TRANSPORTATION IMPACT ANALYSIS GUIDELINES

FEBRUARY 2019

San Francisco Planning

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Additional thank you to the numerous other agencies, consulting firms, and interns who participated in this update. In particular, thank you to Fehr & Peers Transportation Consultants for their contributions regarding the travel demand update.

TABLE OF CONTENTS

I Introduction **1**

II Update Process and Style Guide **3**

III Transportation Review Process **3**

IV Project Description **6**

V Significance Criteria **7**

VI Existing and Existing plus Project **8**

a. Methodology 9

b. Existing Baseline 17

c. Impact Analysis 17

VI Cumulative **20**

a. Methodology 20

b. Impact Analysis 23

VI Other **24**

APPENDICES

A	Transportation Review Process	A-1
B	Update Process and Style Guide	B-1
C	Project Description	C-1
D	Cumulative Conditions Adjustments	D-1
E	Sample Queue Abatement Language	E-1
F	Travel Demand	F-1
G	Walking/Accessibility	G-1
H	Bicycling	H-1
I	Public Transit	I-1
J	Emergency Access	J-1
K	Loading	K-1
L	Vehicle Miles Traveled/Induced Automobile Travel	L-1
M	Driving Hazards	M-1
N	Construction	N-1
O	Vehicular Parking	O-1
P	Supplementary Guidance	P-1


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I. INTRODUCTION

The Environmental Planning Division within the San Francisco Planning Department reviews projects for potential impacts on the environment, a process known as environmental review. The department conducts reviews pursuant to the California Environmental Quality Act (CEQA) and Chapter 31 of the San Francisco Administrative Code. As part of environmental review, the department reviews background technical studies, such as transportation impact studies, to assess a project's effects on the physical environment.

These background technical studies support the conclusions of the environmental impact evaluation and guide decision-makers during the project approval process. To assist in the preparation of transportation impact studies, the department provides to consultants and city staff a guidance document, the Transportation Impact Analysis Guidelines. The department periodically updates the guidelines, with the prior comprehensive update in 2002.

The guidelines are just that, a document to provide guidance to city staff and consultants on how to undertake environmental review. The guidelines provide basic details regarding methodologies and criteria, but individual transportation impact study scopes of work are required to provide a level of detail tailored to fit the size and complexity of transportation issues associated with projects. Once the department approves a scope of work, the specific direction contained within that scope will provide more details than that which appears in the guidelines.

This document updates the prior guidelines. The department prepared the update to the guidelines in consultation with stakeholders (e.g., city and county agencies, consultants). For this update, the department prepared memoranda to cover the following topics:

- Transportation Review Process
- Update Process and Style Guide
- Travel Demand
- *Walking/Accessibility*
- *Bicycling*
- *Public Transit*
- *Emergency Access*
- *Loading*
- *Vehicle Miles Traveled/Induced Automobile Travel*
- *Driving Hazards*
- *Construction*
- *Vehicular Parking*
- Supplementary Guidance

The *italicized* memoranda provide detailed guidance regarding methodology and impact analysis for land use development projects, area plans, infrastructure, and other types of projects. This document summarizes the content within those memoranda for land use development projects. All topics, including the non-italicized topics, provide more details about their topic matter than provided herein. Those memoranda serve as appendices to these guidelines. The memoranda also include attachments for use as additional resources. The department may update the attachments to the memoranda more frequently than this document and the body of the memoranda.

The organization of this document is as follows:

I. Introduction

II. Update Process and Style Guide

III. Transportation Review Process

IV. Project Description

V. Significance Criteria

VI. Existing and Existing plus Project

  a. Methodology

  b. Existing Baseline

  c. Impact Analysis

VII. Cumulative

  a. Methodology

  b. Impact Analysis

VIII. Other (covers different types of projects and situations)

Appendices and attachments

A basic purpose of CEQA is to “inform governmental decision makers and the public about the potential, significant environmental effects of proposed activities.” San Francisco Administrative Code Chapter 31 directs the department to identify environmental effects of a project using as its base the environmental checklist form set forth in Appendix G of the CEQA Guidelines. The department uses significance criteria to facilitate the transportation analysis and address the Appendix G checklist. The guidelines, unless otherwise noted and depending on the characteristics of the project, focus on existing and cumulative conditions, methodology, and impact analysis needed to address the significance criteria.

II. UPDATE PROCESS AND STYLE GUIDE

The update process and style guide memorandum describe some of the reasons that the department may update the guidelines and the level of precision that the department will use in the presentation of any transportation analysis in tables, figures, or text within a transportation impact study or section.

The department does not intend to update this document or the main body of the topic memoranda frequently. At a minimum, the department will assess the necessity of updates approximately every four years, following the periodic updates to the San Francisco County Transportation Plan, or following updates to the San Francisco General Plan, or Transportation Element of the San Francisco General Plan. The department may update the attachments of the topic memoranda more frequently than the main body. At a minimum, the department will assess the necessity of attachment updates approximately every two years. In most instances, when the department updates this document or the main body of the topic memoranda or attachments, it will supersede the previous documents.

Refer to the update process and style guide memorandum for more details regarding updates and levels of precision and its associated attachment for acronyms, terms, and definitions.

III. TRANSPORTATION REVIEW PROCESS

Figure 1 flowchart on the following page provides an overview of transportation review process. The transportation report prepared will be a site circulation memorandum, a transportation impact study, or a draft environmental impact report section. The flowchart includes generalized steps for coordinating with other agencies.

Within the transportation review process, a transportation determination identifies, among others, the level of transportation review anticipated, including key transportation issues. To assist with this, the department includes screening criteria for the following transportation topics: public transit delay, vehicle miles traveled/induced automobile travel, construction, and vehicular parking. If a project meets the screening criteria, then the project would not require any detailed analysis in that topic. Refer to transportation review process memorandum for more details regarding the process and those topic specific memoranda for the screening criteria.

San Francisco Planning

Transportation Review Process

This flowchart provides an overview of transportation review by the Environmental Planning division's transportation team, under the California Environmental Quality Act. The transportation report prepared will be a site circulation review memo, a transportation study, or a draft EIR section. This flowchart includes generalized steps for coordinating with other agencies. Refer to the Transportation Review Process memorandum for more details.

LEGEND

EP - Environmental planning
PPA - Preliminary project assessment
EIR - environmental impact report
P/MND - preliminary mitigated negative declaration
PCL - Plan Check Letter

- ⋙ Review Milestone
- ● (orange) Coordination with Urban and Street Design Advisory teams
- ● (blue) Coordination with MTA
- ● (green) Coordination with other agencies

1 PPA

- **1a.** PPA application filed
- **1b.** Planner assigned
- **1c.** Planner requests transportation study determination
- **1d.** Department includes transportation study determination language in PPA letter
- ⋙ PPA letter issued

2 Project Initiation & Scoping

- **2a.** Project sponsor submits Project Application and pays fees
- **2b.** Project sponsor selects consultant (*if applicable*)
- **2c.** Consultant submits draft scope of work
- ⋙ Project Application accepted

- **i.** Transportation planner assigned
- **ii.** Transportation planner requests second transportation determination
- **iii.** Department confirms/changes prior transportation study determination language and includes it in first Plan Check Letter

&

- **iv.** Transportation planner reviews draft 1 scope
- **v.** Transportation planner/consultant/ project sponsor meet (*site visit*)
- **vi.** Consultant submits/transportation planner reviews draft 2 scope

⋙ Complete response to first Plan Check Letter / stable project description / scope of work finalized

3 Analysis

- **3a.** Consultant collects data/conducts initial analysis
- **3b.** Consultant submits/transportation planner reviews initial findings submitted as spreadsheets, a travel demand memo, or other interim deliverable
- **3c.** Transportation planner/consultant meet to review analysis results
- ⋙ Analysis results confirmed

NOTE: If no consultant is required, the transportation planner completes Step 4 by collecting data from the project sponsor, or another source, and calculates travel demand; initial findings are shared with team.

4 Report Preparation

Site Circulation Review Memo

- **4a.** Transportation planner prepares draft 1/internal review of draft 1
- **4b.** Check-in with team
- **4c.** Transportation planner prepares draft 2/internal review of draft 2
- ⋙ Report finalized

or

Transportation Study

- **4a.** Consultant submits/ transportation planner reviews draft 1
- **4b.** Consultant submits/ transportation planner reviews draft 2
- **4c.** Consultant submits/ transportation planner reviews screencheck
- ⋙ Report finalized

or

Draft EIR sections

- **4a.** Consultant submits/ transportation planner reviews draft 1
- **4b.** Consultant submits/ transportation planner reviews draft 2
- **4c.** Consultant submits/ transportation planner reviews screencheck
- ⋙ Report finalized

5 Additional Review

(if needed)

- **5a.** Consultant submits/transportation planner reviews alternatives analysis memo
- **5b.** Consultant submits/transportation planner reviews responses to comments (MND or EIR)
- **5c.** Consultant/transportation planner assists with appeal of a PMND (see Step 7)
- ⋙ Environmental review complete, project approved

6 Appeal

(if needed)

- **6a.** Consultant/transportation planner assists with the appeal response
- **6b.** Consultant/transportation planner participates in pre-hearing briefing; and/or
- **6c.** Consultant/transportation planner attends public hearing(s) (*answer questions/give testimony*)

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IV. PROJECT DESCRIPTION

This section describes project description features, figures, and tables as it relates to transportation topics. This section also describes approvals from agencies other than the department that a project sponsor may need to obtain for those features.

Basics

This sub-section describes the typical physical, additional physical, and programmatic features for existing and project conditions to the extent applicable. The geographic extent of these features must, at a minimum, include the project's frontage and may include the entirety of the project's block.

Typical Physical Features

Appendix C, Table 1 identifies the typical physical features the project description must include to the extent applicable.

Additional Physical Features

Appendix C, Table 2 identifies the additional physical features the project description may include to the extent applicable. The department will determine applicability of the additional proposed physical features based upon whether the project would change some of these features and the extent this information may be necessary to inform the impact determination.

Programmatic Features, if applicable

Appendix C, Table 3 identifies the additional programmatic features the project description may include to the extent applicable. The department will determine project description applicability based upon whether these features are inherent features of the project, which may typically be considered, or whether they are actions related to project construction or operations that are used to avoid a significant impact (e.g., funding mechanisms), which may typically not be considered, and the extent this information may be necessary to inform the impact determination.

Existing and Proposed Project SIte Characteristics

Appendix C, Table 5 provides a template table for listing existing and proposed project site features.

Approvals

Appendix C, Table 4 provides a non-exhaustive list of approvals from agencies other than the department that a project sponsor may need to obtain for the project description features described above.

V. SIGNIFICANCE CRITERIA

San Francisco Administrative Code Chapter 31 directs the department to identify environmental effects of a project using as its base the environmental checklist form set forth in Appendix G of the CEQA Guidelines. As it relates to transportation and circulation, Appendix G asks whether the project would:

- Conflict with a program plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities
- Conflict or be inconsistent with CEQA Guidelines Section 15064.3, subdivision (b)
- Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses
- Result in inadequate emergency access

The department uses significance criteria to facilitate the transportation analysis and address the Appendix G checklist. The department separates the significance criteria into construction and operation.

Construction

Construction of the project would have a significant effect on the environment if it would require a substantially extended duration or intense activity; and the effects would create potentially hazardous conditions for people walking, bicycling, or driving, or public transit operations; or interfere with emergency access or accessibility for people walking or bicycling or substantially delay public transit.

Operation

The operational impact analysis addresses the following six significance criteria. A project would have a significant effect if it would:

- Create potentially hazardous conditions for people walking, bicycling, or driving or public transit operations
- Interfere with accessibility of people walking or bicycling to and from the project site, and adjoining areas, or result in inadequate emergency access
- Substantially delay public transit
- Cause substantial additional VMT or substantially induce additional automobile travel by increasing physical roadway capacity in congested areas (i.e., by adding new mixed-flow travel lanes) or by adding new roadways to the network
- Result in a loading deficit and the secondary effects would create potentially hazardous conditions for people walking, bicycling, or driving; or substantially delay public transit
- Result in a substantial vehicular parking deficit and the secondary effects would create potentially hazardous conditions for people walking, bicycling, or driving; or interfere with accessibility for people walking or bicycling or inadequate access for emergency vehicles; or substantially delay public transit[1]

[1] Given the limited possibility for projects to have significant impacts regarding a substantial vehicular parking deficit, the remainder of this guidelines document does not address these impacts. Refer to vehicular parking memorandum for details regarding such analysis.

VI. EXISTING AND EXISTING PLUS PROJECT

Methodology

This section describes the typical methodology required to address the significance criteria. The methodology section identifies the collection, generation, and approach to analyze data. The department will determine the appropriate methodology as necessary to inform the analysis.

Geography

The methodology will typically focus on the streets adjacent to the project site, the intersections within one block (e.g., 275 to 800 feet) of the project site, and nearby transit stations/stops (e.g., crosswalks, sidewalks) and major destinations. For projects that require a transportation impact study, the department may typically extend the methodology to two to five block radii or further for public transit delay, depending on the size of the blocks and the size of the project. When a project may impact a wide area, the department will select streets and intersections most impacted by the project to represent the impacts that may occur at other locations.

Period

In San Francisco, the weekday extended p.m. peak period (Tuesday, Wednesday, or Thursday, 3 p.m. to 7 p.m.) is typically the period when the most overall travel happens.[2] Although a substantial amount[3] of travel occurs throughout the day and impacts from projects would typically be less during other periods, the methodology should typically focus on this period (including limiting the hours within the extended p.m. peak period) as changes in travel demand or public right-of-way would be acute during these periods compared to other times of the day and days of the week. In some instances, the most overall travel may occur at different periods (a.m., midday, post p.m. peak, and/or weekend) for smaller geographic areas (e.g., a segment of a street) in existing conditions or as a result of the project, or the project may result in substantial disparity in travel demand at different periods (e.g., special events). In these instances, the methodology may substantiate the use of periods in addition to or other than the weekday p.m. peak.

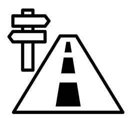
For loading, the methodology typically uses the 11 a.m. to 2 p.m. period to assess commercial vehicle loading demand and 5 p.m. to 8 p.m. period to assess passenger vehicle loading demand. Refer to the loading memorandum for more details.

[2] Examples that illustrate this statement: within the San Francisco County Congestion Management Program network transit and vehicular travel speeds are lower during the p.m. peak period (4:30-6:30 p.m.) than during the a.m. peak period (7-9 a.m.) as documented in San Francisco County Transportation Authority, *Congestion Management Program*, December 2015; demand at transit stations is consistent and generally higher throughout the p.m. peak period relative to demand at transit stations during the a.m. peak period, as documented in the Metropolitan Transportation Commission, *Core Capacity Transit Study Briefing Book*, July 2016; the weekday peak period for for-hire vehicles occurs from 6:30 p.m. to 7p.m., as documented in San Francisco County Transportation Authority, *TNCs Today: a Profile of San Francisco Transportation Network Company Activity, June 2017*.

[3] Throughout the guidelines, the term "substantial number" is used but not defined. This is because what constitutes a substantial number of people, vehicles, etc., depends on the context in which the project is being evaluated (e.g., existing conditions, proposed land uses, and other variables).

Existing Conditions

The existing conditions methodology should include counts of people using the transportation system, a visual analysis with recorded observations, and a description of street characteristics. The following identifies the typical existing conditions methodology, separated by topic. Refer to applicable memoranda for more details.



Regional and Local Roadways

The existing conditions should describe the closest regional roadways to the project site, including on- and off-ramps. In addition, the existing conditions should describe the existing local roadways in the study area, including their geographic extent; San Francisco General Plan, Better Streets Plan, Key Walking Street, and High Injury Corridor designation to the extent applicable; speed limit; and number and type of travel lanes and directions. For those existing streets adjacent to the project site, the existing conditions should also describe the width of the roadway, including travel lanes, and any potentially or observed vehicle to vehicle hazardous conditions (driving hazards). Lastly, the existing conditions should describe the number of people driving at study intersections.

A typical figure includes the transportation impact study area and study intersections and driveways, including counts. Typical tables include a description of local roadways and intersection and driveway vehicular turning movement counts.

Walking/Accessibility Conditions

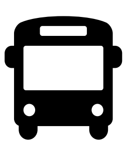
The existing conditions should describe the absence, discontinuity, or presence of features related to people walking[4] in the study area. In addition, the existing conditions should identify any potentially or observed hazardous conditions at locations that people walk. Lastly, the existing conditions should describe the number of people walking at study intersections.

A typical figure includes the walking network, including any high injury corridor streets. A typical table includes walking counts.

Bicycling Conditions

The existing conditions should describe the absence, discontinuity, or presence of features related to people bicycling in the study area. In addition, the existing conditions should identify any potentially or observed hazardous conditions at locations that people bicycle. Lastly, the existing conditions should describe the number of people bicycling at study intersections.

A typical figure includes the bicycling network, including any high injury corridor streets. A typical table includes bicycling counts.



Public Transit Conditions

The existing conditions should describe the local and regional public transit service in the study area, including their geographic extent; scheduled frequency; and transit stop proximity to the project site. In addition, the existing conditions may quantify transit travel times for certain routes and identify observed conditions which delay public transit.

A typical figure includes transit service network. Typical tables include transit service and local transit travel times.

[4] People walking includes people with disabilities that may or may not require personal assistive mobility devices.

Emergency Access Conditions

The existing conditions should describe the closest emergency access facilities to the project site. In addition, the existing conditions should identify any observed delays to emergency access operators adjacent to the project site.

Vehicle Miles Traveled

The existing conditions should describe vehicle miles traveled metrics, including the existing vehicles miles traveled metrics for the project site transportation analysis zone and region, and the modeling parameters for those metrics.

Typical figures include infographic explaining vehicle miles traveled and regional vehicle miles traveled map. A typical table includes vehicle miles traveled by the project site transportation analysis zone and region.

Loading Conditions

The existing conditions should describe the absence, discontinuity, or presence of features related to people loading in the study area. The existing conditions description should include an assessment of commercial and passenger on and off-street spaces, hour restrictions, and usage. In addition, the existing conditions should identify any potentially or observed hazardous conditions or delays to public transit because of loading activities.

A typical figure includes loading locations. A typical table includes loading counts.

Existing plus Project Conditions

The following identifies the typical existing plus project conditions methodology, separated by topic. Refer to applicable memoranda for more details.

Travel Demand Analysis

Project travel demand refers to the number, type, and common destinations of new trips that people would take to and from the project. The following summarizes the typical methodology.

Existing Site Trips

Projects may include trip credits, based on empirical data collection at the site. The methodology may then subtract or credit the existing site trips from the project trips for net new trips. Refer to supplementary guidance memorandum for more details.

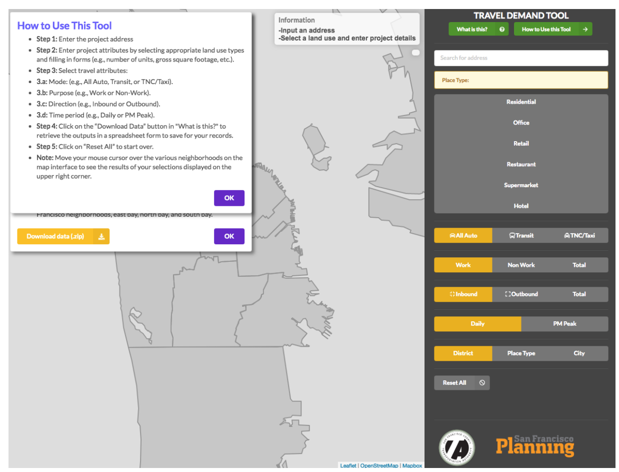
Project Trips

The typical methodology consists of four steps: 1) trip generation, 2) ways people travel, 3) common destinations, and 4) assignment. The following summarizes each of these steps.

