tenants to commute via transit rather than in a privately owned automobile, because TNCs are both a first- and last-mile solution as well as a back-up for mid-day trips. Another developer expressed that TNCs are not seen as a replacement for heavy rail or commuter rail transit, such as BART and Caltrain, but may replace trips on Muni for people who are not inclined to take local transit.

More people are biking, and companies are responding by building more bike parking and other amenities. A couple of interviewees noted that bike amenities are an important aspect highlighted in their marketing materials.

Best Practices in Other Geographic Areas

Interviewees were asked if they knew of any other cities or countries that are adapting to the trends discussed throughout the interview. None of the interviewees cited best practices directly related to TNCs, but some did mention other programs or practices involving development and/or transportation (e.g., parking technology, commuter benefits program, buildings that incorporate public transit, and others) in different jurisdictions.

Areas for San Francisco to Explore/ Address

Interviewees were asked to suggest what the Planning Department's or other City agencies' strategies and priorities should be in relation to TNCs.

The need for more TNC passenger loading zones and/or pick-up and drop-off points is the top concern among interviewees. Suggestions related to passenger loading include the following, with agencies that have jurisdiction over the action noted in parentheses:

- Convert existing on-street parking to loading zones (SFMTA).
- Streamline the process for approval of loading zones in new buildings (Planning, SFMTA).
- Provide a best practices toolkit and/or clear rules for designing loading zones specifically for TNC activity (Planning, SFMTA).
- Separate uses that are currently competing for the same curb space (Planning, SFMTA).
- Study the demand for different types of curbside activities (Planning, SFMTA).

Another priority suggested by multiple interviewees is to provide an integrated multimodal technology platform, such as Mobility as a Service for planning trips, comparing services, and payment (SFMTA, Transportation Authority, regional agencies, private sector). This would enable seamless transfers between modes and help customers make informed decisions.

Additional suggested priorities from the interviewees include:

- Create regulations aimed at mitigating increased traffic congestion as a result of TNCs (SFMTA, Transportation Authority).
- Incorporate TNCs in the requirements for transportation impact studies (Planning).
- Focus planning on large-scale transit services rather than autonomous vehicles and other single-rider modes (Planning, SFMTA, Transportation Authority).
- Parking requirements should be different for for-sale and rental residential buildings (Planning).
- Hold TNCs responsible for the impacts of drivers coming to work in San Francisco from long distances (SFMTA, Board of Supervisors, SF Police Department, California Public Utilities Commission).
- Increase the availability of e-scooters and bike-sharing (SFMTA).

Attachment E1: Text of Invitation Email

November 2018

Dear _____:

The San Francisco Planning Department is working with WSP and Ronny Kraft Consulting to study the effects of ridehailing services (such as Lyft and Uber) on land use. In reaction to the rapid shift towards these ridehailing services and the advent of autonomous vehicles, we are interviewing developers working in San Francisco to:

- Understand if/how developers are planning for a shift in travel behavior in the design and ongoing management of both residential and commercial developments
- Understand what current City processes make this challenging
- Inform policy discussions on how to address changes in travel behavior

The project team would like talk to you or someone at your organization about your perspective on this. If you would like to participate in a one-hour interview, please:

- Read through the interview questions, which can be found at this link (link removed)
- Confirm you are the right contact or direct us to others who would be interested in participating in this survey
- Please select a time for your interview with Ronny Kraft here (link removed). Slots are available from 11/26 to 12/7.

Once you have selected a time, you will be sent a confirmation email for your interview with (name, email address, and phone number removed).

These interviews will be referenced in a report to be published by the City. Your responses will be anonymous and will not be attributed to you in any way.

Please send any questions or correspondence about this project to Tam Tran (SF Planning) at tam.tran@sfgov.org or 415-575-8716.

Sincerely,
John Rahaim
Planning Director

Attachment E2: Interview Questions

1. First, please share with us your or your company's thoughts on TNCs and their current and potential effects on cities and urban living.

2. Have you seen demand for off-street parking or passenger or freight loading change in San Francisco? How about demand for on-street parking and passenger or freight loading? If yes, in what ways has the demand changed?

3. How has your work in San Francisco been impacted by the shift in travel behavior towards pick-up and drop off for TNCs?
   a. Please explain how (if it's been impacted).
   b. How is this impact (both in and outside of SF) being thought about by your organization?

4. Is your firm planning for change in parking demand over the next 10 years?
   a. If yes, how? (Or please elaborate or specify how.)
   b. If no, please explain why your firm is not planning for change in parking demand.

5. Have you or your company considered or implemented any financial incentives, subsidies, or other types of programs or partnerships with TNCs? For example, some companies provide TNC credits as part of their benefits.
   a. If yes, please describe/elaborate.
   b. If no, would that type of program be something you might do in the future? Why or why not?

6. In your experience, which development types are seeing higher impacts from increased TNC services/use? Please explain.

7. I'm going to list off a number of items related to the future of mobility. Please tell me if your firm is considering each one by indicating yes or no.
   a. Adaptive reuse of existing or proposed parking garages (yes/no)
   b. Potential for increased developable space resulting from less parking (yes/no)
   c. Pick-up and drop-off solutions (yes/no)
   d. Reduced parking (yes/no)
   e. Electric vehicle charging infrastructure (yes/no)
   f. Other. Please specify or give an example

8. Is your company incorporating these mobility trends into the marketing, ongoing management/amenities, and transportation demand management (TDM) programming for your projects?
   a. If yes, please provide an example of how you are doing this.

9. What, if any, challenges stand between your organization and responding to these changes (e.g., uncertainty about parking needs, costs, development financing, client expectations, building codes, Planning Code?)?

10. One hypothesized outcome related to autonomous vehicles is the potential for decreased necessity of vehicle ownership and storage. Have you begun to see evidence of this possible future trend in your work?
    a. If yes, how have you, as a developer, been thinking about on-street and off-street parking spaces (e.g., new opportunities for development, decreased parking requirements, increased pick-up/drop-off locations, storage areas for fleets, new architectural needs, other)?

11. In what other cities and countries are you seeing the most adaptation to these trends? Please provide examples of what these jurisdictions are doing, whether it's policy- or project-related.

12. How important of an issue is this for SF Planning or the City to address? What do you think the Planning Department's or the City's priorities in this area should be?

13. Do you have any other thoughts related to what we've been discussing?

Endnotes

1 Ward, J. W., Michalek, J. J., Samaras, C., Azevedo, I. L., Henao, A., Rames, C., & Wenzel, T. (2021). The impact of Uber and Lyft on vehicle ownership, fuel economy, and transit across U.S. cities."

2 McKinsey & Company. (2019). Change vehicles: How robo-taxis and shuttles will reinvent mobility, https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/change-vehicles-how-robo-taxis-and-shuttles-will-reinvent-mobility#

3 A study examining the effectiveness of shared (or pooled) Uber and Lyft services in reducing VMT found that pre-pandemic levels of pooling led to at least a doubling of VMT when comparing ride-hail trips with travelers' previous mode, with increases of 97% in Chicago, 118% in San Francisco, and 157% in Boston.

Schaller, B. (2021). Can sharing a ride make for less traffic? Evidence from Uber and Lyft and implications for cities. *Transport Policy*, 102, 1–10. https://doi.org/10.1016/j.tranpol.2020.12.015

4 San Francisco County Transportation Authority. (2017). TNCs Today: A Profile of San Francisco Transportation Network Company Activity. https://www.sfcta.org/sites/default/files/content/Planning/TNCs/TNCs_Today_112917.pdf

5 San Francisco County Transportation Authority. (2018). TNCs and Congestion. https://www.sfcta.org/sites/default/files/ content/Planning/TNCs/TNCs_Congestion_Report_181015_Final.pdf