Step 1. Trip Generation

Trip generation refers to the number of estimated trips people would take to and from the project, regardless of the way they travel (see step 2 below). The following refers to these trips as person trips. The methodology should apply person trip rates, accounting for the size and type of land use, to estimate the number of project person trips. Select the trip generation rate most applicable to the project's land uses. Refer to the travel demand memorandum for trip generation rates.

A typical table includes the estimated number of daily and p.m. peak period project person trips by land use.



Step 2. Ways People Travel

Ways people travel, also known as mode split, refers to the estimated way or method people travel. The methodology defines five methods: walking, bicycling, public transit, for-hire vehicle, automobile (driving alone or with passengers).[5] The mode split percentage accounts for three different geographic contexts of San Francisco: urban high, urban medium, and urban low density. Select the geographic context most appropriate for the project site. Refer to the travel demand memorandum for mode splits.

Typical tables include the estimated p.m. peak period percentage of trips by way of travel and estimated number of p.m. peak period project trips by different ways of travel.

[5] While private transit trips are included as a percentage of the observed total person trips, the department excludes private transit from impact analysis. Therefore, private transit is not mentioned as a method.

Step 3. Common Destinations

Common destinations, also known as trip distribution, refers to the estimated number of trips people would take to (inbound) and from (outbound) the project and another place (e.g., another neighborhood). Common destinations consist of eight San Francisco neighborhoods, east bay, north bay, and the south bay. Select the appropriate distribution method most appropriate for the project site. Refer to the travel demand memorandum for common destinations.

Typical figures include the estimated percentage of p.m. peak period project vehicle and trip trips to the common destinations. A typical table uses the same information from the figures in tabular form.

Step 4. Assignment

Assignment refers to the location or assignment of project vehicle trips to different streets, on-street loading zones, and driveways, and project transit trips to specific transit routes. In other words, assignment uses the results of step 2, number of project trips by different ways of travel, and step 3, percentages of those projects trips to and from common destinations, to place project vehicle and transit trips onto physical locations. Roadway assignment between an origin or destination and the project site can be based on factors such as consideration for one-way versus two-way streets, access to on and off-ramps, or prohibited movements in the study area intersections. Transit assignment between an origin and destination can be based on factors such as transit travel time, number of transfers, and location of transit stop. Select and document factors most appropriate for the project.

In some instances, the methodology may also assign or describe other types of person trips to and from a project site (e.g., walking, bicycling, etc.).

A typical figure includes the estimated number of p.m. peak period project vehicle trips to the intersections and driveways in the study area. A typical table includes the estimated number of p.m. peak period project transit trips to the transit routes in the study area.

<u>Project Loading Demand</u>

Loading demand consists of the estimated number of project delivery, service, and passenger vehicle trips. The methodology applies loading demand rates, accounting for the size and type of land uses, to estimate the demand. Select the loading demand rates most applicable to the project's land uses. Refer to the travel demand memorandum for loading demand rates.

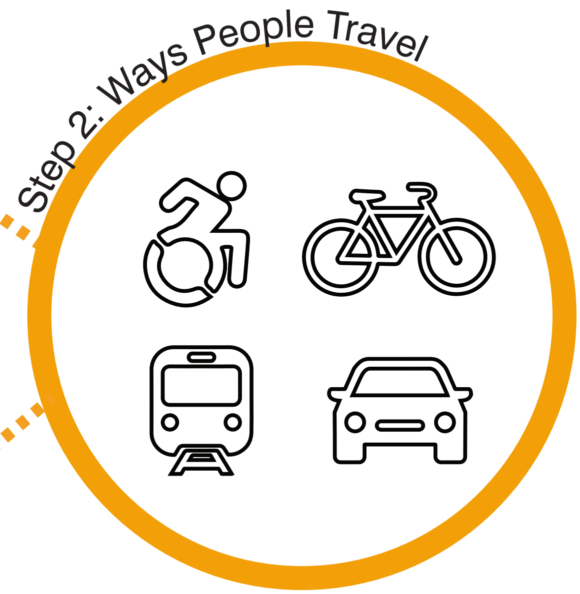
A typical table includes daily and average peak period project delivery, service, and passenger vehicles and associated demand.

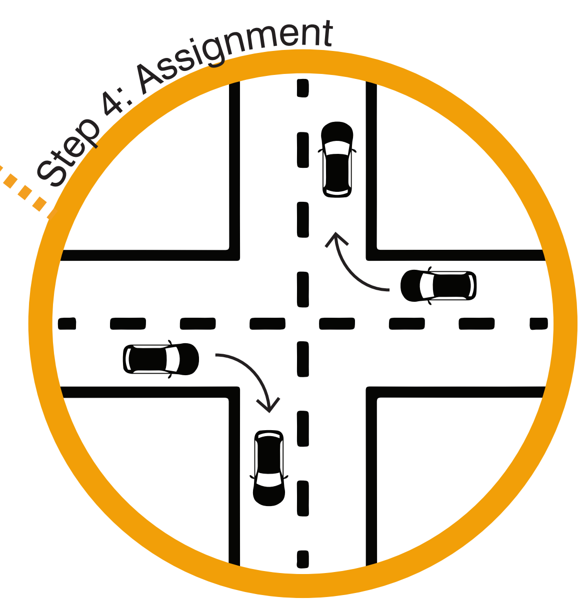
Travel Demand Analysis

The following represents the steps in a typical travel demand analysis for environmental review

Step 1: Trip Generation
Number of estimated trips people take to and from the project site.

Step 2: Ways People Travel
Estimated way or method people take to and from the project site.





Step 3: Common Destinations
Origin and destination of trips to and from the project site.

Step 4: Assignment
Location of project trips on different streets or transit routes.

Construction Impacts

The analysis for addressing project construction impacts uses preliminary project construction information. The evaluation addresses the staging and duration of construction activities, estimated daily worker and truck trips, truck routes, roadway and/or sidewalk closures, and evaluates the effects of construction activities on people walking, bicycling, or driving, and riding public transit and emergency vehicle operators. Refer to the construction memorandum for more details.

Operational Impacts

The following describes the methodology for analysis of operational impacts, by significance criterion.

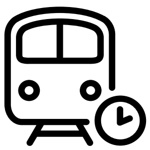
<u>Potentially Hazardous Conditions</u>

A "hazard" refers to a project generated vehicle potentially colliding with a person walking, bicycling, or driving or public transit vehicle that could cause serious or fatal physical injury, accounting for the aspects described below. Human error or non-compliance with laws, weather conditions, time-of-day, and other factors can affect whether a collision could occur. However, for purposes of CEQA, hazards refer to engineering aspects of a project (e.g., speed, turning movements, complex designs, substantial distance between street crossings, sight lines) that may cause a greater risk of collisions that result in serious or fatal physical injury than a typical project. This analysis focuses on hazards that could reasonably stem from the project itself, beyond collisions that may result from aforementioned non-engineering aspects or the transportation system as a whole.

Therefore, the methodology should qualitatively address the potential for the project to exacerbate an existing or create a new potentially hazardous condition to people walking, bicycling, or driving, or public transit operations. The methodology should account for the amount, movement type, sightlines, and speed of project vehicle trips and project changes to the public right-of-way in relation to the presence of people walking, bicycling, or driving or public transit vehicle. Refer to the walking/accessibility, bicycling, driving hazards, and public transit memoranda for more details.

Accessibility

The methodology should qualitatively address the potential for the project to interfere with the accessibility of people walking or bicycling or results in inadequate emergency access. The methodology should account for the amount, movement type, sightlines, and speed of project vehicle trips and project changes to the public right-of-way in relation to the presence of people walking and bicycling or emergency service operator facilities. Refer to the walking/accessibility, bicycling, and emergency access memoranda for more details.



Public Transit Delay

The department uses a quantitative threshold of significance and qualitative criteria to determine whether the project would substantially delay public transit. For individual Muni routes, if the project would result in transit delay greater than or equal to four minutes, then it might result in a significant impact. For individual Muni routes with headways less than eight minutes, the department may use a threshold of significance less than four minutes. For individual surface lines operated by regional agencies, if the project would result in transit delay greater than one-half headway, then it might result in a significant impact. The department considers the following qualitative criteria for determining whether that delay would result in significant impacts due to a substantial number of people riding transit switching to riding in private or for-hire vehicles: transit service headways and ridership, origins and destinations of trips, availability of other transit and modes, and competitiveness with private vehicles.

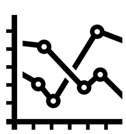
The methodology should assess and, if necessary, report p.m. peak hour transit delay for public transit routes using traffic congestion, transit reentry, and passenger boarding delays; Transit Cooperative Research Program 165[6] methodology; or other methodologies. Refer to the public transit memorandum for more details.

VMT Analysis

Land Use Components

The department uses the following quantitative thresholds of significance to determine whether the project would generate substantial additional VMT:

- For residential projects, if it exceeds the regional household VMT per capita minus 15 percent.
- For office projects, if it exceeds the regional VMT per employee minus 15 percent.
- For retail projects, if it exceeds the regional VMT per retail employee minus 15 percent.
- For mixed-use projects, evaluate each land use independently, per the thresholds of significance described above.



The department uses VMT efficiency metrics (per capita or per employee) for thresholds of significance. VMT per capita reductions mean that individuals will, on average, travel less by automobile than previously but, because the population will continue to grow, it may not mean an overall reduction in the number of miles driven.

The department uses a map-based screening criterion to identify types and locations of land use projects that would not exceed these quantitative thresholds of significance. The department also uses other screening criteria (e.g., the size of the project and its proximity to transit stations) for further presumptions regarding VMT impacts.

[6] Transit Cooperative Research Program 165 is a reference document that provides research-based guidance and quantitative techniques for calculating transit delays and other operational characteristics.

For projects that include a substantial amount of vehicular parking or do not meet the map-based screening criteria, the department may compare the project's vehicular parking with the neighborhood parking rate and quantify or qualitatively describe the effects of transportation demand manage measures on VMT. Refer to the VMT/induced automobile travel memorandum for more details.

Transportation components

The department uses the following quantitative threshold of significance and screening criteria to determine whether transportation projects may substantially induce additional automobile travel: 2,075,220 VMT per year. This threshold is based on the fair share VMT allocated to transportation projects required to achieve California's long-term greenhouse gas emissions reduction goal of 40 percent below 1990 levels by 2030.

The department uses a list of transportation components that are presumed not to exceed this quantitative threshold of significance. If a project fits within the general types of projects (including combinations of types) in the VMT/induced automobile travel memorandum, then the department presumes that VMT impacts would be less than significant. Refer to the VMT/induced automobile travel memorandum for more details.

<u>Loading</u>

The methodology should assess the potential for convenient off- and on-street loading facilities to meet the project's loading demand during the average peak period. For the purposes of this topic, convenient refers to facilities within 250 linear feet of the project site.

If convenient loading facilities meet the estimated demand, the analysis is complete. If convenient loading facilities do not meet the demand, then the methodology should qualitatively address the potential for the project to exacerbate an existing or create a new potentially hazardous condition to people walking, bicycling, or driving or substantially delay public transit. Refer to the loading memorandum for more details.

Existing Baseline

The existing baseline must include a description of the physical environmental conditions in the vicinity of the project, as they exist at the time the notice of preparation is published, or if no notice of preparation is published, at the time environmental analysis is commenced (e.g., department notification of project receiving environmental review), from both a local and regional perspective. While the existing baseline subsection may repeat existing conditions features described in the project description, the existing baseline will also present (text, figure, or table) the elements included in the methodology as it relates to those features. For example, the project description describes the physical location of an existing curb-cut. The existing baseline conditions refers to the physical location of an existing curb-cut and describes any existing potential or observed hazards between people driving and people walking at the curb-cut. In addition, the existing baseline conditions must indicate the date and time that counts, visual observations, etc. occurred.

Refer to supplementary guidance memorandum for details concerning the use of a near-term baseline.

Impact Analysis

The purpose of the impact analysis is not to exhaustively repeat information from elsewhere. Instead, the impact analysis should present the findings of the analysis based upon the methodology(ies) applied to gather information. The impact analysis must only provide information that is relevant to the significance criterion. The impact analysis section should present a format (text, figure, or table) consistent with earlier sections of the guidelines for easy comparison between existing and existing plus project conditions.

Construction

For the significance criterion, the analysis must (in the order presented):

1) Address the project's direct and indirect physical changes to the existing baseline conditions. Describe the intensity (e.g., number of construction trips), location (e.g., driveway, particular streets), duration, and other construction features (e.g., anticipated staging areas, sidewalk closures and detours, travel lane closures) that may be relevant to address the significance criterion. Be specific (e.g., the project would generate an average of between 10 – 20 construction truck trips traveling to the site daily), do not generalize (e.g., the project would generate a modest number of truck trips). The impact analysis shall assume the project will comply with laws and regulations, including the public works code and the blue book. The analysis shall describe how compliance would occur, what it would entail, and how it may reduce impacts. Note: most projects will rely on screening criteria. Refer to construction memorandum for examples of circumstances that could lead to significant impacts.

2) Identify an impact finding without mitigation: no impact, less-than-significant impact, or a significant impact. Ensure that step 1 substantiates the rationale for that impact finding with substantial evidence.
    - 2.A) If the project would result in no impact or a less-than-significant impact, the impact analysis is complete.
    - 2.B) If the project would result in a significant impact, if applicable, introduce the title of a mitigation measure in paragraph form to reduce the impact. The title should briefly convey what the measure involves. Briefly describe the nexus and rough proportionality to the extent applicable between the mitigation measure and the impact. Briefly describe how the mitigation measure would reduce the impact and briefly analyze separately whether the mitigation measure itself would have any environmental impacts of its own.

3) If the impact requires mitigation, begin the text of the mitigation measure with its title. Measure text should clearly explain who is responsible for what, where, and when. Mitigation measure text should attempt to reduce the impact below the threshold of significance. If the mitigation measure does not reduce the impact below the threshold of significance, but it still reduces the impact, explain qualitatively how the impact is reduced, and why it is not reduced below the threshold of significance.

4) If the project would result in a significant impact, identify the conclusion impact finding: less than significant with mitigation, significant and unavoidable, or significant and unavoidable with mitigation.

Operation

Potentially Hazardous Conditions

For the significance criterion, the analysis must (in the order presented):

1) Address the project's direct and indirect physical changes to the existing baseline conditions. Describe the intensity (e.g., number of vehicle trips), location (e.g., driveway, particular streets), and other project features that may be relevant to address the significance criterion. Be specific (e.g., the project would generate 120 vehicle trips into the driveway during the p.m. peak hour), do not generalize (e.g., the project would generate a modest number of vehicle trips). The impact analysis shall assume the project will comply with laws and regulations. The analysis shall describe how compliance would occur, what it would entail, and how it may reduce impacts. Refer to walking/accessibility, bicycling, driving hazards, and public transit memoranda for examples of circumstances that could lead to significant impacts.

Repeat steps 2 through 4 described under construction.

Accessibility

For the significance criterion, the analysis must (in the order presented), conduct step 1 under potentially hazardous conditions and steps 2 through 4 under construction. Refer to walking/accessibility, bicycling, and emergency access memoranda for examples of circumstances that could lead to significant impacts.

Public Transit Delay

For the significance criterion, the analysis must (in the order presented):

1) Address the project's direct and indirect physical changes to the existing baseline conditions. Describe the intensity (e.g., number of vehicle trips), location (e.g., driveway, particular streets), and other project features that may be relevant to address the significance criterion. Be specific (e.g., the project would generate 120 vehicle trips into the driveway during the p.m. peak hour which is adjacent to the [transit route(s) name] during the p.m. peak hour), do not generalize (e.g., the project would generate a modest number of vehicle trips that would cross the [transit route(s) name]). The impact analysis shall assume the project will comply with laws and regulations. The analysis shall describe how compliance would occur, what it would entail, and how it may reduce impacts. Note: most projects will rely on screening criteria. Refer above for thresholds of significance and to public transit memorandum for examples of circumstances that could lead to significant impacts.

Repeat steps 2 through 4 under construction.

VMT/Induced Automobile Travel

VMT Assessment

For the significance criterion, the analysis must (in the order presented):

1) Address the project's direct and indirect physical changes to the existing baseline conditions. Describe the intensity (e.g., VMT per capita) and other project features that may be relevant to address the significance criterion. Be specific (e.g., based on the project's location, the department estimates the project would result in an average daily 7.0 VMT per capita), do not generalize (e.g., the project would result in a modest level of VMT per capita). The impact analysis shall assume the project will comply with laws and regulations. The analysis shall describe how compliance would occur, what it would entail, and how it may reduce impacts. Note: most projects will rely on screening criteria. Refer above for thresholds of significance and to VMT/induced automobile travel memorandum for examples of circumstances that could lead to significant impacts.

Repeat steps 2 through 4 described under construction.

Induced Automobile Travel Assessment

For the significance criterion, the analysis must (in the order presented):

1) Address the project's direct and indirect physical changes to the existing baseline conditions. Describe the project features (e.g., active transportation or minor transportation project) that may be relevant to address the significance criterion. Be specific (e.g., the project results in two new curb-cuts and one bulb-out), do not generalize (e.g., the project would result in some minor transportation changes). The impact analysis shall assume the project will comply with laws and regulations. The analysis shall describe how compliance would occur, what it would entail, and how it may reduce impacts. Note: most projects will rely on screening criteria. Refer above for thresholds of significance to VMT/induced automobile travel memorandum for examples of circumstances that could lead to significant impacts.

Repeat steps 2 through 4 described under construction.

Loading

For the significance criterion, the analysis must (in the order presented):

1) Address the project's direct and indirect physical changes to the existing baseline conditions. Describe the intensity (e.g., number of loading trips), location (e.g., driveway, particular streets), and other project features that may be relevant to address the significance criterion. Be specific (e.g., the project would generate four commercial loading trips into the off-street loading zone during the p.m. peak period), do not generalize (e.g., the project would generate a modest number of commercial loading trips). The impact analysis shall assume the project will comply with laws and regulations. [include as a footnote any correspondence with the SFMTA regarding their inclination to grant proposed on-street loading zones.] The analysis shall describe how compliance would occur, except to the extent existing observations indicate otherwise, what it would entail, and how it may reduce impacts. Refer to loading memorandum for more specific steps in conducting the analysis and examples of circumstances that could lead to significant impacts.

Repeat steps 2 through 4 under construction.

VII. CUMULATIVE

The cumulative subsection will present the applicable elements included in the methodology.

Methodology
This section describes the typical cumulative methodology required to address the significance criteria. If there are no other cumulative projects or information is not practically or reasonably available to conduct cumulative analysis regarding related impacts, then the methodology for cumulative analysis can state that. The section for cumulative only needs to expand upon the methodology section for existing and existing plus project to the extent the methodology differs. The department will determine the appropriate methodology as necessary to inform the analysis.

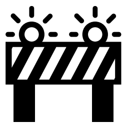
Geography
The geography for the cumulative impact analysis will typically be the same as that used for existing and existing plus project conditions, as described further below.

Period
The period for cumulative is typically the same as that used for existing and existing plus project conditions except projected out to a future year based upon reasonably foreseeable projects (see modeling below for more details). Future year estimates should typically be between 10 and 25 years. In some instances, the most overall travel may occur at different periods (a.m., midday, post p.m. peak, and/or weekend) as a result of a cumulative project (e.g., an event center), or the project may result in substantial disparity in travel demand at different periods. In these instances, and in consultation with the department, the methodology may substantiate the use of periods in addition to or the other peak periods described above.

Construction

Generally, the cumulative study area is limited to within the project block or along to network changes near the project site that could affect truck routing.

Operation

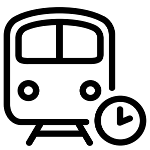


Potentially Hazardous Conditions

Generally, the cumulative study area is limited to within the project block or study area intersections to analyze combined network changes and projects vehicle trips effects.

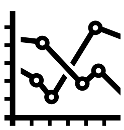
Accessibility

Generally, the cumulative study area is limited to within the project block to look at accessibility challenges or further if other projects propose re-routed transit or new major destinations.



Public Transit Delay

Generally, the cumulative study area is like the existing plus project study area, but the department may select streets and intersections along transit route(s) most impacted by cumulative projects to evaluate potential delays to public transit that may occur at additional locations along the transit route(s) than analyzed under existing plus project conditions.



VMT/Induced Automobile Travel

VMT by its nature is largely a cumulative impact. The number and distance of vehicular trips associated with past, present, and future projects might cause contribute to the secondary physical environmental impacts associated with VMT. It is likely that no single project by itself would be sufficient in size to prevent the region or state in meeting its VMT reduction goals. Instead, a project's individual VMT contributes to cumulative VMT impacts. Therefore, the study area for cumulative conditions, like existing plus project conditions, is regional.

Loading

Generally, the cumulative study area is limited to within convenient loading locations of the project site to analyze combined loading demand from projects or the removal of loading from future transportation projects.

Modeling

For future year VMT estimates, traffic volumes, and transit service and ridership, the methodology typically relies on projections of travel demand model outputs, such as the San Francisco County Transportation Authority San Francisco chained activity modeling process. Inputs to the model should typically include:

- infrastructure projects listed in the latest adopted region's Sustainable Communities Strategy
- infrastructure projects listed in San Francisco's Countywide Transportation Plan, Capital Plan, or a San Francisco agency's (e.g., SFMTA) Capital Improvement Program
- infrastructure, private development, or area plan projects actively undergoing environmental review, recently completed environmental review, or the department anticipates undertaking environmental review soon because they have received sufficient project definition
- land use growth based upon estimates of projections developed in preparation of the latest adopted region's Sustainable Communities Strategy

Adjustments

The methodology must adjust future year projections, street conditions, or volumes based on reasonably foreseeable projects, typically using a list-based approach (see above modeling for different bulleted lists), to the extent applicable. The methodology must document rationale for adjustments (e.g., travel demand outputs) and describe changed conditions, in consultation with the department. Appendix D, Table 1 lists examples of changes from cumulative projects that may result in adjustments.

A typical figure includes the transportation impact study area and study intersections and driveways, including future year adjusted counts.

Impact Analysis

This section ties the methodology and description of cumulative conditions together to address the significance criteria for cumulative conditions. The impact analysis section should present a format (text, figure, or table) consistent with earlier sections of the guidelines for easy comparison between existing and cumulative conditions, including the project's contribution to those cumulative conditions to the extent applicable.

Basics

No cumulative analysis is required for each significance criterion if the existing plus project impact analysis found no impact. However, if the analysis found less than significant impacts, then an analysis of cumulative impacts are required for each significance criterion. For each significance criterion for which the project has some level of impact, the analysis must (in the order presented):

1) Address whether the project in combination with the reasonably foreseeable projects (i.e., cumulative projects) results in a significant impact. The discussion shall reflect the severity of the impacts and their likelihood of occurrence, but the discussion need not provide as great detail as is provided for the existing plus project impact analysis. The discussion of cumulative impacts shall focus on the cumulative impact to which the identified other projects contribute rather than the attributes of other projects which do not contribute to the cumulative impact. The impact analysis shall assume the projects will comply with laws and regulations and the analysis shall describe how compliance would occur, what it would entail, and how it may reduce impacts.

2.) Identify an impact finding without mitigation for the cumulative projects: less-than-significant impact or a significant impact. Ensure that step 1 substantiates the rationale for that impact finding with substantial evidence. Cumulative impacts should use the same methodology as existing plus project conditions, which includes a combination of a quantitative and qualitative approach.

    2.A) If the cumulative projects would result in a less-than-significant cumulative impact, the impact analysis is complete.

    2.B) If the cumulative projects would result in a significant cumulative impact, identify whether the project's contribution is cumulatively considerable.

    2.C) If the project would not contribute considerably to the significant cumulative impact, the impact analysis is complete.

    2.D) If the project would contribute considerably to the significant cumulative impact, if applicable, introduce the title of a mitigation measure in paragraph form to reduce the impact, which may be a same mitigation measure as an existing plus project conditions mitigation measure. Briefly describe the nexus and rough proportionality to the extent applicable between the mitigation measure and the impact. Briefly describe how the mitigation measure would reduce the impact and briefly analyze separately whether the mitigation measure itself would have any environmental impacts of its own.

3) If the impact requires mitigation, begin the text of the mitigation measure with its title. Measure text should clearly explain who is responsible for what and where and when. Mitigation measure text should attempt to reduce the impact below the threshold of significance. The mitigation measure should also describe the project's fair share contribution.

4) If the project would contribute considerably to the significant cumulative impact, if applicable, identify the conclusion impact finding: less than significant with mitigation, significant and unavoidable, or significant and unavoidable with mitigation.

Construction and Operation Topics

Refer to topic memoranda for examples of circumstances that could lead to significant impacts. Generally, the same examples as provided in the topic memoranda for existing plus project conditions apply here, except for cumulative conditions.

VIII. OTHER

The guidance provided herein assumes a land use development project located outside of an area plan that requires a transportation impact study.

Land Use Development Project Located within an Area Plan

For projects that are consistent with an area plan for which an environmental impact report (EIR) was certified, pursuant to CEQA guidelines section 15183, the assessment must limit its analysis to such conditions specified in that section. The assessment must include a project description, discussion of existing baseline conditions (including infrastructure changes), and analysis of existing plus project and cumulative conditions. Typically, the assessment will use the significance criteria and approach identified above and identify if there are any mitigation or improvement measures applicable from the area plan environmental impact report that should apply to the project. The cumulative impact analysis shall limit assessment to new cumulative projects that were not known at the time of the environmental impact report certification and, if applicable, whether any new impacts would occur from those cumulative projects.

As of February 2019, the Planning Commission certified the following area plan EIRs (in order of certification): Rincon Hill Area Plan, Market & Octavia Neighborhood Plan, Visitation Valley Redevelopment Plan, Balboa Park Station Area Plan, Eastern Neighborhoods Rezoning and Area Plan (Mission, Showplace Square/Potrero, Central Waterfront, East SoMa), Treasure Island and Yerba Buena Island Redevelopment Plan, Glen Park Community Plan, Transit Center District Plan, Western SoMa Community Plan, and Central SoMa Plan.

Area Plans, Infrastructure, and Other Types of Projects

Refer to topic memoranda for the type of additional or different information that may be necessary to address impacts for area plans, infrastructure, or other types of projects.

Supplementary Guidance

In addition, the supplementary guidance memorandum provides guidance for situations that may occur during the development of a project's transportation analysis (e.g., trip credits, identification of mitigation measures, informational analysis).

TRANSPORTATION IMPACT ANALYSIS GUIDELINES

APPENDICES

TRANSPORTATION IMPACT ANALYSIS GUIDELINES

APPENDIX A
TRANSPORTATION REVIEW PROCESS

SEAL OF THE CITY AND COUNTY OF SAN FRANCISCO

San Francisco Planning

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Appendix A
Transportation Review Process Memorandum

Date:	February 14, 2019
To:	File: 2015-012094GEN
Prepared by:	Rachel Schuett
Reviewed by:	Wade Wietgrefe
RE:	**Transportation Impact Analysis Guidelines Update, Transportation Review Process Memo**

INTRODUCTION

This memorandum updates the prior guidance provided in the Transportation Impact Analysis Guidelines, and subsequent guidance issued by the department on the transportation review process. The department prepared this memorandum in consultation with stakeholders (e.g., city and county agencies, consultants). The department will issue memoranda that provide updates to other topics (e.g., transit, loading) within the guidelines. When the department issues a memorandum about a topic, it will supersede existing guidance regarding that topic.

This memorandum provides a basic overview of the transportation review process, and the inter-divisional and inter-agency consultation that may be required for transportation review. More specific information on the inter-divisional and inter-agency consultation is included the attachments attached to this memorandum. The department may update the appendices to this memorandum more frequently than the body of this memorandum.

BASICS

For California Environmental Quality Act (CEQA), the department's transportation review team's typical process[1] includes seven consecutive steps.[2] The following identifies those steps and important milestones, with additional information (including the transitions between steps) in text boxes.

Figure 1. Transportation Review Process provides an overview of these steps. Note that the timing for inter-divisional and inter-agency consultation is indicated in Figure 1 of the guidelines. Typically, consultation with the urban and street design advisory teams would occur during steps 1 and 2; consultation with SFMTA and other agencies would occur during steps 3 and 4, and 5, and 6 (if needed).

[1] The process herein may vary on a case-by-case basis, but the department is outlining the typical review for most projects.
[2] The department supplements the information herein with the Environmental Review Guidelines, 2012, or subsequent updates.

STEP 1: Preliminary Project Assessment

The transportation review process begins soon after the sponsor files a preliminary project assessment application. The assigned environmental planner working on the preliminary project assessment requests a transportation determination from the transportation team (the transportation study determination form is provided in Attachment D). The transportation determination identifies:

- The level of transportation review anticipated (see **Step 4: Report Preparation**, below)
- The need for a consultant
- The associated fees and instructions for payment

The transportation determination may also include:

- Key transportation issues (e.g., potentially significant effects)
- Identification of additional information the sponsor must submit with the project application
- Recommendations for coordination with other agencies

To assist with this, the department includes screening criteria for the following transportation topics: public transit delay, vehicle miles traveled/induced automobile travel, construction, and vehicular parking. If a project meets the screening criteria, then the project would not require any detailed analysis in that topic.

The transportation team will coordinate with other internal and external city staff, if applicable, on comments on the preliminary project assessment. The department includes this information, as applicable, in the preliminary project assessment letter.

- ***MILESTONE: The department issues Preliminary Project Assessment Letter***

Once the department issues the preliminary project assessment letter, the sponsor may file a project application. If applicable though, prior to filing an application, the sponsor contacts the department for a list of consultants and selects a consultant. At this point, the case moves to **Step 2: Project Initiation and Scoping.**

STEP 2: Project Initiation and Scoping

Included with the project application, the project sponsor provides additional information, pays the required fees, and submits the consultant draft scope of work, if applicable.

- ***MILESTONE: Project Application Accepted***

Once the department accepts the application, the department assigns an environmental planner. The project may change in response to the preliminary project assessment letter, City feedback at the street design or urban design advisory teams, or for other reasons. Therefore, the environmental planner requests a second transportation determination. The transportation team confirms or changes the prior transportation study determination. If the transportation team determines that the project requires a transportation study, the department will assign a transportation planner (see Step 4 below for different levels of transportation review).

As part of Step 2, the environmental planner will coordinate with other internal and external city staff, if applicable, on project-related comments. The department will include those comments, along with confirmation/changes to the transportation study determination, in the first plan check letter. The sponsor will submit to the department a response to the first plan check letter.

During the plan check letter process, the transportation planner reviews the first draft of the scope of work. Following this initial review, the transportation planner holds a meeting with the team to discuss the scope. The transportation planner may hold this meeting at the project site or at the planning department. Following the meeting/site visit, the transportation planner provides the consultant with comments. The consultant updates, and the transportation planner reviews and provides comments, until the transportation planner accepts the scope of work as final. The consultant also provides a review schedule.

If the department does not require a consultant, the transportation planner meets with the team to discuss the scope of the review.

- ***MILESTONE: Stable Project Description/Complete Response to First Plan Check Letter***
- ***MILESTONE: Scope of Work Finalized***

STEP 3: Analysis

The consultant collects data, takes observations, and conducts the project analysis. Prior to the consultant submitting a first major deliverable, the consultant meets with the team to discuss initial findings and schedule. The consultant may submit initial findings in spreadsheets or tables, etc. or include an interim travel demand memo, or another interim deliverable(s).

If the department does not require a consultant, the environmental planning transportation planner collects data from the project sponsor, or another source, calculates the travel demand, and shares the initial findings with the team.

- ***MILESTONE: Analysis Results Confirmed***

STEP 4: Report Preparation

The consultant or the department prepares a draft transportation report. The transportation report may be for site circulation review or a transportation study.[3]

Projects that require site circulation review typically require analysis of a limited, localized analysis of a few transportation topics. A consultant or a department transportation planner may prepare the site circulation review. For consultant-prepared reviews, the consultant prepares and the transportation planner reviews three drafts (draft 1, draft 2, and screencheck), until the transportation planner determines the review is final. For department-prepared reviews, the department transportation planner prepares a first draft, checks in with the team, and then updates and finalizes the memo.

[3] The department sometimes requires a school circulation memo and pick-up/drop-off plan for a proposed daycare or school use. When required, the project sponsor should submit the draft consultant-prepared report with the application. The department will assign a transportation planner to review the report.

Projects that require a transportation study typically require analysis of several transportation topics within a geographic area that extends beyond the project block. These projects may also be complex because they are multi-phased, require a large infrastructure investment, or are of statewide, regional, or area-wide significance as defined in CEQA, or the analysis may include both programmatic and project-level review. For a transportation study, the consultant prepares and the transportation planner reviews three drafts (draft 1, draft 2, and screencheck), until the transportation planner determines the study is final.[4]

- ***MILESTONE: Transportation Report Finalized***

STEP 5: Additional Transportation Review Tasks

The department may require additional transportation review tasks. The transportation planner and a consultant may perform these tasks. These tasks include preparation and/or review of an alternatives analysis memo, or responses to comments document (for a mitigated negative declaration (MND) or environmental impact report (EIR)), and/or an appeal of a preliminary MND (see also Step 6, below).

Environmental review is complete when the department issues a categorical exemption or the planning commission's adopts a MND, or certifies an EIR.

- ***MILESTONE: Environmental Review Complete/Project Approved***

STEP 6: Appeal (if required)

In some cases, an appellant may file an appeal of an environmental review document. If the department prepares a categorical exemption, community plan evaluation, or EIR, the San Francisco Board of Supervisors would hear the appeal, after the planning commission approves the project.

If the department prepares a mitigated negative declaration, the appellant can appeal the preliminary mitigated negative declaration to the planning commission during the public review period. If the planning commission affirms the preliminary mitigated negative declaration, the department prepares a final mitigated negative declaration. Once the planning commission approves the project, the appellant may appeal the final mitigated negative declaration to the Board of Supervisors.

If the appellant raises questions related to the transportation impact analysis, the transportation planner and the consultant may:

- Assist in preparing the appeal response (this may include additional transportation analysis, research and/or coordination with other agencies or individuals);
- Participate in pre-hearing briefings; and/or
- Attend and/or testify at a public hearing(s).

[4] For EIRs, the department may choose to not require a standalone transportation study and require the consultant to prepare the transportation section of the EIR, with technical appendices.

Once the planning commission approves a project, the department may require additional transportation review tasks. The department may require these tasks if a project involves changes to the public right-of-way or temporary street closures, or requires review and approval by SFMTA, Public Works and/or the Board of Supervisors. Typically, the department's transportation review team is not involved in these tasks; thus, these tasks are beyond the scope of the process described herein.

CONSULTATION

The transportation planner will frequently consult with other divisions within the department and with other agencies. Internally, the transportation planner may consult with the urban design advisory team, and the street design advisory team. Attachment A: Consultation with the Street Design Advisory Team/Urban Design Advisory Team provides triggers and timing for consultation with these teams.

The planning department may request that the San Francisco Municipal Transportation Agency (SFMTA) provide comments during the scoping and transportation review stages (Steps 2 and 4). Attachment B: SFMTA Consultation provides triggers and timing for consultation with SFMTA.

In addition, the transportation planner may coordinate with other agencies that operate transportation-related services and/or facilities. Attachment C: Other Agency Consultation includes triggers for and timing consultation with these other agencies**.**

ATTACHMENT A

Consultation with the Street Design Advisory Team/Urban Design Advisory Team

Internally, the environmental planning transportation planner may consult with the urban design advisory team, and the street design advisory team. Feedback received from these teams may result in changes to the project's design or description.

The **urban design advisory team** is an internal planning department staff team that reviews new construction based on the Urban Design Guidelines and other relevant design guidelines, the planning code, and the policies in the General Plan. The scope of urban design advisory team review includes massing, scale, articulation, materials, composition of open space, the relationship of the new building to existing buildings and the street pattern, and location of building functions especially as they relate to the public realm and aesthetics. The urban design advisory team is comprised of staff planners with expertise in architecture, landscape architecture, historic preservation, and urban design.

Planning department staff leads **street design advisory team** meetings. The street design advisory team is a multi-agency team that reviews proposed changes to the public right-of-way as part of land use development projects. Staff from the SFMTA, San Francisco Public Works, and the San Francisco Public Utilities Commission (city public utilities commission)[1,2] are also members of the street team. The street team also hosts a monthly meeting with the San Francisco Fire Department (fire department). The street team typically reviews developments that trigger the requirements of planning code section 138.1(C)(2), propose to meet privately owned public open space requirements by including open space in the public right of way, modify curb lines, or may result in transportation safety concerns. The street team's primary role is to address a development's design as it relates to the public right-of-way (e.g., curb extensions, curb cut locations and dimensions). The street team also plays an important role in resolving issues that arise through streetscape entitlements and permit processes that take place post-planning commission entitlements.

A development may require street team review regardless of whether a California Environmental Quality Act transportation study is required. The street team review typically occurs during two phases of development review: 1) during the preliminary project assessment phase; and 2) shortly after the filing of a project application. During the latter phase, more than one street team meeting concerning a specific project may be necessary. The street team provides a letter to the sponsor regarding the aforementioned technical aspects.

The urban design advisory team provides feedback on the relationship of a land use development project to the public right of way, and on changes to the public right of way. As a result, it is important to be sure that that the feedback from both teams is consistent. In particular, basic information such as the primary and secondary ingress/egress points for a project should be identified.

Timing: The timing for consultation with the street design advisory team/urban design advisory team is summarized in Figure 1 of the guidelines.

[1] The Bureau of Urban Forestry has also attended some meetings, but are not currently regular attendees at street design advisory team meetings.

[2] Street design advisory team meetings may serve as the initial point of coordination with multiple agencies.

ATTACHMENT B

San Francisco Municipal Transportation Agency (SFMTA) Consultation

The transportation planner may consult with SFMTA staff during the transportation review process. In general, the transportation planner will consult with SFMTA when a project could affect SFMTA's services or facilities, or would require SFMTA approval. A brief overview of the circumstances that trigger consultation with SFTMA, and the timing for that consultation follow.

The following identifies the triggers for developments that warrant SFMTA staff consultation or review during the California Environmental Quality Act (CEQA) transportation review process:

- Development is proposing streetscape changes beyond publicly accessible rights-of-way fronting the property (i.e., those beyond typical project requirements of planning code section 138.1(C)(2)). Examples include:
  - A new street;
  - Traffic control device changes (e.g., stop signs, signals, etc.);
  - Roadway dimension changes or restriping (e.g., lane removal or addition, lane width reduction or expansion, addition of bicycle facility, one-way to two-way, etc.);
  - Mid-block crossings for people walking;
- Development is proposed along a street with a future (i.e., under construction or reasonably foreseeable) streetscape or other project that includes curb extensions, bicycle facilities, or transit service or facilities;
- Development proposes changes to the location or physical features of a public transit zone;
- Development proposes changes to public transit service;
- Development proposes to operate shuttle bus service;
- Development proposes changes to the length, location, and hour restrictions to color curb designations or metered parking;
- Development is proposing greater than 150 vehicular parking spaces for accessory uses or more than 50 vehicle parking spaces for non-accessory uses (i.e., private or public parking garage/lot);
- Development is proposing an event center or regional-serving entertainment venue; or,
- If, the development does not meet any of the above triggers and during scoping or transportation analysis, department staff, potentially with input from SFMTA staff (e.g., street design advisory team), determines the development could require mitigation measures or alternatives to address a potentially significant transportation impact.

If the development triggers one or more items, the transportation planner will consult with SFMTA staff.

Timing: The transportation planner will typically consult with SFMTA, as part of the scoping process, or during the analysis, or report preparation phases (Steps 2 – 4). Consultation may also occur as part of Steps 5 and 6, if needed.