6 An indication of increased TNC activity is total collection of the San Francisco voter-approved TNC tax (Proposition D) increased significantly in July and August 2021 compared to the prior 2020-2021 fiscal year. Source: San Francisco County Transportation Authority. (2021). Executive Director's Report. https://www.sfcta.org/sites/default/files/2021-09/EDR%2009.28.21FINAL.pdf

7 Bergal, J. (2017). "Uber, Lyft Cut Into Parking Revenue That Keeps Airports Running." Governing Magazine. https://www.governing.com/archive/sl-uber-lyft-airports.html

Larco, N. (2018). "Driverless cars are here (just with drivers." Urbanism Next. University of Oregon. https://www.urbanismnext.org/news/driverless-cars-are-here-just-with-drivers-tncs

Metz, C. (2021). "The Costly Pursuit of Self-Driving Cars Continues On. And On. And On." New York Times. https://www.nytimes.com/2021/05/24/technology/self-driving-cars-wait.html

Allen, W. (2019). "How AVs, TNCs and public transit will shape the future of transportation." Metro Magazine. https://www.metro-magazine.com/10002899/how-avs-tncs-and-public-transit-will-shape-the-future-of-transportation

8 Studies typically show that TNC users tend to be younger, more educated, and more affluent than other populations. Example studies include:

Clewlow, R. R. & Mishra. G.S. (2017). "Disruptive Transportation: The Adoption, Utilization, and Impacts of RideHailing in the United States." Institute of Transportation Studies, University of California, Davis, Research Report UCD-ITS-RR-17- 07

Fehr & Peers. (2017). 2013-2017 Travel Decision Survey Data Analysis and Comparison Report. https://www.sfmta.com/sites/default/files/reports/2017/Travel_Decision_Survey_Comparison_Report_2017-Accessible.pdf.

9 San Francisco County Transportation Authority. (2017). TNCs Today: A Profile of San Francisco Transportation Network Company Activity. https://www.sfcta.org/sites/default/files/content/Planning/TNCs/TNCs_Today_112917.pdf

10 Studies show that the convenience of TNC services is a major factor of its growth and popularity. For example, the Pew Research Center found that 86% of ride-hailing users feel that these services save their users time and stress. Smith, A. (2016). The New Digital Economy: Shared, Collaborative and On Demand. Pew Research Center: Internet, Science & Tech. https://www.pewresearch.org/internet/2016/05/19/the-new-digital-economy/

11 Studies show that TNC services may provide user benefits, including increasing the convenience of planning spontaneous rides and decreasing user uncertainty around wait times. For example, one study showed that in San Francisco, 90% of TNC rides occurred within 10 minutes of the request at all times of the day, compared to with only 35% of taxi rides during the day.

12 San Francisco County Transportation Authority. (2017). TNCs Today: A Profile of San Francisco Transportation Network Company Activity. https://www.sfcta.org/sites/default/files/content/Planning/TNCs/TNCs_Today_112917.pdf

13 Ward, J. W., Michalek, J. J., Samaras, C., Azevedo, I. L., Henao, A., Rames, C., & Wenzel, T. (2021). The impact of Uber and Lyft on vehicle ownership, fuel economy, and transit across U.S. cities."

14 Studies show that TNCs also competes with public transportation as riders (especially non-car owners) consider the service as a replacement for transit. Example studies include:

Erhardt, G. D., Mucci, R. A., Cooper, D., Sana, B., Chen, M., & Castiglione, J. (2021.) "Do transportation network companies increase or decrease transit ridership? Empirical evidence from San Francisco." Transportation. https://link.springer.com/article/10.1007/s11116-021-10178-4

Rayle, L., Dai, D., Chan, N., Cervero, R., & Shaheen, S. (2016). "Just a better taxi? A survey-based comparison of taxis, transit, and ridesourcing services in San Francisco." Transportation Policy 45, 168–178. https://doi.org/10.1016/j.tranpol.2015.10.004

Shaheen, S., Totte, H., & Stocker, A. (2018). "Future of Mobility." UC Berkeley: Institute of Transportation Studies UC Berkeley, https://escholarship.org/uc/item/68g2h1qv

15 A study examining the effectiveness of shared (or pooled) Uber and Lyft services in reducing VMT found that pre-pandemic levels of pooling led to at least a doubling of VMT when comparing ride-hail trips with travelers' previous mode, with increases of 97% in Chicago, 118% in San Francisco, and 157% in Boston.

Schaller, B. (2021). Can sharing a ride make for less traffic? Evidence from Uber and Lyft and implications for cities. *Transport Policy*, 102, 1–10. https://doi.org/10.1016/j.tranpol.2020.12.015

16 San Francisco County Transportation Authority. (2018). TNCs and Congestion. https://www.sfcta.org/sites/default/files/ content/Planning/TNCs/TNCs_Congestion_Report_181015_Final.pdf

17 California Air Resources Board. (2019). Clean Miles Standard: 2018 Base-Year Emissions Inventory Report. https://ww2.arb.ca.gov/resources/documents/2018-base-year-emissions-inventory-report

18 Fehr & Peers. (2019). Estimated TNC Share of VMT in Six U.S. Metropolitan Regions (Revision 1). Research funded by Uber. https://drive.google.com/file/d/1FlUskVkj9lsAnWJQ6kLhAhNoVLjfFdx3/view

19 California Office of Planning and Research. (2016). Revised Proposal on Updates to the CEQA Guidelines on Evaluating Transportation Impacts in CEQA. https://opr.ca.gov/docs/Revised_VMT_CEQA_Guidelines_Proposal_January_20_2016.pdf

20 Uber Technologies, Inc. (2019). Amendment No. 1 to Form S-1 Registration Statement under The Securities Act of 1933 to United States Securities and Exchange Commission. https://www.sec.gov/Archives/edgar/data/1543151/000119312519120759/d647752ds1a.htm

21 Brown, A. (2019). Prevalence and Mechanisms of Discrimination: Evidence from the Ride-Hail and Taxi Industries. *Journal of Planning Education and Research*. https://doi.org/10.1177/0739456X19871687

22 San Francisco County Transportation Authority. (2018). Emerging Mobility Evaluation Report. https://www.sfcta.org/projects/emerging-mobility-evaluation-report.

23 An indication of increased TNC activity is total collection of the San Francisco voter-approved TNC tax (Proposition D) increased significantly in July and August 2021 compared to the prior 2020-2021 fiscal year. Source: San Francisco County Transportation Authority. (2021). Executive Director's Report. https://www.sfcta.org/sites/default/files/2021-09/EDR%2009.28.21FINAL.pdf

24 San Francisco Planning Code, Section 101, Purpose.

25 Regression analyses demonstrate if a relationship exists (i.e., if a variable is associated with an event or trend) and cannot demonstrate causation.

26 *Statistical significance* indicates if a research result or research finding is due to the cause or relationship being studied or if it is due to chance. A low level of statistical significance (or insignificance) suggests that a relationship is not likely.

27 The methodology for this research (Part B) is only included in this report. Further details are not available in Appendix D, which provides a methodology for the online survey.

28 The study team conducted focus groups with TNC drivers in October 2019. The online survey of TNC drivers was administered from January through June 2020.

29 San Francisco Chronicle. (2021). Waymo is offering robo taxi rides in S.F., if you're selected for its test program. https://www.sfchronicle.com/tech/article/Waymo-is-offering-robo-taxi-rides-in-SF-if-16408340.php

PR Newswire. (2021). Motional and Lyft To Launch Fully Driverless Ride-Hail Service In Las Vegas In 2023. https://www.prnewswire.com/news-releases/motional-and-lyft-to-launch-fully-driverless-ride-hail-service-in-las-vegas-in-2023---will-mark-first-city-in-multimarket-deployment-301419623.html