ATTACHMENT C

Other Agency Consultation

The transportation planner will consult with other agencies on a case-by-case basis, but answering “yes” to one or more of the following questions should serve as the initial reason for consultation:

1- Is the project site within or adjacent to an area within an agency’s jurisdiction?

2- Does the agency own or operate an existing, planned, or proposed facility within the project site or study area?

3- Would the project create new trips that could significantly impact an agency’s services (i.e. creating additional ridership) or facilities?

The transportation planner may consult with the local, regional, and state agencies listed below. The following includes further information regarding specific triggers for each agency.

City and County of San Francisco

- **San Francisco Municipal Transportation Agency (SFMTA)**. See Attachment B SFMTA Coordination.
- **San Francisco Public Works (public works).** The project involves changes to the public right of way. Public Works coordination may be initiated through the street design advisory team (see Attachment A).
- **Port of San Francisco (Port).** The project site is on or adjacent to a Port property.
- **Office of Community Investment and Infrastructure (OCII).** The project site is within or adjacent to a property within OCII jurisdiction.
- **Office of Economic and Workforce Development (OEWD).** The project includes a development agreement and that development agreement includes transportation-related topics.
- **San Francisco Fire Department (fire department).** The project site is within one block of an existing fire station, includes a new fire station, or would result in a change in vehicular access on a public right of way that could affect access to a fire station.
- **San Francisco Police Department (police department).** The project site is within one block of an existing police station, includes a new police station, or would result in a change in vehicular access on a public right of way that could affect access to a police station.

Regional and State Agencies

The department typically consults with regional and state agencies for "projects of statewide, regional or areawide significance" as defined in Section 15206(b) of the California Environmental Quality Act (CEQA) Guidelines.[1] The transportation planner should also consult with regional and state agencies that provide transit services when a project would include or result in changes to routes or facilities, for example:

- **Bay Area Rapid Transit (BART):** changes to a BART station, access to a BART station, or construction within a BART easement or Zone of Influence.[2]
- **Alameda County Transit (AC Transit):** changes to an AC Transit stop or route.
- **Ferries:** changes to a ferry landing, or access to a ferry landing.
- **Golden Gate Bridge Highway and Transportation District (Golden Gate Transit):** changes to a GGT stop or route.
- **Caltrain[3]:** changes to a Caltrain station, or access to a Caltrain station.
- **San Mateo County Transit District (SamTrans)[4]:** changes to a SamTrans stop or route.
- **California High Speed Rail ("high speed rail"):** changes to the transportation network that could affect the proposed high speed rail alignment.
- **Transbay Joint Powers Authority ("joint powers authority"):** changes to the transportation network that could affect the Transbay Transit Center.

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[1] For projects within the jurisdiction boundaries of the City and County of San Francisco, projects of statewide, regional or areawide significance are typically general plan or general plan elements that require preparation of an environmental impact report (see CEQA Guidelines section 15206(b)(1)) or large land use development projects, as defined in CEQA Guidelines section 15206(b)(2).

[2] The BART Zone of Influence (ZOI) includes privately held parcels typically located over or adjacent to BART's subway structures.

[3] Caltrain is operated by the Peninsula Corridor Joint Powers Board.

[4] SamTrans is operated by the San Mateo County Transit District

The primary **California Department of Transportation (Caltrans)** facilities within San Francisco include United States Highway 101 (U.S. 101), Interstate (I-280), Interstate 80 (I-80), California State Route 1 (SR 1), associated highway and freeway on-and-off ramps and Caltrans maintenance facilities.

Caltrans reviews CEQA projects on a case-by-case basis taking into consideration the distance from the project site to the state transportation network (STN), the current facility type, the proposed use, and the overall impact that might occur based on the number of trips that would be added to the transportation network, and/or any particular characteristics or elements of the project that may affect Caltrans facilities.

At a minimum, the transportation planner should consult with Caltrans under any of the following circumstances:

- A Caltrans intersection/ramp junction is within the study area for consideration of potentially hazardous conditions for traffic, transit, bicycles, or pedestrians and/or an intersection/ramp junction to a Caltrans facility is included as a study intersection.[5]
- The department proposes measures that may involve/affect Caltrans intersections/ramp junction (e.g. additional lane, traffic controls, signalization, advanced traffic management systems/ITS).
- The department proposes measures to address construction traffic that involve/affect Caltrans jurisdiction (e.g. lane closures).

Lastly, the **San Francisco County Transportation Authority** may assist in travel demand modeling efforts or technical assistance on reviews such as vehicle miles traveled.

Timing: The transportation planner will typically consult with other agencies as part of the scoping process, or during the analysis, or report preparation phases (Steps 2 – 4). Consultation may also occur as part of Steps 5 and 6, if needed.

[5] For the location of Caltrans facilities, please refer to: http://www.dot.ca.gov/dist4/cpra/.

ATTACHMENT D

Transportation Study Determination Request Form

SAN FRANCISCO
PLANNING DEPARTMENT

MEMO

DATE: **2/14/2019**

TO: **Colin Clarke, Jenny Delumo, Dan Wu &Transportation Staff**

FROM: **[Staff Name]**

RE: **Transportation Study Determination Request**
Case No. [Record Number], [Application Name]
Neighborhood: [Neighborhood Name]
Zoning: [Zoning] ([Zoning Name])
Area Plan: [Plan Area Name]

Attached is information regarding the above project for which a determination of whether a transportation study is/or may be required. Please note that the TS Team reviews these determinations every Wednesday between 12:30 – 1:30 PM in Room 404. You are welcome to attend if you have any specific questions about your submitted project.

Helpful Links:
SF Transportation Information Map (TIM) - www.sftransportationmap.org
SF Travel Demand - http://test-sftia2.surge.sh/
Caltrans Interactive Highway Map –
https://caltrans.maps.arcgis.com/apps/webappviewer/index.html?id=04efb9a9f14c4da2aabd9ce36b7dda48
Development Pipeline Map - http://developmentmap.sfplanning.org/

PPA/ENV Case Planner Section:
To facilitate this determination, **please mark the appropriate boxes below** and save the requested information into M-Files (PPA or ENV record number for project). Save the plans, application, and trip generation table as applicable using the naming convention: [Name/Address of Project]_[Document Name or Type]_[Version Number or Draft]. For example, 349 8th Street_Plans_20190118.

Submit the Transportation Study Determination request form in the box near Dan's cube. **Your input is only required for the first few pages**:

☐ PPA or ENV Application. Please save in M-Files.

☐ Project plans & project description. Please include the project plans in M-Files. Please include the project description in the section below. (Page 5)

☐ Would the project include land uses such as Recreational facilities, Concert Venues, Schools or large land use projects such as Pier 70, Seawall Lots etc.? (Trip Generation Table *is not required* for a TS Determination Request)

☐ Would the project potentially add ≤50 dwelling units or ≤5,000 square feet of non-residential uses or ≤20 parking spaces? (SF Travel Demand data results table *is not required* for a TS Request)

☐ Would the project potentially add >50 and<300 dwelling units or >5,000 square feet and and<100,000 square feet of non-residential uses or >20 and<50 parking spaces? (SF Travel Demand data results table[8] *is required* for a TS Request. Please include this information in M-Files)

☐ Would the project potentially add ≥300 dwelling units or ≥100,000 square feet of non-residential uses or ≥50 parking spaces? (SF Travel Demand data results table *is required* for a TS Request. Please include this information in M-Files)

☐ Would the project make alterations to Muni/Other Regional Transit Agencies/DPW right of way such as moving/adding/removing bus stops, proposing new colored curbs, removing existing colored curbs, proposing uses on city right of way such as reducing sidewalk widths, removing or adding travel lanes including turn pockets, removing parking lanes, adding new streets, adding or removing traffic signals etc.?

☐ Would the project fall within 300 feet of a Caltrans right-of-way or is adjacent to a regional transit stop. (Please review the Interactive Highway Map (link above) and the "Transit Tab" in TIM to look up this information. Please note that all highway ramps leading to these facilities are also within Caltrans purview.)

☐ Would the project front a high-injury corridor where pedestrian, bicycle, or vehicular injuries or fatalities occurred? (Please go to the "Safety Tab" in TIM to look up this information.)

☐ For PPA/ENV Cases, check if the project is over the amount of parking permitted:
  - ☐ by right or
  - ☐ with a CUA as per the Planning Code.

☐ Would the project meet the VMT and parking map-based screening criteria by checking the "Vehicles plus Parking Tab" on TIM to ensure that it is located in an area that exhibits Regional Average VMT minus 15% based on the proposed use?

☐ Would the project meet any of the additional screening criteria for VMT?
  - ☐ Does the proposed project qualify as a "small project"? or
  - ☐ Is the proposed project in proximity to a transit station? (must meet all four sub-criteria)
    - Located within a half mile of an existing major transit stop; and
    - Would have a floor area ratio greater than or equal to 0.75; and
    - Would result in an amount of parking that is less than or equal to that required by the planning code without a conditional use authorization; and
    - Is consistent with the Sustainable Communities Strategy?

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[8] If your project is proposing a unique land use for which trip generation rates are not included in the *SF Guidelines* please consult with transportation staff, or note specific transportation issues related to project. I:\MEA\Transportation\Transportation Study Determinations\Trip Generation Tables.

☐ Does the project contain transportation elements?

- ☐ Does the project qualify as an "active transportation, rightsizing (aka Road Diet) and Transit Project"? or
- ☐ Does the proposed project qualify as an "other minor transportation project"?

☐ Would the project result in 300 inbound project vehicle trips during the peak hour?

☐ Would the project meet the transportation-related construction screening criteria?

Project Site Context

- ☐ The amount of excavation is less than two levels below ground surface; and/or
- ☐ The amount of demolition would result in less than 20,000 cu yards of material removed from the site.

Notes: ____

Construction Duration and Magnitude

- ☐ Construction is anticipated to be completed in 30 months or less.
- ☐ Construction of a project is not multi-phased (e.g., construction and operation of multiple buildings planned over a long time period)

Notes: ____

SDAT Triggers

Check the appropriate box if the project involves any of the following:

Better Streets Plan Required (Planning Code 138.1);

☐ On a lot greater than ½ acre; or
☐ Contains 150 feet of frontage on public ROW; or
☐ Encompasses full block

AND

☐ Includes more than 50,000 gross square feet of new construction; or
☐ New construction of 10 or more dwelling units; or
☐ New construction of 10,000 gross square feet or greater of non-residential space; or
☐ Addition of 20% or more of GFA to an existing building; or
☐ Change of use of 10,000 gross square feet of greater of a PDR use to non-PDR use

☐ Other: (e.g., curb line modification, shared street, etc.)

UDAT Triggers

Check the appropriate box if the project involves any of the following:

☐ Development proposes new porte cochere or other type of off-street sidewalk level vehicular driveway, typically used for passenger loading/unloading, between the building and the public right-of-way;

☐ Development is seeking an exception for off-street loading (freight, service, or tour bus) requirements;

☐ Development is seeking a conditional use for additional vehicular parking;

☐ Development is proposing vehicular parking for non-accessory uses (i.e., private or public parking garage/lot);

☐ Development is proposing greater than 50 vehicular parking spaces for residential and office uses or greater than 10 vehicular parking spaces for retail uses;

☐ Development is proposing to retain or alter an existing curb cut, but with increased vehicular activity (i.e., greater than 50 vehicular parking spaces for residential and office uses or greater than 10 vehicular parking spaces for retail uses);

☐ Development triggers large project requirements of Planning Code section 138.1 (Better Streets Plan);

☐ Development is proposing a new curb cut within 15 feet of another curb cut, greater than 15 feet in width for dual-lane vehicular parking garages, greater than 24 feet in width for dual-lane large truck loading bays, a combined vehicular parking/loading of 27 feet, or greater than 30 feet of cumulative curb cuts (e.g., multiple driveways); and

☐ Development is proposing a new curb cut along a street identified within Planning Code section 155(r)(1)(2)(3)(4)(5).

SFMTA Consultation Triggers

☐ Proposed changes to color curb designations
☐ Proposed changes to transit stops
☐ Proposed streetscape changes
☐ Other: ____

Project Description & Transportation-Related Notes:

Note: Development projects sometimes propose modifications to project descriptions. If there is a substantial change in the project description after a TS Determination has been made, please consult with transportation staff during transportation office hours (Wade's Office or Room 405, Thursday from 2:00 PM to 3:00 PM) Substantial changes will require a resubmitted TS Determination.

TS Determination Team Section:

Please indicate the determination of whether a transportation study is required below. Thank you for your assistance.

PPA Case (check all that are applicable):

☐ *TS/Consultant-prepared Transportation Study/Section is not likely required*
☐ *TS/Consultant-prepared Transportation Study/Section is likely required (See Scope of Work Checklist)*
☐ *School Circulation Memo is likely required (See Scope of Work Checklist)*
☐ *SFMTA review is required*
☐ *Transportation Planner coordination is likely required (See Scope of Work Checklist)*

Reason for TS determination:

ENV Case (check all that are applicable):

☐ *TS/Consultant-prepared Transportation Study/Section is not required*
☐ *TS/Consultant-prepared Transportation Study/ Section is required (See Scope of Work Checklist)*
☐ *School Circulation Memo is required (See Scope of Work Checklist)*
☐ *SFMTA review is required*
☐ *Transportation Planner coordination is required (See Scope of Work Checklist)*

Reason for TS determination:

PPA/ENV Case Planner - Please review all our comments in the next two pages.

Determined by: ______________________________ Date: __________

Comments to Sponsor Regarding the CEQA Transportation Review (check all that are applicable):

☐ *The Department has determined that this is a complex project. Complex projects are multi-phased, require a large infrastructure investment, include both programmatic and project-level environmental review, or statewide, regional, or areawide significance as defined in CEQA. A list of three consultants will be provided.*

☐ *The Department has determined that this is a regular project or a project that requires site circulation. Site circulation or regular projects are projects that require analysis of one or more transportation topics within a geographic area that may include the project block or extend beyond the project block. Project sponsors may select any consultant from the pool for regular projects.*

☐ *Please submit the Transportation Study Fee $26,330 payable to the San Francisco Planning Department ("Transportation Review or Study" fee), and address the payment to Rhia Bordon.*

☐ *Please submit the Site Circulation Review Fee $9,560 payable to the San Francisco Planning Department ("Transportation Review or Study" fee), and address the payment to Rhia Bordon.*

☐ *Please submit the SFMTA $14,800 complex transportation review fee payable to the SFMTA.*

☐ *Please submit the SFMTA $2,950 site circulation transportation review fee payable to the SFMTA.*

☐ *Please submit the SFMTA $960 Development Project Review fee transportation fee payable to the SFMTA.*

The contact person at SFMTA who will be responsible to receive these fees will be:

David Kim
San Francisco Municipal Transportation Agency (SFMTA)
Finance & Administration Division
One South Van Ness Avenue, 8th Floor
San Francisco, CA 94103
Phone: (415) 646-2192 or David.Kim@sfmta.com

Additional Comments to Sponsor:

Comments to Staff (check all that are applicable):

☐ *ENV Case/ EP Transportation Planner should conduct a site visit to identify any pedestrian/ cyclist/transit/ vehicles safety issues*
☐ *ENV/PPA Case or EP Transportation Planner should bring this project to SDAT*
☐ *ENV/PPA Case or EP Transportation Planner should bring this project to UDAT*

☐ *ENV Case Planner/ EP Transportation Planner should coordinate with Caltrans on:*

☐ *ENV Case Planner/ EP Transportation Planner should attend Color Curb Office hours:*

☐ *ENV Case Planner/ EP Transportation Planner should coordinate with Other Transit Agencies on:*

Additional Comments to Staff:

TRANSPORTATION IMPACT ANALYSIS GUIDELINES

APPENDIX B
UPDATE PROCESS & STYLE GUIDE

SEAL OF THE CITY AND COUNTY OF SAN FRANCISCO

San Francisco Planning

SAN FRANCISCO
PLANNING DEPARTMENT

MEMO

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Appendix B
Update Process and Style Guide Memorandum

Date:	February 14, 2019
To:	Record No. 2015-012094GEN
Prepared by:	Colin B. Clarke
Reviewed by:	Wade Wietgrefe
RE:	**Transportation Impact Analysis Guidelines, Update Process and Style Guide**

INTRODUCTION

The department issued a series of memoranda that provide updates to topics (e.g., transit, loading) within the Transportation Impact Analysis Guidelines. The prior guidelines did not include the contents that are now included within this memorandum below and its attachment. The department will use this memo as a reference in the development for each of the aforementioned memoranda and for general use in transportation analysis. The department prepared this memorandum in consultation with stakeholders (e.g., city and county agencies).

Transportation analysis will evolve as transportation technologies, devices/modes, systems, services, networks, and legislation change. Therefore, the department may periodically update this memorandum to reflect those changes, as discussed below.

The organization of the memorandum is as follows: process for updates and precision. The attachment (Attachment A) is under separate cover and consists of commonly used acronyms, abbreviations, and definitions. The department may update the attachment to the memorandum more regularly than the body of the memorandum.

PROCESS FOR UPDATES

This section describes some of the reasons that may justify updates to the guidelines and main body of the topic memoranda and associated attachments. The department will not revise the guidance and topic memoranda if the reasons prompting an update are generally not applicable to several projects over a period of time.

Justification for Updates – Main Body

The department does not intend to update the guidelines and main body of the topic memoranda frequently. At a minimum, the department will assess the necessity of updates approximately every four years, following the periodic updates to the San Francisco County Transportation Plan, or following updates to the San Francisco General Plan, or Transportation Element of the San Francisco General Plan. The following list includes some of the reasons that would induce potential updates, if applicable:

- Published California Quality Act(CEQA) appellate or supreme court decisions
- Statutory changes to CEQA
- Regulatory changes to the CEQA Guidelines
- Legislative changes to San Francisco Administrative Code chapter 31

- Findings from the Planning Commission or Board of Supervisors in response to a CEQA appeal
- Resolutions adopted by the Planning Commission or Board of Supervisors
- New substantial evidence[1] regarding travel demand (e.g., demographics, economics, emerging mobility services and technologies, etc.)
- Major policy documents (e.g., if a policy document identifies goals for vehicle miles traveled) or code changes (e.g., if a code change eliminates the possibility of a significant effect for a significance criterion, that methodology or significance criterion may be removed or revised)
- Substantial changes to methodologies and review processes
- Other updates as determined by the department

In most instances, when the department updates the guidelines and main body of the topic memorandum, it will supersede the previous guidelines and topic memorandum. The department will use that new guidance for all transportation analyses, despite the status of the transportation analysis for any particular project (e.g., if the department has started, but not yet finalized a transportation analysis). However, instances may occur where the department already commenced analysis that is more conservative (e.g., more stringent in what the department considers an impact on the environment), but yet would not be misleading to the public and decision-makers, and therefore the department may consider the analysis complete and adequate. Example: if the department issues revised trip generation rates that result in lower, but not substantially lower, trip generation than prior analysis already commenced for a particular project, the department may consider not updating the already commenced analysis. Another example: if the department removes a significance criterion, the department may consider presenting the already commenced analysis for informational purposes only, at the department's discretion.

Justification for Updates – Attachments

The department may update the attachments of the memoranda more frequently than the main body or guidelines. At a minimum, the department will assess the necessity of updates approximately every two years. The following list includes some of the reasons that would induce potential updates, if applicable:

- The department identifies new mitigation or improvement measures
- The planning commission adopts an area plan and associated mitigation measures
- A department or consultant-prepared transportation study that includes a useful example of an impact and mitigation measure
- Updated terms and definitions as a result of code or policy changes or emerging technologies and services
- Updated data maintenance requirements
- Other updates as determined by the department

In most instances, when the department updates an attachment, it will supersede the previous attachment. The department generally uses the attachments as additional *resources* (e.g., sample projects, sample mitigation measures and improvement measures, sample design solutions), with the exception of acronyms, terms, and definitions contained herein, as opposed to *guidance*. Therefore, the department will generally not use updates to the attachments, as opposed to direction regarding the guidelines or main

[1] CEQA defines the term "substantial evidence", which the department will use, and the department will determine if something is "major "or "substantial" as it relates to other listed items.

body of the memoranda, for already commenced analysis (e.g., a consultant submitted draft 1 of a transportation analysis).