30 San Francisco Planning Department, Case No. 2016-003640PRJ, https://sfplanninggis.org/pim/.

31 Lyft website. The Hub: California Service Locations & Hours. https://www.lyft.com/hub/hours/california.

32 The Production, Distribution, and Repair-2 zoning district includes a wide range of light and contemporary industrial activities. For a full definition of this zoning district, see https://codelibrary.amlegal.com/codes/san_francisco/latest/sf_planning/0-0-0-20123 and "Industrial Land in San Francisco: Understanding Production, Distribution, and Repair," https://sfplanning.org/sites/default/files/resources/2019-06/Industrial_Land_in_San_Francisco_PDR_SF_2002.pdf

33 San Francisco Planning Department, Case No. 2016-008074CUA. https://sfplanninggis.org/pim/.

34 Lyft website. The Lyft Hub. https://sites.google.com/lyft.com/powerdrivers/home

35 San Francisco Planning Department, Case No. 2016-003640PRJ, https://sfplanninggis.org/pim/.

36 San Francisco Planning Department, Case No. 2016-010221ZAD, https://sfplanninggis.org/pim/.

37 San Francisco Planning Department, Case No. 2018-013267ZAD, https://sfplanninggis.org/pim/.

38 San Francisco Planning Department, Case No. 2020-009198ZAD, https://sfplanninggis.org/pim/.

39 San Francisco Planning Department, Case No. 2018-002794ENF, https://sfplanninggis.org/pim/.

40 San Francisco Planning Department, Case No. 2019-012091PRL, https://sfplanninggis.org/pim/.

41 San Francisco Planning Department, Case No. 2020-0011000PRL, https://sfplanninggis.org/pim/.

42 San Francisco Planning Department, Case No. 2021-001111PRJ, https://sfplanninggis.org/pim/.

43 San Francisco Planning Department, Case No. 2021-011363PRV, https://sfplanninggis.org/pim/.

44 San Francisco Planning Department, Case No. 2021-009982PRJ, https://sfplanninggis.org/pim/.

45 San Francisco Planning Department, Case No. 2021-010435PRJ, https://sfplanninggis.org/pim/.

46 Examples of these logistics facility applications are at 749 Toland Street and 2000 McKinnon Avenue, San Francisco Planning Department, Case No. 2015-012491PRJ; 1313 Armstrong Avenue, San Francisco Planning Department, Case No. 2020-010684PRJ; and anticipated at 900 7th Street, San Francisco Planning Department, Case No. 2021-001762PPA.

47 The study team conducted these interviews in 2019, prior to the COVID-19 pandemic. The team did not follow up with developers later.

48 ConnectSF is a multi-San Francisco agency collaboration process to conduct long-range transportation planning. https://connectsf.org/about/about-connectsf/

49 The San Francisco Planning Commission adopted Resolution No. 20738 on June 11, 2020 to center the Planning Department's work on racial and social equity. The resolution includes a statement to ensure that "plans, policies and programs actively address and redress structural and institutional racism."

50 The Better Streets Plan, which implements the associated policy, creates a unified set of standards, guidelines, and implementation strategies to govern how San Francisco designs, builds, and maintains its pedestrian environment. The Planning Code requires certain new development projects to make changes to the public right-of-way that it is consistent with the Better Streets Plan. https://www.sfbetterstreets.org/

51 Vision Zero refers to an action plan to reduce traffic fatalities to zero by 2024 through engineering, education, and enforcement. The Transportation and Urban Design Elements of the San Francisco General Plan make reference to Vision Zero.

52 The City Charter includes a Transit First policy. The San Francisco General Plan incorporates this policy, and the policy requires all City boards, commissions, and departments to implement principles that, among others, encourage people walking, bicycling, and riding public transit on public rights-of-way above the use of the personal automobile.

53 In 2021, the San Francisco Board of Supervisors adopted targets to reduce San Francisco greenhouse gas emissions, including reducing transportation-related emissions by at least 90% compared to 1990 levels and sequestering any residual emissions. To accomplish this, the Board of Supervisors identified transportation goals to increase low-carbon trips and the adoption/use of electrification of vehicles.