Precision

This section describes the level of precision that the department will use in the presentation of any transportation analysis in tables or text/narrative within a transportation study or section. The department may include more detailed level of precision, if necessary, in appendices of a transportation study or section (e.g., spreadsheet).[2] Level of precision will depend on the subject matter and flexibility is allowed where appropriate to illustrate any meaningful difference (e.g., more precision may be warranted if the total reported value is small). The following table is intended to provide guidance, not strict rules, and it includes a non-comprehensive list of metrics and the associated level of precision.

Table 1: Precision

Metric	Level of Precision, i.e., rounding
Project Description and Existing Baseline (i.e., actual observations)	
distance	actual distance via each transportation mode, not as the crow flies; less than 50, nearest foot; between 50 and 100, nearest 10 feet; between 100 and 1,000, nearest 50 feet; greater than 1,000, nearest 0.25 mile
linear feet for sidewalk and roadway width	nearest whole foot (text); nearest six inches (table, figure)
square feet	less than 100 square feet, nearest 10; between 100 and 1,000, nearest 50; between 1,000 and 10,000, nearest 100; … between 90,000 and 99,999, nearest 900; greater than or equal to 100,000, nearest 1,000
parking spaces (e.g., bicycle, loading, vehicle)	less than 100, nearest whole number; between 100 and 200, nearest five spaces; greater than 200, nearest 10 spaces
parking rate (e.g., neighborhood, per unit, per square footage)	nearest 5/100 (e.g., 0.15, 0.20, etc.)
counts (number of people walking, riding transit, bicycling, driving)	less than 100, nearest 10; between 100 and 199, nearest 20; …

[2] In other words, the appendices of a transportation study or section should present a greater level of precision (e.g., calculations in mathematical formulas) than the main body of a transportation study or section.

Metric	**Level of Precision, i.e., rounding**
	between 900 and 999, nearest 100; greater than or equal to 1,000, nearest 110;
counts (commercial and passenger loading spaces or trips, number of parking spaces)	nearest whole number
transit headway(s)	nearest half minute
utilization (e.g., transit, parking, etc.)	nearest whole percentage
injuries or fatalities	nearest whole number, rounding up
Modeling, Forecasting, and Projections (i.e., estimates)	
transit delay or speed	nearest second or 1/10 mile per hour
vehicle miles traveled per metric (e.g., household or land use (retail, office, etc.))	nearest 1/10 (e.g., 0.1., 0.2, etc.)
trip generation rate (estimate)	nearest 1/10 (e.g., 0.1., 0.2, etc.)
trip generation (number of people walking, riding transit, bicycling, driving)	less than 100, nearest 10; between 100 and 199, nearest 20; … between 900 and 999, nearest 100; greater or equal than 1,000, nearest 110
commercial and passenger loading demand, parking demand	round up to whole number
average number of persons in a vehicle (i.e., average vehicle occupancy)	nearest 1/10 (e.g., 0.1., 0.2, etc.)
ways people travel (i.e., mode split); common destinations (i.e., trip distribution)	less than 10%, nearest 1/10 (0.1%, 0.2%, etc.); greater than 10%, nearest whole percentage

ATTACHMENT A

Acronyms and Abbreviations & Terms and Definitions

Acronyms and Abbreviations

The department uses abbreviations and acronyms to enhance the readability of a document, not for the convenience of the writer. The department generally avoids technical and legal terms and replaces those terms with plain English whenever possible. The department avoids excessive use of abbreviations, acronyms, and technical terms as they make documents more challenging to understand.

The following includes a list of generally commonly used transportation-related acronyms and abbreviations not listed in the San Francisco Planning Department's Environmental Review Guidelines and Planning Style Guide. If the department did not list an acronym below or in those documents, the acronym most likely should not be used; however, a shortened name in replacement of the term may be used after the first use instead of an acronym.

FIGURE 1

Acronyms and Abbreviations

Acronym or Abbreviation	Meaning
ABAG	Association for Bay Area Governments
AC Transit	Alameda County Transit
ADA	Americans with Disabilities Act (Federal law)
BART	Bay Area Rapid Transit
Blue Book	San Francisco's Regulations for Working in San Francisco Streets – 8th Edition (or subsequent update)
BMPs	best management practice(s)
BRT	Bus Rapid Transit
Caltrain	Peninsula Corridor Joint Powers Board
Caltrans	California Department of Transportation
state public utilities commission	California Public Utilities Commission
DMV	California State Department of Motor Vehicles
Golden Gate Transit	Golden Gate Bridge Highway and Transportation District
mph	miles per hour
MTC	Metropolitan Transportation Commission (regional)
Muni	San Francisco Municipal Railway and transit system managed by the Municipal Transportation Agency (SFMTA)
Planning Code	San Francisco Planning Code
planning department	San Francisco Planning Department
public works	San Francisco Public Works
SamTrans	San Mateo County Transit District
street design team	Street Design Advisory Team, multi-agency
transportation authority	San Francisco County Transportation Authority
fire department	San Francisco Fire Department
SFgo	San Francisco County Transportation Authority's Congestion Management Program, and Advanced Technology/Information Systems Transit Signal Priority
SFMTA	San Francisco Municipal Transportation Agency
police department	San Francisco Police Department
city public utilities commission	San Francisco Public Utilities Commission
TDM	transportation demand management
joint powers authority	Transbay Joint Powers Authority
bay ferry	Water Emergency Transportation Authority in the San Francisco Bay

Terms and Definitions

The following includes a list of common terms and definitions. The list is separated into common and less common terms and definitions. Both lists are in alphabetical order. The department developed the definitions, in consultation with stakeholders and other agencies, for terms that are used in the guidelines and in transportation impact analysis documents, to allow for the use of consistent language (ideally across agencies, i.e., planning department, SFMTA, transportation authority, etc.), when developing a project description and impact analysis.

Common Terms and Definitions

assignment. Generally, refers to the process of estimating the location or assignment of project vehicle trips to different streets, on-street loading zones, and driveways, and project transit trips to specific transit routes.

bicycle parking, including Class 1 (secured, enclosed bicycle parking) and Class 2 (outdoor publicly accessible bicycle parking)**.** For definitions and requirements, refer to Planning Code sections 155.1 and 155.2, and Zoning Administrator Bulletin 9.

bicycle facility. Any facility that provides primarily for, and promotes, bicycling. Facility types may include protected (one-way, raised, two-way), bicycle lanes (conventional, buffered, contra-flow, left-side), or shared (e.g., sharrow or shared-lane marking). Refer to the California Highway Design Manual Chapter 1000 (e.g., class-I, II, III, IV), the (California; and Federal Highway Administration) Manual on Uniform Traffic Control Devices, and the National Association of City Transportation Officials for definitions.

bulb-in. Also known as cut-in. On-street loading bay.

bulb-out. Also known as curb extension. Location where the sidewalk edge is extended from the prevailing curb line into the roadway at sidewalk grade, effectively increasing space for people walking.

> **extended bulb-out.** Curb extension that continues significantly beyond the typical corner area, to allow space for landscaping or public use.
>
> **transit bulb-out.** Curb extension that includes a transit stop to allow transit vehicles to board without pulling in and out of traffic.

car-share service. Refer to Planning Code section 166 and Zoning Administrator Bulletin 6.

> **certified car-share organization.** Refer to Planning Code section 166.
>
> **off-street car-share parking space.** Refer to Planning Code section 166.
>
> **on-street shared-vehicle parking permit program space.** Also known as a vehicle pod(s) for qualified vehicle-sharing organizations.

car-share vehicle. Refer to Planning Code section 166. Refer to “vehicle” definition.

car-sharing. Refer to Planning Code sections 166 and 151.1.

color curb loading zone. A marked curb designation for specific types of on-street vehicular parking and on-street loading activities regulated by the SFMTA. When the "loading" term is used, it is often also referring to unloading (e.g., pick-up and drop-off). Refer to SF Transportation Code section 7.2 for curb parking regulated uses and durations under on-street parking.

- **blue curb zone.** A color curb marked in blue paint for one or more Americans with Disabilities Act-compliant vehicular parking spaces for persons with disabilities.
- **dual-use curb zone.** A color curb marked in white paint (but old ones are sometimes yellow) for both part-time commercial and part-time passenger loading.
- **green curb zone.** A color curb marked in green paint for short-term parking.
- **part-time loading curb zone.** A color curb marked in white paint if both part-time passenger loading and on-street vehicular parking; or a color curb marked in yellow paint if both part-time commercial loading and on-street vehicular parking.
- **red curb zone.** A color curb marked in red paint to prohibit parking and loading at specific locations such as fire hydrants, transit stops, or driveways to provide additional clearance to allow (driveway) access to off-street parking.
- **white curb zone.** A color curb marked in white paint for passenger loading. However, commercial loading is also allowed to occur.
  Refer to SF Transportation Code section 1006.
- **yellow curb zone.** A color curb marked in yellow paint for commercial loading.

commercial trips. Including goods movement through-trips, and freight and delivery service vehicle trips that often result in off-street or on-street loading or unloading activity.

- **delivery service.** Typically refers to pick-up trucks, light trucks, box trucks, moving trucks, or vans, etc. (e.g., SU-30, i.e., a wheel base between 22 and 30 feet). The larger end of the light truck vehicle type may occupy approximately 30-40 linear feet, which includes the space for loading/unloading, and maneuvering.
- **freight.** Refers to heavy trucks with wheelbases length of 40 feet or more, whose total length may approach 55 feet (e.g., WB-40). Freight trucks may occupy approximately 60 feet when parked.

common destinations. Also known as trip distribution. The number or ratio of total trips that the department estimates would occur between one place and another place (e.g., between a home and downtown), including the routes people may take between those places.

curb cut. Location where the sidewalk curb is depressed to the level of the roadway, either for a curb ramp, driveway, or other feature. Commonly, it is distinct from Americans with Disabilities Act-compliant curb ramps for accessibility.

driveway. Location where the sidewalk curb is depressed to the level of the roadway (with a curb cut), to provide vehicle access across a sidewalk to a parcel or to each use within a parcel. Refer to SF Transportation Code section 7.2 for parking in driveways, under on-street parking.

for-hire vehicle. Inclusive of “motor vehicle for hire,” “ride-hailing service,” and “taxi.”

motor vehicle for hire. Refer to SF Transportation Code section 1102.

ride-hailing service. Also known as ride-sourcing. Mobility service where a trip is requested typically using a phone, internet, or phone/computer application. A passenger(s) is matched with a driver, on-demand or pre-scheduled. Often referred to as “ride-sharing;” however, “ride-hailing” is used instead because the driver typically does not share a destination with the passenger(s). This service is distinguished from taxi service by the ride-hailing service’s inability to legally street hail; ride-hailing companies can only pick up pre-arranged rides. Regulated by the California Public Utilities Commission as a “transportation network company.”

taxi. Refer to SF Transportation Code section 1102.

hazard. For the purposes of the guidelines, “hazard” refers to a project-generated vehicle potentially colliding with (the applicable transportation topic, i.e., a person driving, or bicycling, or walking, or public transit operations) that could cause serious or fatal physical injury to the person driving, accounting for the aspects described below. Human error or non-compliance with laws, weather conditions, time-of-day, and other factors can affect whether a collision could occur. However, for purposes of CEQA, hazards refer to engineering aspects of a project (e.g., speed, turning movements, complex designs, substantial distance between street crossings, sightlines) that may cause a greater risk of collisions that result in serious or fatal physical injury than a typical project. This significance criterion focuses on hazards that could reasonably stem from the project itself, beyond collisions that may result from aforementioned non-engineering aspects or the transportation system as a whole.

headway. As it relates to transit, the scheduled time duration between public transit vehicles on the same route.

high-injury network. The City and County of San Francisco adopted Vision Zero as a policy in 2014, with the goal of zero traffic deaths for all ways people travel, including people in vehicles, walking, and bicycling. The network identifies streets in San Francisco where most severe and fatal injuries are concentrated. The network helps the City target traffic safety investments to reduce severe and fatal injuries to people walking, bicycling, and driving in those locations.

improvement measure. Recommended measure (different from mitigation measure) to reduce a less-than-significant impact further.

inbound. As it relates to transit. For Muni, indicates direction of travel generally in the direction of the downtown/Transbay Terminal or northern parts of San Francisco, and in the direction generally away from the southern and western parts of San Francisco.

loading. Passenger or commercial (freight or delivery service) loading, on-street or off-street. Refer to “color curb” and “for-hire vehicle” definitions.

major destination. Also known as “trip attractor.” A location that a substantial number of people would travel to such as a school, event center, recreational facility, tourist activity location, shopping district, high-density residential or office area, transit station, and airport.

mitigation measure. Refer to CEQA Guidelines section 15370.

mixed-flow travel lane. A lane allowed for legal use by the multiple ways people travel: transit (e.g., buses), people bicycling, people driving, and other vehicles. Also known as a traffic lane.

modify/modification. To change. This term or the term "change" must be used instead of improve/ments for descriptions of modifications to the public right-of-way. Refer to Public Works Code section 186.

outbound. As it relates to transit. For Muni, indicates direction of travel generally in the direction of the southern and western parts of San Francisco, and in the direction generally away from the downtown/Transbay Terminal parts of San Francisco.

parking (use "vehicular parking"). Generally refers to physical, vehicle parking, whether off-street parking or on-street parking, or on-site or off-site. Parking configuration types vary (e.g., parallel parking, reverse-in/back-in/head-out angled parking). Parking types include visitors, customers, employees, commuters, and residents; no-cost/free-of-charge, shared, leased, or rented; potential restrictions such as priority, preferential, or reserved parking; and time-limited (e.g., short-term, long-term). Parking generally does not refer to bicycle parking. Refer to SF Transportation Code section 7.2 for on-street parking regulated uses and durations.

parking, accessory. Refer to Transportation Demand Management Program Standards Glossary of Terms.

parking ratio. Also known as project parking rate, or neighborhood parking rate. The number of parking spaces to the number of dwelling units. The number of parking spaces to square feet per land use.

parking supply. The amount of vehicle parking provided within a geographic area (e.g., project site, 1,000-foot radius).

peak hour. The one-hour during the peak period with the greatest constraint on the transportation system. It can vary by the way people travel and location. For example, for transit, the peak hour in which delays to Muni are estimated to be the greatest.

peak period. The peak period (which typically contains the peak hour) with the greatest constraint on the transportation system. It is typically characterized by constrained capacity, throughput/flow, reduced speeds, and/or longer travel times. It can vary by the way people travel and location. For example, for transit, the period during which delays to Muni are estimated to be the greatest.

people bicycling. Any person(s) traveling on a bicycle for transport, recreation, exercise, or sport. Also known as cyclists, bicyclists, and bicycle traffic.

people driving. Also known as motorists and vehicle traffic. Includes people driving all types of vehicles in the roadway. Refer to "vehicle" definition.

people loading. Includes people participating in passenger loading (e.g., visitors and customers, employees, and residents) and commercial freight and delivery service loading activities.

people riding transit. People or passengers in transit vehicles operated by a public transit agency.

people walking. Primarily people walking in the public right-of-way, including people with physical disabilities that may or may not require personal assistive mobility devices. May also include other motorized or non-motorized users authorized on the sidewalk. May also refer to people participating in recreational or social activities. Refer to SF Transportation Code section 7.2 for non-motorized user-propelled vehicles (NUV), and California Vehicle Code Division 11, Chapter 5 for pedestrians.

person trip. A trip that a person takes, regardless of the way (mode) that a person travels, between one location and another location (e.g., between home and work, home and school, home and grocery store, work and grocery store, etc.).

place type. Geographic area that shares a similar mode share for vehicle use. The department identified three place types: urban high density, urban medium density, and urban low density.

public right-of-way. Refer to SF Public Works Code section 2.4.4.

sidewalk. A part of the transportation network typically in the public right-of-way: (1) that is intended for use primarily by people walking, including people with disabilities that require personal assistive mobility devices, and other authorized motorized or non-motorized users, and (2) that is between (i) the lateral curb lines or in the absence of curbs, the lateral boundary line of a roadway; and (ii) the adjacent property lines. Refer to SF Public Works Code section 2.4.4 for a "sidewalk" definition, and SF Transportation Code section 7.2 for regulated uses.

signal. Designed to manage and direct traffic movement at an intersection, driveway, or crosswalk.

street. Refer to SF Planning Code section 102 and SF Transportation Code section 101 for definitions.

streetlight. A light illuminating a sidewalk or roadway typically mounted on a pole. Different than a traffic "signal."

traffic. Vehicles or persons moving (or not) along or across a sidewalk or roadway, including bicycle facilities.

transit, public. Public transit system operations within the public right-of-way, including public transit services owned and/or operated by a local or regional government agency. Transit does not include private transit carriers, on-demand services, and/or shuttle services, as they are considered private vehicles within the public right-of-way during evaluation of a project's transportation-related impacts. Refer to the definitions for "private bus" and "private transit vehicle."

transit, regional. Any public transit that exits or enters San Francisco, including BART, Caltrain, AC Transit, SamTrans, bay ferry, Amtrak thruway (expressway) bus connections, and Golden Gate Transit.

transit delay. Additional time experienced by a transit vehicle as it travels between stops across one or more intersections in the corridor due to a several factors (e.g., vehicular congestion).

transit priority area. Refer to California Public Resources Code, Division 13 - Environmental Quality, section 21099.

transit stop. A stop or station along a public transit route used by people riding transit for boarding and alighting a transit vehicle. A flag stop is marked with a transit route number on a pole, without a shelter and sometimes without a color curb or (transit zone) pavement marking.

transportation network company. Refer to "ride-hailing service" under "for-hire vehicle" definition.

transportation project. As it relates to vehicle miles traveled. Active transportation (walking, bicycling), right-sizing (road diet), or transit project.

active transportation, right-sizing (road diet), and transit project. Any of the following:

- Reduction in number of through lanes.
- Infrastructure projects, including safety and accessibility modifications, for people walking or bicycling.
- Installation or reconfiguration of traffic-calming devices.
- Creation of new or expansion of existing transit service.
- Creation of new or conversion of existing general purpose lanes (including vehicle ramps) to transit lanes.
- Creation of new or addition of roadway capacity on local or collector streets, provided the project also substantially improves conditions for people walking, bicycling, and, if applicable, riding transit (e.g., by improving neighborhood connectivity or improving safety).

(other) minor transportation project. Any of the following:

- Rehabilitation, maintenance, replacement, and repair projects designed to improve the condition of existing transportation assets (e.g., highways, roadways, bridges, culverts, tunnels, transit systems, and bicycle and pedestrian facilities) and that do not add additional motor vehicle capacity.
- Installation, removal, or reconfiguration of travel lanes that are not for through-traffic, such as left, right, and U-turn pockets, or emergency breakdown lanes that are not used as through lanes.
- Conversion of existing general purpose lanes (including vehicle ramps) to managed lanes (e.g., high-occupancy vehicle, high-occupancy toll, or trucks) or transit lanes.
- Grade separation to separate vehicles from rail, transit, pedestrians or bicycles, or to replace a lane in order to separate preferential vehicles (e.g. high-occupancy vehicle, high-occupancy toll, or trucks) from general vehicles.
- Installation, removal, or reconfiguration of traffic control devices, including Transit Signal Priority features.
- Traffic metering systems.
- Timing of signals to optimize the flow of vehicles, or people walking or bicycling on local or collector streets.
- Installation of a modern roundabout.
- Adoption of or increase in tolls.
- Conversion of streets from one-way to two-way operation with no net increase in number of travel lanes.
- Addition of transportation wayfinding sign(s).
- Removal of any off- or on-street parking space.
- Adoption, removal, or modification of on-street parking or loading restrictions (including meters, time limits, accessible spaces, and preferential/reserved parking permit programs).

trip generation. Number of trips (person trips and vehicle trips) that the department estimates that people would take to and from a (project) site.

vehicle miles traveled. For purposes of analysis for compliance with Senate Bill 743 (CEQA Guidelines sections 21155, 15064.3, etc.). The amount and distance of vehicle travel attributable to a project, or cumulative and regional analysis. Calculation consists of the distance of vehicular travel, inclusive of for-hire vehicles (including both in-service and out-of-service mileage) to the extent that information is available and exclusive of public transit, and accounting for the average number of people per vehicle (average vehicle occupancy).

vehicle miles traveled per capita (residential). Vehicle miles traveled as defined by a residential land use or other land uses with similar travel behavior (refer to appendix of the vehicle miles traveled memorandum for more details, for each land use).

vehicle miles traveled per employee (office).

vehicle miles traveled per employee (retail).

ways people travel. Also known as ways of travel, mode share, and mode split. The percentage of the way or methods people use to travel between destinations (walking, bicycling, transit, etc.).

Less Common Terms and Definitions

advance stop and yield lines. An intersection stop line is a required solid white line, typically 12 to 24 inches wide, extending across all vehicle approach lanes to indicate where vehicles must stop in compliance with a stop sign or signal. An advance stop line is typically four to 30 feet before a crosswalk or the nearest edge of the intersection. A yield line is an optional row of white triangles placed across approach lanes to indicate the point at which vehicles must yield at locations without a signal or stop sign.

alighting. The activity of passengers unloading from a transit vehicle. Refer to "boarding" definition.

alley. Refer to SF Transportation Code section 101.

bicycle box (bike box). Refer to the (California; and Federal Highway Administration) Manual on Uniform Traffic Control Devices, e.g., two-stage bicycle turn box vs. intersection bicycle box. Also called "Dutch pockets" and enlarged bike lanes. An intersection bicycle box is typically a painted area at a signalized intersection provided for people bicycling to pull in front of waiting vehicular traffic. Most bike boxes have a distinct color as well as a bicycle symbol and "Wait Here"-painted area on the pavement.

bikeshare. A privately owned, publicly owned, or public-private partnership, system of bicycles that is available to users to access as needed for point-to-point or roundtrip trips, often to docking station kiosks that are generally unattended and established in dense urban areas. Bikeshare includes bikeshare locking technology that allows "free-floating" bicycles (known as stationless or dockless) within a geographic region that do not require a trip to end at a docking station kiosk.

boarding. The activity of passengers loading onto a transit vehicle. Refer to "alighting" definition.

bollard. Short fixed post or vertical element designed to separate or buffer people walking and bicycling, and other authorized motorized or non-motorized users, from areas with vehicles.

chicane. A traffic calming measure designed to slow traffic by visually narrowing the roadway and requiring vehicles to laterally shift from side to side while traversing.

commuter shuttle. Privately operated transit vehicle that transports workers from origins typically near home neighborhoods to destinations such as places of work or a transit station or stop, or transportation hub, in pre-arranged trips. A commuter shuttle is not a type of private transit vehicle. Refer to the definitions for "private bus" and "private transit vehicle."

cordon. A round, rectangular, or irregular study area defining where to include counts of people traveling into or out of (e.g., people driving).

corridor. As it relates to transit. A generally linear street segment with one or more transit routes that share a common path.

corner island. Triangular raised island or area with striped pavement markings between through travel lanes and a right-turn slip lane. Often referred to as a "pork chop" island.

crosswalk. Legally designated location for people walking to cross from one side of a roadway to the other. Present at all intersections that intersect at approximately right angles; may be marked or unmarked.

continental crosswalk. High visibility crosswalk marking that typically features 2-foot-wide crosswalk stripes, parallel to the curb and the full width of the crosswalk, separated by 2-foot spaces between stripes. Not to be confused with a ladder crosswalk, which uses a similar striping pattern but also retains the transverse stripes of a standard crosswalk at both edges.

high-visibility crosswalk. Marked crosswalks that use longitudinal or diagonal stripes to increase crosswalk visibility to approaching vehicles.

marked crosswalk. White or yellow retro-reflective thermoplastic striping in the roadway to delineate the presence of a crosswalk.

mid-block crosswalk. Marked crosswalk at a mid-block (non-intersection) location.

raised crosswalk or intersection. Area where the level of the crosswalk or intersection is raised to the sidewalk grade to provide a continuous grade walking surface along the sidewalk.

standard crosswalk. Basic pavement marking that typically uses two parallel 12-inch crosswalk stripes, for example, perpendicular to the curb, to delineate the two edges of the crosswalk, although they are not “standard” treatments for new crosswalks in San Francisco.

curb radius. Radius defining the sharpness of the curve that the curb or edge of the sidewalk follows as it turns a corner.

curb ramp. Location where the curb is depressed to the level of the roadway to provide a flush transition from the sidewalk to the roadway to enable accessible street crossing or movement.

daylighting. The removal of on-street parking near intersections and crosswalks to improve the sightline distance and visibility for ways people travel, often people driving. Daylighting can range from 10 feet to more than a couple of parking spaces depending on conditions. Refer to the Urban Street Design Guide from the National Association of City Transportation Officials.

employment center project. Located on property zoned, or to be zoned, for commercial uses with a floor area ratio of no less than 0.75 and that is located within a transit priority area. If the underlying zoning for the project site allows for commercial uses and the project meets the rest of the criteria in this definition, then the project may be considered an employment center.

flexible parking zone. On-street vehicular parking lane that is used temporarily or semi-permanently for other uses, such as café or public seating.

furnishings zone. Portion of the sidewalk between the edge zone (typically a curb) and the throughway zone of the public right-of-way that contains most street trees, plantings, Class 2 bicycle parking, lighting, utility poles and equipment, seating such as benches, and site furnishings. Also includes licensed vendors, and items also known as street furniture.

high speed. Relative to the geographic context and the behavior of people driving and presence of other ways people travel, and does not only or necessarily refer to speeds observed above the posted speed limit.

island. An area between travel lanes used to channel traffic movements; differentiated from medians by their discontinuous and often irregular shape and location off of the centerline. Refer to definitions for "corner island," "transit boarding island," and "refuge."

median. The portion of the roadway separating opposing directions of the traveled way, or local lanes from through travel lanes. Medians are generally linear and continuous through a block, and may be depressed, raised, or flush with the road surface.

other land use project. As it relates to vehicle miles traveled. A land use other than residential, retail, and office**.**

overhead contact system, or overhead catenary system. As it relates to transit. Part of Muni's trolley bus overhead electric wire system for powering buses, in combination with the traction power (also refer to "traction power" definition). Consists of copper-alloy wires along the transit route that provides power to the trolleybuses or streetcars, guy wires stabilizing the copper-alloy wires, and poles that hold up the guy wires. Overhead wire poles are often placed along street curb frontage to support these electric wires.

parking, unbundled. Refer to Transportation Demand Management Program Standards Appendix-A Measure PKG-1 Unbundle Parking, and Planning Code section 167.

parking, long-term. Refers to on-street or off-street vehicle parking spaces that are generally in use for longer than two hours. "Long-term" definition will vary though by land use, geographic context, and type.

parking, short-term. Refers to on-street or off-street vehicle parking spaces that are in use for a short period of time (e.g., generally from a minimum of 10 minutes up to three hours; up to two hours for retail or downtown worker parking), or office daytime and residential nighttime parking, or the SFMTA Residential Parking Permit program durations (e.g., one day or one week). "Short-term" definition will vary though by land use, geographic context, and type. Refer also to Transportation Demand Management Program Standards Appendix-A Measure PKG-2 Short-Term Daily Parking.

parking deficit. A quantified shortage or lack of parking supply, derived from the trip generation estimates for a project, and not meeting its estimated vehicular parking demand.

parking demand. The estimated amount of daily vehicular parking demand generated by each proposed use (project-generated demand for space on-site and off-site, if applicable).

parking facility types. A parking facility includes a public or private parking garage, parking lot, on-street parking lane or space, valet parking storage location (tandem or otherwise), or parking equipment (automated or human-operated) such as a mechanical stacker or lift, and includes the facilities and spaces listed in various sections of Planning Code section 102, 151.1, 154 and 166 and Transportation Code section 1.1.

parking meter. Refer to SF Transportation Code section 1.1.

parking permit. Refer to SF Transportation Code section 1.1.

parking turnover rate. The rate at which a given parking space becomes occupied by a different vehicle (e.g., the average number of vehicles in a parking space over a set time duration).

paratransit. As it relates to transit. Van and taxi services for people with disabilities, unable to independently use public transit due to a disability or disabling health condition.

passenger car equivalent. The quantity of loading spaces should be given in terms of a passenger car equivalent, typically 22 linear feet, which includes the space for loading, unloading, and maneuvering, for purposes of evaluating the number of proposed spaces versus the estimated passenger loading demand.

pedestrian. Refer to "people walking" definition.

private bus. Refer to SF Transportation Code section 101. A private bus is not a type of private transit vehicle, and can include fixed or dynamically generated (crowd-sourced) routes. A private bus does not necessarily require membership for ridership eligibility, but may require pre-arranging a ride.

private transit vehicle (PTV). Similar to the formerly used term, jitney. Also known as microtransit or a low-capacity service, carrying small numbers of people at a time. A privately operated shuttle service, typically available to the general public, enabled by technology that usually operates along a dynamically (crowd-sourced) generated route, or fixed-route offering bus-stop similar service (not point-to-point), in a bus or van. Refer to SF Transportation Code section 1202.

refuge. For people walking, area protected by a raised median or island where people may safely pause or wait while crossing a street in two stages. Refer to "island" definition.

> **thumbnail.** A small island, in the roadway, forming the intersection side of a refuge for people walking, often curved to roughly form the shape of a thumbnail.

right-turn slip lane. A mixed-flow travel lane that allows larger and faster vehicle turns by increasing the curb radius and adding a corner island or striped area between the right turn lane and adjacent through travel lanes; may be controlled or uncontrolled. A right-turn slip lane is considered a free right turn (no stop or signal) if vehicles enter into a dedicated travel lane upon exiting the slip lane.

roundabout, modern. A type of looping junction in which vehicular traffic travels in one counterclockwise direction around a central circular raised area and priority is given to the vehicles already traveling in the roundabout. Signs typically direct traffic entering the roundabout to slow their speed and give way to traffic already in the roundabout. Yield-controlled circular intersection design used to control traffic on moderate to high-volume streets. Refer to "traffic calming circle" definition, which is different.

safe-hit posts. Physical vertical barriers (often flexible material to allow them to be knocked down and get back up) in the street intended to deter vehicles from entering, parking within, and intruding on painted safety zones, areas where transit vehicles need clearance to turn, and bicycle lanes. These posts can be driven over by emergency vehicles when necessary to safely cross.

scramble. Also known as Barnes Dance, scramble intersection, diagonal crossing, and exclusive pedestrian interval. For people walking, type of traffic signal movement that temporarily stops all vehicular traffic, allowing people walking to cross an intersection in every direction, including diagonally, simultaneously.

shared public way. Right-of-way that is designed at a single surface with no grade differentiation between street and sidewalk areas, and where roadway space is shared between people walking and slow-moving vehicles. Sometimes referred to as a "shared street."

shared vehicle. Also known as shared-use vehicle. Vehicles with multiple people; includes carpool and private transit that has a minimum occupancy of four or more people 85-percent of the time. Refer to "vehicle" definition.

signal, accessible. As it relates to people walking. Signal located at a crosswalk that provides crossing signal status in a non-visual format such as audible tones, verbal messages, and/or vibrating surfaces.

signal, countdown. As it relates to people walking, a component of a traffic signal located at crosswalks that provides supplemental countdown information about the seconds remaining in the current phase for people walking.

signal warrant. A set of standardized criteria used to establish and document the need for the appropriate traffic control device in a particular scenario. A signal is warranted per the (California; and Federal Highway Administration) Manual on Uniform Traffic Control Devices.

signal, transit priority. The traffic signal is designed to recognize an approaching transit vehicle and extend the green light when it is safe to do so. Emergency vehicles have priority and the ability to control the timing of a traffic signal.

throughput. The number of people (e.g., walking, bicycling, riding transit, or driving) that flow along a corridor, segment, block, or at or near an intersection.

throughway zone. Portion of the sidewalk, generally located between the property line and the furnishings zone, where people walking may move free of obstructions. Also known as "effective sidewalk width."

toll road. A roadway with fixed or dynamic pricing (e.g., bridge roads to and from San Francisco), sometimes collected with electronic devices.

traction power. As it relates to transit. Part of Muni's trolley bus overhead electric wire system for powering buses, in combination with the Overhead Contact System.

traffic calming (features). Practice of designing streets to improve safety by discouraging people driving from speeding through neighborhoods using visual or geometric changes including, but not limited to, lane reductions, roadway narrowing, intersection bulb-outs, raised medians, horizontal or vertical shifts in the roadway, or other features.

traffic calming device. Refer to SF Transportation Code section 101.

traffic calming circle. Also known as "neighborhood traffic circle." Generally circular raised area in the center of a standard intersection that provides space for landscaping, and can slow traffic by visually breaking up the scale of wide streets, the monotony of the street grid, and visually shortening the roadway, forcing people driving to slow their vehicle speed to circulate around them. Traffic calming circles require counterclockwise travel and are generally used at low-volume neighborhood intersections. Refer to "roundabout, modern" definition, which is different.

traffic control device. Refer to SF Transportation Code sections 101 and 10.1.

traffic delineators. Raised pavement markers or bicycle lane separators such as zebras that are easy to drive over with a vehicle and "separate" people bicycling from people driving in mixed-flow travel lanes.

transit boarding island. Also known as "transit platform." Raised area within the roadway that houses a transit stop, allowing transit vehicles to use center lanes without having to pull over to the side of the roadway for passengers to board. This may include a raised platform, raised curb, or floating island as part of a transit stop.

transit-only area. Refer to SF Transportation Code section 101. Transit-only areas are inclusive of transit-only lanes.

transit reliability/variability. Performance-based measurement of transit service indicating the ability for a transit vehicle to provide reliable service to people riding transit. Reliability of transit service can be affected by circumstances such as congestion by other vehicles.

truck. Refer to SF Transportation Code section 1.1.

- **extra legal truck.** Refers to a vehicle with dimensions that exceed 8.5 feet in width, 65 feet in length, and 14 feet in height; this vehicle requires a permit from SFMTA.
- **large freight truck.** Refers to a heavy truck with a wheelbase length of 40 feet or more, with a total length that may approach 65 feet, 14 feet in height, and 8.5 feet in width (e.g., WB-40 and larger up to WB-65). A large freight truck may occupy approximately 60-90 feet, which includes the space for loading/unloading, and maneuvering.
- **truck loading zone.** Refer to SF Transportation Code section 1.1 and SF Transportation Code section 7.2 for commercial vehicles. On-street loading.
- **truck terminal.** Refer to Planning Code section 102. Off-street loading. Also known as loading terminal, loading berth, loading bay, or loading dock.

vanpool. Refer to SF Environment Code section 427.

vehicle. Refer to California Vehicle Code section 670. Refer to definitions for car-share vehicle, for-hire vehicle, passenger car equivalent, shared vehicle, and commercial trips.

- **authorized emergency vehicle.** Refer to California Vehicle Code section 165.
- **design vehicle.** Type of vehicle used to determine appropriate roadway design characteristics such as curb radius.
- **non-standard vehicle.** Refer to SF Transportation Code section 1202.

vehicular use area. Refer to Planning Code section 102.

vulnerable people. As it relates to hazards: people walking and bicycling, including children, seniors, and people with disabilities.

warning devices. Refer to “traffic control device” under SF Transportation Code section 10.1.

> **audible warning device.** This device announces audible warning messages, providing an acoustic warning to complement visual warning signs, e.g., at signalized crosswalks, and to warn people walking of approaching vehicles, typically installed at garage entrances/exits where there is a sidewalk and people walking.
>
> **detectable warning.** A surface feature of truncated dome material (raised shape) built in or applied to the walking surface to advise of an upcoming change from a right-of-way for people walking to a right-of-way for people driving that would be hazardous for people walking. Also can be used on a transit boarding island or accessible curb ramp edge.
>
> **flashing beacon.** Flashing amber-colored light mounted to a pole adjacent to or above the roadway to alert drivers to an upcoming crosswalk for people walking.
>
> **visual warning device.** An actuated device used to visually warn approaching vehicles and/or people walking of each other’s presence, such as in-roadway warning lights at crosswalks, flashing beacons, ‘bikes in tunnel,’ or a ‘vehicle approaching’ warning.

wayfinding sign. Static physical directional sign located on the sidewalk, typically used to help people walking and bicycling orient themselves and locate nearby destinations.

TRANSPORTATION IMPACT ANALYSIS GUIDELINES

APPENDIX C
PROJECT DESCRIPTION

SEAL OF THE CITY AND COUNTY OF SAN FRANCISCO

San Francisco Planning

ATTACHMENT A

This attachment identifies the typical physical, additional physical, and programmatic features the project description may include to the extent applicable. The geographic extent of these features must, at a minimum, include the project's frontage and may include the entirety of the project's block. This attachment also provides a non-exhaustive list of approvals from agencies other than the planning department that a project sponsor may need to obtain for the project description features described above. Lastly, this attachment provides examples of project description figures and tables.

TABLE 1

Typical Physical Features

Typical Physical Feature[a]	Topic[b]	Presentation[c]		
		Text	Figure	Table
Whether the existing site is vacant, partially occupied, or fully occupied, by use	Multiple	X	X	X
Type, location, and square footage (gross and total) by land use, building, and total amount	Multiple	X	X	X
For residential, number of units by bedroom type (number of bedrooms) and percentage of on-site affordable units by income level and/or age (e.g., senior housing)	Multiple	X		X
For hotel, number of guest rooms	Multiple	X		X
For student housing, number of rooms	Multiple	X		X
For entertainment uses, number of seats and/or standing capacity (maximum occupancy)	Multiple	X		X
For schools and child care facilities, capacity by age and number of teachers and employees	Multiple	X		X
Location and number of off-street vehicular parking spaces	Multiple	X	X	X
Location and number of off-street bicycle parking spaces	Bicycling	X	X	X
Location, number, and dimensions of off-street freight or delivery service loading spaces	Multiple	X	X	X
Location and dimensions of driveways, including the throat (i.e., area between property line and internal vehicular circulation system) and associated control devices (e.g., gates, stop sign, right turn in/out)	Multiple	X	X	
Location (e.g., distance and direction from intersection), number, and dimension of curb-cuts	Multiple	X	X	
Typical dimensions of paved areas between the curb line and property line (i.e., sidewalks), including identifying any curb dimension changes (e.g., loading bay, bulb-ins, bulb-outs, Americans with Disability Act curb ramp)	Multiple	X	X	
Location and dimensions of on-street passenger loading spaces (e.g., paratransit, for-hire vehicles, passenger, commercial, private shuttles[d]), transit boarding zones, or red zones	Multiple	X	X	
Entrance and exit locations to building(s) for people walking to and from publicly accessible areas	Walking/ Accessibility, Loading, Emergency Access	X	X	
Depth and amount of excavation (feet, cubic yards)	Construction	X		

a. The typical physical features must be presented for existing and project conditions to the extent applicable. The geographic extent of these features must, at a minimum, include the project's frontage and may include the entirety of the project's block.

b. Multiple = requirement for four or more topics to the extent applicable. Name of a topic (e.g., Bicycling) = requirement to address a topic to the extent applicable.

c. "X" indicates the presentation of the typical physical features.

d. Shuttles refer to private development shuttles and do not include private commuter shuttles. The study may include shuttles as a measure in a project's transportation demand management plan and as part of a project description.