54 The agencies have adopted these principles to serve as a framework for evaluating EMST, identifying ways to meet City goals and shaping future studies, policies, and programs. See https://www.sfmta.com/reports/guiding-principles-emerging-mobility-services-and-technologies-0 and https://www.sfcta.org/policies/emerging-mobility#panel-guiding-principles

55 San Francisco Municipal Transportation Authority. (2015). SFMTA Transit Economic Benefits Study. https://www.sfmta.com/sites/default/files/agendaitems/2015/8-18-15%20Item%2012%20Transit%20Economic%20Benefits%20Study.pdf

56 Local vehicular emissions may be less of a concern due to recent changes to California state law. California Governor Newsom signed Senate Bill 500 in 2021, which will require zero emissions from new autonomous vehicles of a certain size with deployment permits starting January 1, 2030. Deployment permits have the potential for the most vehicular travel. This bill expands upon a prior California Senate bill adopted in 2018 (1014 - Clean Miles Standard) that will set greenhouse gas reduction targets for particular kinds of passenger service.

57 Governor's Office of Planning and Research. (2016). Revised Proposal on Updates to the CEQA Guidelines on Evaluating Transportation Impacts in CEQA. Page III:40 cites several studies to support this statement.

58 San Francisco Municipal Transportation Authority. (2021). Vision Zero Traffic Fatalities: 2020 End-of-Year Report. https://www.visionzerosf.org/wp-content/uploads/2021/03/Vision-Zero-2020-End-of-Year-Traffic-Fatality-Report_1.0.pdf

59 National Bureau of Economic Research. (2016). Racial and Gender Discrimination in Transportation Network Companies. https://www.nber.org/papers/w22776.

60 Elliott, Donald. (2017). Getting Ready for Driverless Cars. American Planning Association, Zoning Practice Series. Issue Number 12.

61 It was estimated that San Francisco's population in December 2021 was 855,550 residents. (Source: San Francisco Chronicle, "California and Bay Area populations decline, with state deaths increasing. Here are the places shrinking the most," December 17, 2021.) U.S. Census data shows that the population was 776,700 in 2000 and 805,200 in 2010 (Source: MTC/ABAG, http://www.bayareacensus.ca.gov/counties/SanFranciscoCounty.htm)

62 These treatments include dedicated bus lanes, protected bike lanes, sidewalk extensions, and shared spaces on curb sidelanes (i.e., parklets). In 2021, the San Francisco Board of Supervisors adopted a permanent Shared Spaces program that allows public and commercial operations in fixed or movable structures in the curbside lane. https://sf.gov/information/making-shared-spaces-program-permanent

63 The purpose of this plan is to reduce potential conflicts between driveway and loading operations, including passenger and freight loading activities, and pedestrians, bicycles, and vehicles, to maximize reliance of on-site loading spaces to accommodate new loading demand, and to ensure that off-site loading activity is considered in the design of new buildings. Development projects of more than 100,000 net new gross square feet in Central SoMa and Van Ness & Market Residential special use districts are subject to such provisions in Planning Code Section 155(u).

64 Changes to state law may be required prior to implementing some policies.

65 For example, the Central SoMa Plan Environmental Impact Report has a mitigation measure for the SFMTA to develop a curb management strategy in this area. City agencies could develop such a strategy earlier in an area planning process and consider area-wide off-street strategies such as consolidation centers funded by new development.

66 Performance-based provisions, or provisions that regulate the performance or outcomes of the use, would allow flexibility as such emerging mobility technologies evolve. For example, a performance-based provision could mandate zero emissions from a development's indirect source of pollutions, which includes the vehicles traveling to and from the development site. The City could seek an outcome of zero emissions, regardless of the vehicles' technology, as opposed to defining the vehicle technology which could change over time.

67 Fehr & Peers. (2019). Estimated TNC Share of VMT in Six U.S. Metropolitan Regions (Revision 1). https://drive.google.com/file/d/1FlUskVkj9IsAnWJQ6kLhAhNoVLjfFdx3/view

68 For example, Uber's Texas group reached out to real estate management companies across Houston to identify pick-up spots at their buildings and may partner with apartments to offer residents Uber credit in exchange for not having parking spots. https://www.houstonchronicle.com/business/real-estate/article/Uber-deal-to-simplify-pickups-at-Houston-11150142.php

69 People demand access to destinations. There is no inherent demand for parking, per se. This report uses the term to be consistent with common language in the planning and transportation fields.