TABLE 2

Additional Physical Features

Additional Physical Feature[a]	Topic[b]	Presentation[c]		
		Text	Figure	Table
Location and dimensions of new publicly-accessible rights-of-ways (e.g., new street, mid-block alley, interior open spaces) or traffic control devices (e.g., stop signs, signals)	Multiple	X	X	
Sightlines along the project frontage (e.g., due steep slopes or obstructions such as parking spaces, transit stops)	Multiple	X	X	
Location (e.g. distance and direction from intersection) and dimensions of alterations to publicly-accessible rights-of-way (e.g., parking, loading zones, bicycle facilities, transit facilities, and any rights-of-way reconfiguration)	Multiple	X	X	
Dimensions of sidewalk throughway zone (i.e., the effective width), taking into account presence and general location of tree wells, above-ground utility boxes, street furniture, fire hydrants, utility poles and guy wires, Muni overhead wire poles, rail tracks, streetlight poles, bollards, traffic control devices, traffic and parking signage, parking meters, litter receptacles, mailboxes, transit shelters, bike racks, emergency call boxes, and any other physical structures	Walking/ Accessibility, Emergency Access	X[d]	X[d]	
Location and type of intersection Americans with Disabilities Act (ADA) curb ramps, intersection crossing pavement markings (e.g., crosswalks), or traffic control devices (e.g., stops signs, signals)	Walking/ Accessibility	X	X	
Dimensions of travel lanes and bicycle lanes	Bicycling	X	X	
Location and type of bicycle facilities (e.g., class 1 bicycle facility, bike share station, bicycle rack) and bicycle facility features (e.g., raised bicycle lanes)	Bicycling	X	X	
Location of physical facilities (e.g., drainage grates, manhole covers, railroad crossing, rumble strips) within bicycle facilities	Bicycling	X[d]	X[d]	
Location of private shuttle or commuter shuttle stops along project frontage	Public Transit	X	X	
Location and dimensions of parklets	Loading	X	X	
Location and dimensions of fire apparatus access road	Emergency Access, Construction	X	X	
Location and dimensions of “Keep Clear Zones”	Emergency Access	X	X	
Distance between curb line and entrance and exit building location	Emergency Access	X	X	
Location of bollards	Emergency Access	X	X	
Transportation demand management physical measures	VMT, Parking	X	X	
Portion of the site occupied during construction	Construction	X	X	
Location of construction staging (on- or off-site) and equipment vehicular parking on public right-of-way	Construction	X	X	
Location and dimensions of temporary public right-of-way closures, including physical structures (e.g., bus stops, overhead wires)	Construction	X	X	
Location of utilities, including connection, construction, or relocation	Construction	X	X	
Location of construction truck travel routes, including weight restricted streets	Construction	X	X	

a. The additional physical features may be presented for existing and project conditions to the extent applicable. The geographic extent of these features must, at a minimum, include the project’s frontage and may include the entirety of the project’s block.

b. Multiple = requirement for four or more topics to the extent applicable. Name of a topic (e.g., Bicycling) = requirement to address a topic to the extent applicable.

c. “X” indicates the presentation of the additional physical features.

d. Only provide generalized description of throughway zone or effective dimensions, do not show or describe each element.

TABLE 3

Programmatic Features

Programmatic Feature[a]	Topic[b]	Presentation[c]		
		Text	Figure	Table
Days and hours of operation of land use and parking facility	Multiple	X		X
Days and hours of operation of loading zone and shared loading areas	Multiple	X		X
Valet, crossing guard, or control officer operations days, hours, and locations	Multiple	X	X	X
Location and operations of vehicle stackers, elevators, turning tables, etc., including process times	Multiple	X	X	
Transportation management plan, including location and duration of potential event-related lane closures or rerouting affecting transit facilities and/or operations	Public Transit	X	X	X
Shuttle loading (e.g., vehicle type, frequency, dwell times, and routes)	Loading	X	X	
Transportation demand management programmatic measures	VMT, Parking	X		X
Days and hours of construction	Construction	X		X
Duration of construction, by phase (months, years); if any phases overlap, anticipated construction activities by phase	Construction	X		X
Average number of daily construction trucks (delivery and haul trips), by phase	Construction	X		X
Average number of daily construction workers per day, by phase	Construction	X		X

a. The programmatic features may be presented for existing and project conditions to the extent applicable.

b. Multiple = requirement for four or more topics to the extent applicable. Name of a topic (e.g., Bicycling) = requirement to address a topic to the extent applicable.

c. "X" indicates the presentation of the programmatic features.

TABLE 4

Approvals

Approval
San Francisco Board of Supervisors
Changes that involve establishing a new sidewalk, shared streets, bulb-ins, reductions in the official sidewalk width, or sidewalk widening in excess of one linear block
Major encroachment permits or any non-standard improvements beyond the limits of the subject property frontage and or/beyond the centerline within the public right-of-way
San Francisco Public Works
New curb cut or alteration to an existing curb cut
Sidewalk bulb-outs, corner bulb-outs, or sidewalk widenings not in excess of one linear block
Tree removal, replanting, and landscaping in the public right-of-way
Installation of physical structures in the public right-of-way (e.g. street furniture, sidewalk seating, bicycle racks) along the project frontage
Parklets
Compliance with Americans with Disabilities Act (ADA) (required for every project)
Excavation permit for any excavation work within the public right-of-way
Temporary occupancy permit for work that involves the use of the sidewalk or a portion of the street pavement, up to one full day, to perform building maintenance work (e.g., using a crane occupying a parking space or pruning trees)
Street space permit for work that involves the use of the sidewalk or a portion of the street pavement outside of the building property line or project limits
Additional street space permit if work cannot meet/satisfy the requirements of a street space permit (e.g., construction activities fronting another property, or the sidewalk is not wide enough to accommodate construction materials/staging and a minimum four-foot accessible path of travel for people walking) for long term occupancies
Contractor parking plan for major construction work of both private and public projects requiring street space occupancy permits for certain durations in specified planning code districts or for major excavation
San Francisco Municipal Transportation Agency
Changes to transit routes, stop locations and stop types including changes to transit shelters and boarding islands
Changes to traffic signals, traffic calming (e.g., islands, bulb-outs, and daylighting), speed limits, and lane striping
Changes to on-street parking
Changes in color curb designation on streets bordering the project and/or in the immediate vicinity
Special traffic permit for any offsite construction activities that cannot fully comply with the requirements and regulations in the Regulations for Working in San Francisco Streets or traffic routing specifications under a construction contract with the City and County of San Francisco
San Francisco Department of Building Inspection
Changes to fire apparatus access roads, including obstructions, minimum widths, and clearances
Emergency access to a building entrance and exit locations

TABLE 5

Existing and Proposed Project Site Characteristics

Table 5 below presents typical project characteristics for existing conditions and proposed conditions on the project site. The table should include all necessary information to describe the existing and proposed conditions (e.g., existing land use types, parking, and loading information). As shown in Table 5, 'x' represents numerical values that would need to be provided and be consistent with project plans. Provide separate tables in the study for existing and proposed conditions.

Existing and Proposed Project Site Characteristics		Address (Building 1)	Address (Building 2)	TOTAL
Gross Square Footage by Use	Land Use 1	xxx,xxx	xxx,xxx	xxx,xxx
	Land Use 2	xxx,xxx	xxx,xxx	xxx,xxx
	Land Use 3	xxx,xxx	xxx,xxx	xxx,xxx
Residential Unit Mix	Two-bedroom units+	x	x	x
	TOTAL	x	x	x
Affordable Housing Units (by age and/or income level)	Percentage by income level	x	x	x
	Percentage by age	x	x	x
Hotel Rooms	Number of rooms	x	x	x
Entertainment Venues	Number of seats	x	x	x
Schools	Number of students	x	x	x
Freight/Service Loading		Number, location, and dimensions of on-street and/or off-street freight/service loading associated with the uses at this building location	Number, location, and dimensions of on-street and/or off-street freight/service loading associated with the uses at this building location	x
Passenger Loading		Number, location, and dimensions of on-street and/or off-street passenger loading associated with the uses at this building location	Number, location, and dimensions of on-street and/or off-street passenger loading associated with the uses at this building location	x
Automobile Parking and Car-share	Number of spaces	x	x	x

Source: xxxxxx

APPENDIX D
CUMULATIVE CONDITIONS ADJUSTMENTS

San Francisco Planning

TABLE 1

Existing and Proposed Project Site Characteristics

Table 1 lists examples of changes from cumulative projects that may result in adjustments made to existing or cumulative projections, street conditions, or volumes.

Example	Potential Adjustment[a]	
	Assignment	Evaluation
Substantial transportation investment (e.g., substantial increase in transit service, a new transit line)	Reassign various person trips	Mode split assumptions
Street network changes (e.g., reduction in vehicular travel lanes, vehicular turn restrictions)	Reassign various person trips	Vehicular turning and other person trip movements in relation to reassignments
Changes to sidewalk width or closures	Reassign walking trips	Emergency service operator and commercial vehicle turning movements
Entrance and exit location used by a substantial number of people driving across a route of travel for people walking and bicycling to and from the project site, emergency vehicle operators, or for public transit service	n/a	Vehicular turning movements in relation to number of people walking and bicycling, emergency vehicle operators, and public transit delay
Placement of a structure that closes off or renders existing facilities for people walking or bicycling challenging to use	Reassign walking and bicycling trips	Distances for people walking or bicycling to safely access destinations
Closure or alterations to existing facilities for emergency service operators	n/a	Ability for emergency service operators to access the area
Changes to transit service location	Reassign walking trips and transit trips	Vehicular turning movements in relation to reassignments and public transit delay
Vehicular parking rate comparison	n/a	Refer to VMT/Induced Automobile Travel memorandum for explanation
Removal or relocation of the location of on-street commercial (freight and delivery service), passenger, or shuttle loading zones	Reassign loading trips	Demand versus supply and whether secondary impacts occur

a. All adjustments shown are potential. The department will provide guidance on the necessity for adjustments on a project by project basis.

TRANSPORTATION IMPACT ANALYSIS GUIDELINES

APPENDIX E
SAMPLE QUEUE ABATEMENT LANGUAGE

San Francisco Planning

QUEUE ABATEMENT SAMPLE LANGUAGE

Update the sample language, particularly in the second and third paragraphs, to reflect the conditions at the project site and the characteristics of the project. The language should provide specific proactive measures to prevent queues from taking place, as opposed to mitigating the queue after it occurs.

It will be the responsibility of the owner/operator of any off-street parking facility with more than 20 parking spaces (excluding loading and car-share spaces) to ensure that vehicle queues do not occur regularly on the public right-of-way. A vehicle queue is defined as one or more vehicles (destined to the parking facility) blocking any portion of any public street, alley, or sidewalk for a consecutive period of 3 minutes or longer on a daily or weekly basis.

If a recurring queue occurs, the owner/operator of the parking facility will employ abatement methods as needed to abate the queue. Appropriate abatement methods will vary depending on the characteristics and causes of the recurring queue, as well as the characteristics of the parking facility, the street(s) to which the facility connects, and the associated land uses (if applicable).

Suggested abatement methods include but are not limited to the following: redesign of facility to improve vehicle circulation and/or on-site queue capacity; employment of parking attendants; installation of LOT FULL signs with active management by parking attendants; use of valet parking or other space-efficient parking techniques; use of off-site parking facilities or shared parking with nearby uses; use of parking occupancy sensors and signage directing drivers to available spaces; TDM strategies such as additional bicycle parking, customer shuttles, delivery services; and/or parking demand management strategies such as parking time limits, paid parking, time-of-day parking surcharge, or validated parking.

If the Planning Director, or his or her designee, suspects that a recurring queue is present, the Planning Department will notify the property owner in writing. Upon request, the owner/operator will hire a qualified transportation consultant to evaluate the conditions at the site for no less than 7 days. The consultant will prepare a monitoring report to be submitted to the Planning Department for review. If the Planning Department determines that a recurring queue does exist, the facility owner/operator will have 90 days from the date of the written determination to abate the recurring queue or conflict.

TRANSPORTATION IMPACT ANALYSIS GUIDELINES

APPENDIX F
TRAVEL DEMAND

San Francisco Planning

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Appendix F
Travel Demand Memorandum

Date:	February 14, 2019
To:	Record No. 2015-012094GEN
Prepared by:	Daniel Wu and Sherie George
Reviewed by:	Wade Wietgrefe
RE:	**Transportation Impact Analysis Guidelines Update, Travel Demand**

INTRODUCTION

In 2015, the department and the San Francisco Municipal Transportation Agency (SFMTA) hired a consultant to assist with an update to the travel demand methodology and estimates within the Transportation Impact Analysis Guidelines. For those prior travel demand estimates, the department relied on a series of sources, such as Citywide Travel Behavior Surveys and Institute of Transportation Engineers Trip Generation rates, from the 1980s through the 2000s. The consultant's specific tasks were to review the existing methodology and data; conduct primary data collection and analysis; derive updated parameters including trip generation rates, way people travel (also known as mode split), common origins and destinations (also known as trip distribution), and loading demand rates; and review the current geographic analysis structure. In addition to the department, the SFMTA and San Francisco County Transportation Authority (SFCTA) also provided feedback on this effort.

This memorandum updates the guidance provided in the prior guidelines for the travel demand topic. The department prepared this memorandum in consultation with stakeholders (e.g., city and county agencies, consultants). The department will issue memoranda that provide updates to other topics (e.g., transit, loading) within the guidelines. When the department issues a memorandum about a topic, it will supersede existing guidance regarding that topic. This travel demand memorandum informs the analysis of other transportation topics. This memorandum provides specific guidance on the methodology for conducting a travel demand analysis. However, summary guidance on the typical methodology for this topic is provided in the guidelines.

The guidance provided herein assumes a typical land use development project including residential, office, retail, and hotel that requires a transportation study. The "Other" subsection provides guidance on other types of projects. The department may use this guidance for multiple projects, but the department has discretion on applying the guidance on a project by project basis.

The organization of the memorandum is as follows:

1) Travel Demand (typical projects)
2) Loading Demand
3) Other (covers different types of projects)

Attachments are under separate cover. The department may update the attachments to the memoranda more frequently than the body of the memoranda.

TRAVEL DEMAND

The section identifies the approach to calculate travel demand, including describing typical geography, period, and methodology for typical projects.

Basics

Geographic Unit of Analysis

There are two travel demand geographic units of analysis – neighborhoods and place type (defined below). Neighborhoods consist of a collection of transportation analysis zones, which are units used by planners as part of transportation models and for other planning purposes. The San Francisco County Transportation Authority manages San Francisco's transportation model and developed boundaries for 12 neighborhoods (nine in San Francisco proper, and three external districts – north bay, east bay, and south bay). Figure 1 in Attachment A shows these neighborhoods and districts.

This methodology sorts each of nine San Francisco neighborhoods developed into one of three place types based on each neighborhood's auto mode share. Figure 2 in Attachment A shows the three place types based on the nine neighborhoods, including an overlay of the neighborhood boundaries. These place types are "urban high density" (place type 1), "urban medium density" (place type 2), and "urban low density" (place type 3).

Period

In San Francisco, the weekday extended p.m. peak period (Tuesday, Wednesday, or Thursday, 3 p.m. to 7 p.m.) is typically the period when the most overall travel happens.[1] Although a substantial amount of travel occurs throughout the day and impacts from projects would typically be less during other periods, the methodology should typically focus on this period (including limiting the hours within the extended p.m. peak period) as changes in travel demand would be acute during these periods compared to other times of the day and days of the week. However, the methodology should also use the weekday daily time period as a unit of analysis to examine the overall daily activity travel patterns and behavior of a project in its entirety. The loading, construction, and vehicular parking memoranda provide specific guidance on the appropriate period of study for those transportation topics.

Methodology

The typical methodology consists of four steps: 1) trip generation, 2) ways people travel, 3) common origins and destinations, and 4) trip assignment. The following subsections summarize each of these steps. Attachment B summarizes the data collection and analysis used to develop the methodology described below. The department developed a tool for travel demand analysis; Attachment C provides details on how to use the tool to implement the methodology described below.

Step 1. Trip Generation

Trip generation refers to the number of estimated trips people would take to and from the project, regardless of the way they travel (see step 2 below). The following methodology refers to these trips as

---

[1] Examples that illustrate this statement: within the San Francisco County Congestion Management Program network transit and vehicular travel speeds are lower during the p.m. peak period (4:30-6:30 p.m.) than during the a.m. peak period (7-9a.m.) as documented in San Francisco County Transportation Authority, *Congestion Management Program*, December 2015; demand at transit stations is consistent and generally higher throughout the p.m. peak period relative to demand at transit stations during the a.m. peak period, as documented in the Metropolitan Transportation Commission, *Core Capacity Transit Study Briefing Book*, July 2016; the weekday peak period for for-hire vehicles occurs from 6:30 p.m. to 7p.m., as documented in San Francisco County Transportation Authority, *TNCs Today: a Profile of San Francisco Transportation Network Company Activity*, June 2017.

person trips. The methodology applies person trip rates, accounting for the size and type of land use, to estimate the number of project person trips. Table 1 shows the estimated daily and p.m. peak hour person trip generation rates by typical land use type.

The department developed these trip generation rates for daily and pm peak hour based on data collection in spring 2017 at 65 typical office, retail, residential, and hotel sites throughout San Francisco. The trip generation rates below include pass-by trips or trips people make en-route two primary locations, such as home and work.[2]

Table 1 – Person Daily and P.M. Peak Hour Trip Generation Rates by Land Use

Land Use	Unit of Land Use	Trip Generation Rate	
Residential	Per Bedroom	Daily	4.5
		PM Peak	0.4
Office	Per 1k square feet of land use	Daily	15.7
		PM Peak	1.4
Retail – General	Per 1k square feet of land use	Daily	150
		PM Peak	13.5
Retail – Supermarket		Daily	297
		PM Peak	21.7
Eating Restaurant	Per 1k square feet of land use	Daily	200
		PM Peak	27
Eating Composite		Daily	600
		PM Peak	81
Hotel	Per Hotel Room	Daily	8.4
		PM Peak	0.6

The department caps residential trip generation rates at the 3-bedroom rate, meaning that a 4-bedroom unit has the same estimated daily and p.m. peak hour number of person trips as a 3-bedroom unit.

Step 2. Ways People Travel

Ways people travel, also known as mode split, refers to the estimated way or method people travel. This methodology defines five methods: automobile modes (driving alone or with passengers), taxi/TNC, walking, public transit (such as bus, light rail, BART, or Caltrain), and bicycling.[3] Figure 1 summarizes extended p.m. peak mode split by one of the three place types and land use. Each place type displays

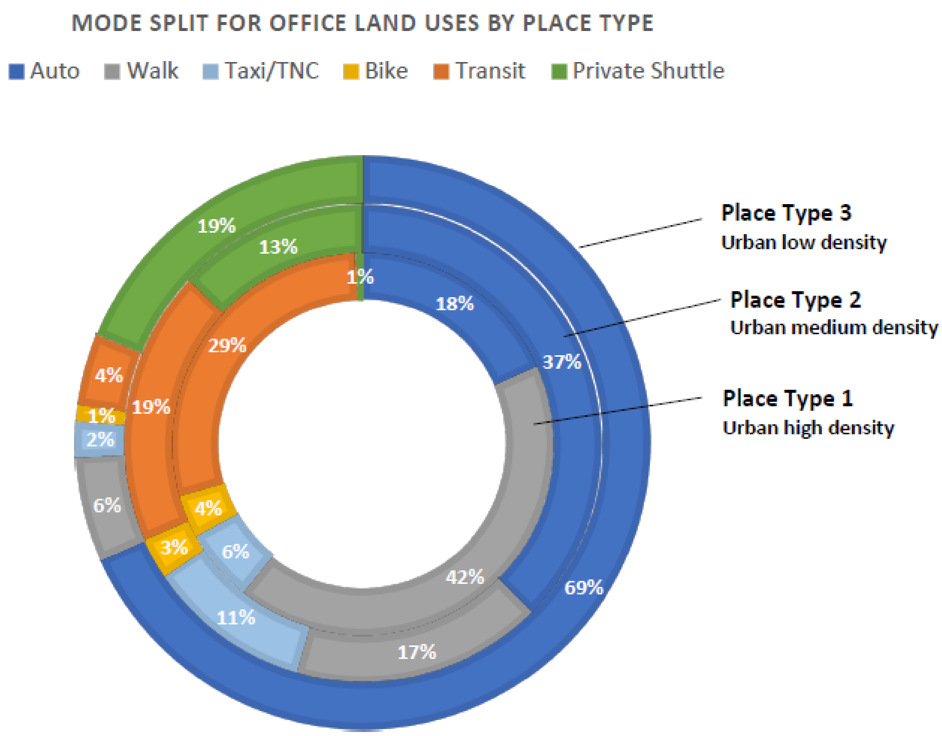
[2] Therefore, models (e.g., California Emissions Estimator Model) should generally assume 0 percent for pass-by trips when inserting projects trips.