70 For example, refer to Metropolitan Transportation Commission, et. al, "Autonomous Vehicles Perspective Paper, June 2018, https://mtc.ca.gov/sites/default/files/2018-06-25_Autonomous_Vehicles_Perspective_Paper.pdf, Section 2.2.

71 For example, aggregate level data of household vehicles between 2012 and 2016 from several U.S. cities, including San Francisco, showed no such household vehicle availability decrease. Source: Schaller, B. (2018). The New Automobility: Lyft, Uber and the Future of American Cities. Table 10. http://www.schallerconsult.com/rideservices/automobility.pdf

72 For example, refer to parking facility design considerations in American Planning Association. (2018). PAS Report 592: Planning For Autonomous Mobility.

73 San Francisco Planning Department. (2019). Transportation Impact Analysis Guidelines for Environmental Review and associated Summary of Changes Memorandum. https://sfplanning.org/project/transportation-impact-analysis-guidelines-environmental-review-update.

74 Travel demand refers to the number, type, and location of trips to and from a development or site.

75 For example, the 2019 TIA guidelines collected data at the site level for a few land uses, whereas this study assessed data at the transportation analysis zone level, which is greater in size and encompasses more land uses.

76 San Francisco County Transportation Authority. (2017). TNCs Today: A Profile of San Francisco Transportation Network Company Activity. https://www.sfcta.org/sites/default/files/content/Planning/TNCs/TNCs_Today_112917.pdf

77 San Francisco County Transportation Authority. (2018). TNCs and Congestion. https://www.sfcta.org/sites/default/files/ content/Planning/TNCs/TNCs_Congestion_Report_181015_Final.pdf

78 San Francisco Planning Code, Section 166: Car Sharing

79 Shared, limited-range vehicles are defined as a two-, three-, or four-wheeled self-propelled vehicle capable of achieving speed of at least 20 miles per hour and no greater than 40 miles per hour and must also be zero emission. These vehicles are inclusive of golf carts and electric bicycles.

80 https://sfplanning.org/project/car-share-program#inventory-of-spaces

81 San Francisco Municipal Transportation Agency. (2017). San Francisco Transportation Sector Climate Action Strategy. https://www.sfmta.com/sites/default/files/reports-and-documents/2017/12/cap_draft_full_document-final1.pdf

82 San Francisco Planning Code, Section 152: Schedule of required off-street freight loading spaces in districts other than C-3, Eastern Neighborhoods Mixed Use Districts, or South of Market Mixed Use Districts)

San Francisco Planning Code, Section 152.1: Required off-street freight loading and service vehicle spaces in C-3, Neighborhood Mixed Use Districts, and South of Market Mixed Use Districts)

San Francisco Planning Code, Section 152.2: Allowed off-street freight loading and service vehicle spaces in Downtown Residential (DTR) Districts)

San Francisco Planning Code, Section 154: Dimensions for off-street parking, freight loading and service vehicle spaces

San Francisco Planning Code,Section 162: Tour bus loading spaces in C-3 districts

83 Wrangler News. (2018). Chandler First in U.S. to Consider Parking Regs for Self-Driving Vehicles. http://www.wranglernews.com/2018/05/15/chandler-first-in-u-s-to-consider-parking-regs-for-self-driving-vehicles/

84 Los Angeles Department of Transportation. (2017). Urban Mobility in a Digital Age. https://ladot.lacity.org/sites/default/files/2020-03/transportationtechnologystrategy_2016.pdf

85 The tool can be found at this location: https://github.com/CityOfLosAngeles/mobility-data-specification

86 Shared Use Mobility Center. (2017.) Twin Cities: Shared Mobility Action Plan. https://sharedusemobilitycenter.org/wp-content/uploads/2017/10/SUMC_TWINCITIES_Web_Final.pdf

87 Ibid.

88 Ibid.

89 Transportation Authority, "TNCs & Congestion", (2018), https://www.sfcta.org/sites/default/files/2019-05/TNCs_Congestion_Report_181015_Finals.pdf.

90 TNC activity refers to TNC pick-ups and drop-offs in this memo. TNC activity has a broader meaning in other TNC and land use memos.

91 Production, distribution, and repair (PDR) are the traditional uses of industrial space. These include traditional manufacturing and distribution; printing and publishing; transportation and delivery services; wholesale construction and distribution; repair shops for cars, trucks, equipment, and appliances; and many others.

92 TNCs often refer to their services as ridesharing but are not considered ridesharing in San Francisco's TDM program.

93 The Department was unable to obtain data directly from Uber and Lyft, which would have likely been the best available data on origins and destinations for this memo.

94 "Activity" refers to TNC drop-offs and pick-ups.

95 A travel analysis zone (TAZ) is a unit of geography used in transportation planning models and is usually made up of census blocks. Transportation planning models are commonly used to forecast travel patterns.

96 Please refer to the TNCs Today report for more details regarding its methodology.

97 San Francisco County Transportation Authority. (2017). "TNCs Today." https://www.sfcta.org/sites/default/files/content/Planning/TNCs/TNCs_Today_112917.pdf

98 This number includes both the mileage driven for when TNC drivers are transporting fare-paying passengers, when they are driving to pick up the next fare-paying passengers, and when they are driving around while they have indicated on their app that they are available to carry fare-paying passengers

99 UCLA Institute for Research on Labor and Employment. (2018). More Than A Gig: A Survey of Ride-hailing Drivers in Los Angeles. https://www.labor.ucla.edu/wp-content/uploads/2018/06/Final-Report.-UCLA-More-than-a-Gig.pdf

100 Peer-to-peer (P2P) carsharing employs privately owned vehicles made temporarily available for shared use by an individual or members of a P2P company.

101 Courier network services (CNS) provide for-hire delivery of packages, food, or other items for compensation. They use an online platform or application (e.g., such as a website or smartphone app) to connect delivery drivers using a personal transportation mode. These services can be used to pair package delivery with existing passenger trips, serve as dedicated for-hire delivery services, or be mixed mode (e.g., for-hire drivers can deliver both passengers and packages).

102 San Francisco County Transportation Authority. (2017). "TNCs Today." https://www.sfcta.org/sites/default/files/content/Planning/TNCs/TNCs_Today_112917.pdf

103 A straight reading of the results would suggest that the third highest response was “Other” (19 responses). However, in reading responses that survey-takers manually entered, it appeared that some of the respondents misunderstood the question. Eleven survey-takers manually entered “home” in the “Other” answer option. These respondents were not factored in the analysis of this question, which asked respondents where they spend the night if they did not drive home at night to sleep. Four other respondents manually inputted “car,” and these responses were added to the other survey-takers who chose the “sleep in car” option.

104 Combined amenities include places that have more than one feature or characteristic for drivers to stop there. An example provided in the survey text included a gas station that sold food and gas.

105 Parking requirements in San Francisco are dependent upon the use and zoning district (location). In late 2018, the Board of Supervisors passed an ordinance removing existing minimum parking requirements for all development in San Francisco.

Prior to this ordinance, some new developments, particularly in the western and southern parts of San Francisco, were required to build a certain amount of parking if the developers did not seek exceptions. This ordinance did not change off-street loading requirements.

106 Generally, transportation demand management (TDM) is a set of strategies to reduce driving. These strategies can include policies, programs, information, services, and incentives to encourage people to use modes other than driving a car.

TNCs are not a part of San Francisco’s TDM strategy. As studies show that TNCs have increased congestion in San Francisco, they are not an effective TDM measure.

107 The interviewees specifically mentioned building 0.25 parking spots per unit.

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