[3] While private transit trips are included as a percentage of the observed total person trips, the department excludes private transit from impact analysis. Therefore, private transit is not mentioned as a method although it is shown in figure 1.

different mode split ratios due to factors that influence travel behavior, such as transit accessibility, walkability, roadway and transit infrastructure.

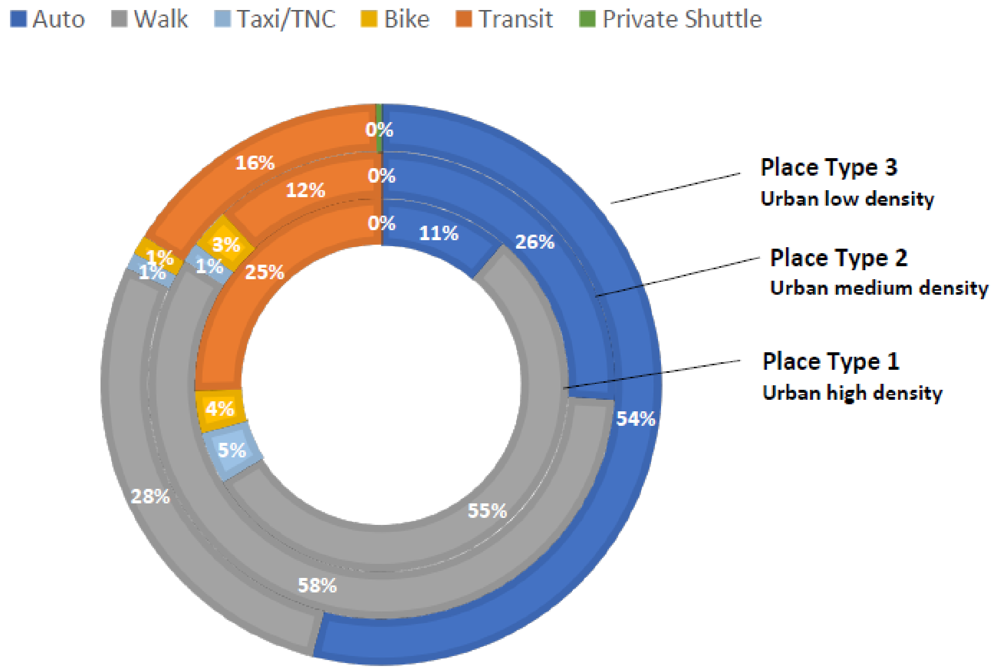
The methodology will typically assume the extended p.m. peak period mode splits would apply to both daily and p.m. peak hour person trip generation to determine person trips by mode.

The department developed mode splits[4] based on data collection in spring 2017 at 65 typical office, retail, residential, and hotel sites throughout San Francisco. Attachment B provides more details on this data collection effort.

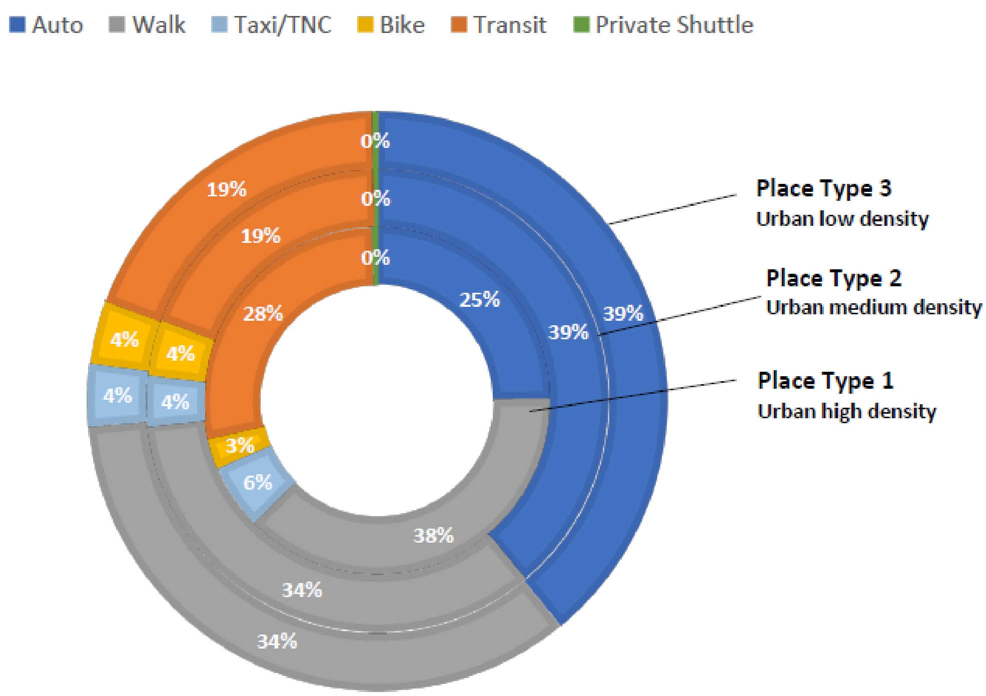


[4] The department calculated mode splits based on intercept survey data collected during the PM peak period (3:00-7:00pm);

MODE SPLIT FOR RETAIL LAND USES BY PLACE TYPE



MODE SPLIT FOR RESIDENTIAL LAND USE BY PLACE TYPE



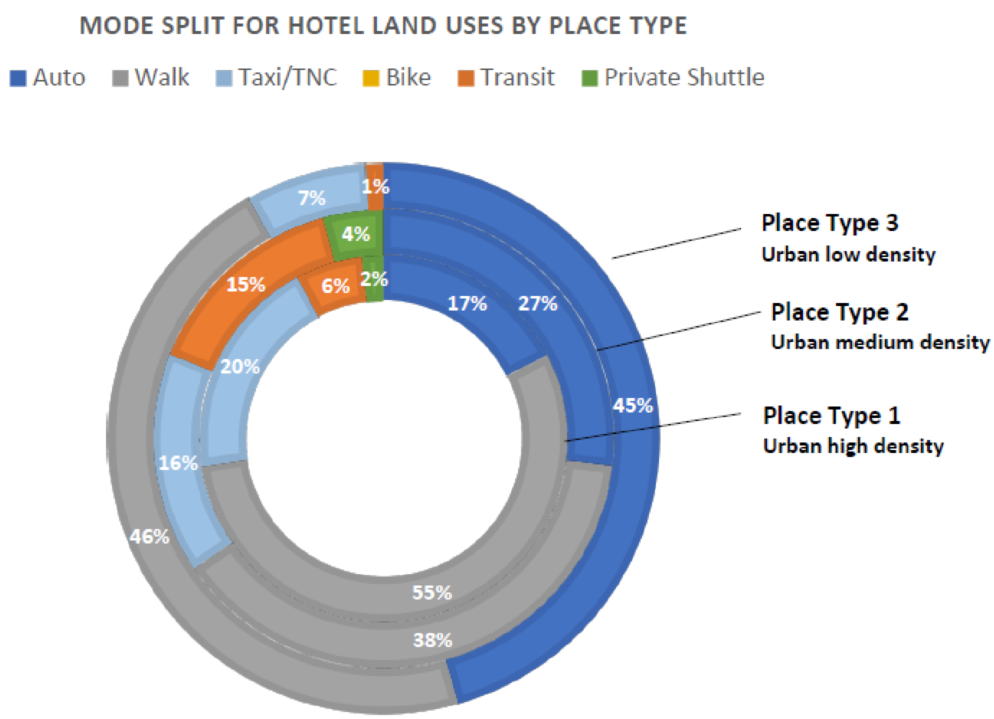


Figure 1 Mode Split by Land Use Type and Place Type

Step 3. Common Origins and Destinations

Common origins and destinations, also known as trip distribution, refer to the estimated number of trips people would take to (inbound) and from (outbound) the project and another place (e.g., another neighborhood). Common origins and destinations consist of locations in the nine San Francisco neighborhoods, east bay, north bay, and the south bay.

The methodology uses the aforementioned travel demand analysis tool to distribute a project's person[5] and vehicle[6] trips to/from a project site's neighborhood district or place type to the 12 neighborhood districts based on the following categories:

- Origin/destination (residential, office, or retail[7])
- Trip purpose (work or non-work)
- Mode (drive alone, shared ride, and transit)

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[5] The department does not distribute walk and bicycle as the impact analysis for walking/accessibility, and bicycles assume these trips to be localized and not traveling between different neighborhoods. The department does not evaluate impacts to private transit.

[6] To calculate vehicle trips, the methodology uses vehicle occupancy rates, defined as the number of passengers in a vehicle during a trip, and calculated as vehicle person trips divided by vehicle drive trips from the California Household Travel Survey trips records between different neighborhood districts. Each neighborhood district's land use type has its own unique vehicle occupancy rate. Vehicle person trip is the sum of carpool (two occupants), carpool (three of more occupants), and drive alone in the Travel Survey. Vehicle drive trips are vehicle person trips divided by assumed vehicle occupancy of 2 for carpool (two occupants), 3.5 for carpool (three or more occupants), and 1 for drive alone tripsperson(s).

[7] The California Household Travel Survey does not provide hotel or visitor trip patterns. The methodology distributes hotel or visitor trips using retail trip patterns based on the department's comparative assessment of retail trip patterns with neighborhoods visited according to the San Francisco Travel Association's 2017 San Francisco Visitor Profile.

- Directionality (inbound or outbound)

The department with the SFCTA developed trip distribution tables, stratified by the above four categories, based on the California Household Travel Survey data; this data includes 5,000 trip records starting or ending in San Francisco. Using the relative weight of these trips, per each of the four categories, the methodology provides a better granularity to assign trips to roadways and transit routes in the subsequent step as described below. See Attachment C for more details and instructions for accessing and using the tool.

The department developed recommendations on whether a project should use auto or transit trip distribution based on the project's neighborhood or place type as shown in Table 2 Recommended Level of Trip Distribution below. The department developed these recommendations by analyzing the number of California Household Travel Survey trip records available for each given neighborhood, land use type, and mode of travel (auto versus transit); the recommended geographic level of distribution below reflects the department's assessment of whether the number of trip records for a given neighborhood and mode of travel is sufficient; if it is not, then a project would use place type level of trip distribution.

Table 2. Recommended Level of Trip Distribution

Mode	Recommended Level of Trip Distribution	Example
Auto	Projects should distribute by neighborhood district, except for: • Projects in SoMa (distribute by place type), or • Projects with office in urban medium or urban low place types (distribute by place type for all project land use types)	Project with 500,000 square feet of office and 400 residential units in the Mission (a district in urban medium place type) would use place type trip distribution for the project's office and residential components
Transit	Projects should distribute by neighborhood district, except for: • Projects in urban low place type (distribute by place type), or • Projects with office in urban medium place types (distribute by place type for all project land use types)	Project with 150 residential units and 5,000 square feet of retail in the Sunset (a district in urban low place type) would use place type level trip distribution for project's residential and retail components

Step 4. Assignment

Assignment refers to the location or assignment of project vehicle trips to different streets, on-street loading zones, and driveways, and project transit trips to specific transit routes. In other words, assignment uses the results of step 2: number of project trips by different ways of travel, and step 3, percentages of those projects trips to and from common origins and destinations, to place project vehicle and transit trips onto physical locations. Roadway assignment between an origin or destination and the project site can be based on factors such as consideration for one-way versus two-way streets, access to on and off-ramps, or prohibited movements in the study area intersections. Transit assignment between an origin and destination can be based on factors such as transit travel time, number of transfers, and location of transit stop.

The methodology will multiply the percentage of taxi/TNC trips calculated from the total estimated number of vehicle trips by two to account for separate vehicle trips both to and from a site (one as the vehicle arrives, and one as the vehicle departs). The methodology will assign taxi/TNC vehicle trips to the nearest study intersection(s). At the intersection, the methodology will assign taxi/TNC vehicle trips to critical movement to the extent applicable.[8] This same methodology will apply for parent/guardian vehicle trips (pick-up/drop-off) to and from childcare and schools to the extent applicable.

FREIGHT AND PASSENGER LOADING DEMAND

The section identifies the approach to calculate loading demand, including a description of geographic unit by the study area, period, and methodology for a typical project. Refer to the loading memorandum for further guidance.

Basics

Geographic Unit of Analysis

The methodology will typically focus on the streets, including alleys, adjacent to the project site, and on-street and off-street passenger and commercial loading (and potential shared loading) zones within convenient locations of the project site, which is typically 250 linear feet of the project site.[9] The project will use the nine San Francisco neighborhoods and three place types units as described under the travel demand geographic unit of analysis subsection.

Period

For loading demand, the period will differ depending upon the land use and type of loading activity. The periods defined below assume residential, office, and commercial land uses and commercial or passenger loading. For other land uses and other loading activities, the department will determine the appropriate period that loading demand and activity should be analyzed.

For commercial vehicle loading, such as freight and delivery service vehicles, the weekday mid-day is the peak period (Tuesday, Wednesday, or Thursday from 11 a.m. to 2 p.m.).

For passenger vehicle loading, consisting of private and for-hire vehicles, the weekday p.m. hours are the peak period (Wednesday, Thursday, or Friday, from 5 p.m. to 8 p.m.).

Methodology

Loading demand analysis represents how the estimated number of loading trips will affect the use of available loading facilities. The methodology calculates demand for freight and delivery, and passenger loading.

---

[8] The department data collection effort in spring 2017 estimated the number of person trips by mode generated by a development. While there is limited information regarding the distribution of TNCs across the surrounding street network beyond an immediate block face, the methodology above intends to appropriately account for the vehicle trips produced by TNCs to adequately analyze their effects on localized issues (e.g., passenger loading, localized safety).

[9] For the purposes of this memorandum, “convenient” refers to locations that meet people’s loading and unloading needs, including people with disabilities. Convenient generally is within 250 linear feet of the project site, but depends on contextual characteristics such as proximity to an alley, curb lane, or ADA curb ramp; distance and type of intersections in relation to the project site; and directionality of project frontage roadways.

Freight and Delivery Loading

Freight and delivery loading demand represents the number of spaces generated by a particular land use during the peak hour throughout the average weekday peak period. Table 3 presents freight and delivery loading daily demand rates.

The department bases these rates on a 1980 study of goods movement activity in San Francisco.

Table 3. Freight and Delivery Daily Trip Demand Rates per 1,000 Square Feet of Floor Area by Land Use

Land Use	Rate per 1,000 square feet
Office	0.21
Retail (Composite)[10]	0.22
Restaurant/Bar	3.60
Services	
Hotel	0.09
Institution	0.10
Warehousing	0.46
Manufacturing	0.51
Light Industry	0.65
Residential	0.03
Source: Center City Pedestrian Circulation and Goods Movement Study (Wilbur Smith & Associates for San Francisco Department of City Planning). September 1980.	

The freight and delivery loading demand calculation formula is:

$$\text{Number of spaces per 1,000 GSF} = \left[\frac{(1.25)(R)}{9}\right]/(2.4)$$

Where,

R = Daily truck trip demand rates per 1,000 GSF of use from Table 3;

1.25 = Peak hour deliveries at 25% higher rate than other hours;

9 = Number of hours deliveries are made (8:00 a.m. – 5:00 p.m.); and

2.4 = Assuming average truck delivery/pick up of 25 minutes, 2.4 trucks could be accommodated per hour.

Round up the demand calculation to the nearest whole number of loading spaces (e.g. 1.4 spaces would round up to two spaces).

---

[10] Retail includes but not limited to personal services, wholesale, apparel, drug store, and specialty shops.

Passenger Loading

Passenger loading demand is expressed as the required number of loading spaces generated by the land use during any one minute of the peak hour throughout the average peak period or if the project site is located along a non-center running public transit rapid network route or unprotected bicycle facility (e.g., no safe hit post, parking/loading in between, or raised sidewalk), then calculate demand for any one minute of the peak 15 minutes of the average peak period.

Passenger loading demand is calculated by using the mode split percentage of all person trips going to a particular project site that would involve a passenger loading instance occurring at the curb near the project site. These percentages (also known as passenger loading percentage), are shown in Table 4 by land use and place type. These passenger loading percentages are calculated using the planning department's intercept survey data collection in spring 2017.

Table 4. Curb Loading-type p.m. Peak Period Mode Splits by Land Use and Place Type Geography

Land Use	Geography	Number of Sites	Taxi/TNC%	Private Vehicle Drop-off (50% of HOV Passenger Mode)	Passenger Loading %
Office	Place Type 1	8	6.1%	1.2%	7.3%
	Place Type 2	7	11.0%	2.4%	13.4%
	Place Type 3	3	2.0%	5.1%	7.1%
Retail	Place Type 1	4	4.6%	0.9%	5.5%
	Place Type 2	10	1.4%	1.6%	3.0%
	Place Type 3	7	1.0%	4.2%	5.2%
Residential	Place Type 1	4	6.0%	2.8%	8.8%
	Place Type 2	9	3.5%	3.7%	7.2%
	Place Type 3	2	4.2%	2.7%	6.9%
Hotel	Place Type 1	4	19.6%	2.2%	21.8%
	Place Type 2	5	15.6%	4.1%	19.7%
	Place Type 3	2	7.5%	6.0%	13.5%

Note: Because survey respondents were not asked to specify if they were dropped off or simply part of a group arriving in single vehicle, the methodology assumed a 50 percent factor for HOV trips for purposes of loading analysis.

The passenger loading demand calculation formula is as such:

$$\text{Peak hour spaces of passenger loading demand} = \left[\frac{P*L*D}{60}\right]$$

Where,

P = Person trip generated by the land use during the p.m. peak hour based on the land use type's trip generation rate as shown in Table 1 and the amount of land use;

L = Loading mode type percentage (mode split of all person trips going to a project site involving passenger loading occurring at the curb) as shown in Table 4 for the land use and place type; and

D = The average stop duration is assumed to be 1 minute.

Peak 15 minutes spaces of passenger loading demand = $[\left(\left(\frac{P*L}{2}\right)*D\right)/15)]$

Where,

P = Person trip generated by the land use during the p.m. peak hour based on the land use type's trip generation rate as shown in Table 1 and the amount of land use;

L = Loading mode type percentage (mode split of all person trips going to a project site involving passenger loading occurring at the curb) as shown in Table 4 for the land use and place type;

2 = Assumes that half of peak hour loading demand occurs during the peak 15 minutes; and

D = The average stop duration is assumed to be 1 minute.

Round up the demand calculation to the nearest whole number of loading spaces (e.g. 1.4 spaces would round up to two spaces). For projects that consist of more than one building, the methodology should calculate passenger loading demand for the lobby entrance at each individual building.

OTHER

The guidance provided in this memorandum assumes a typical land use development project. This section describes the type of additional or different information that may be necessary to calculate travel demand for the following circumstances: atypical land use, cumulative, an area plan, and substantial rezoning outside of area plans.

Atypical Land Use

This section applies to projects that are not typical land use types (e.g. residential, office, retail, or hotel) or do not have the same travel behaviors as these typical land use types.

Project Description

The project description must include the physical features to the extent applicable to calculate trip generation. Examples include:

- For student housing, number of rooms [text, table]
- For entertainment uses, number of seats and/or standing capacity (maximum occupancy) [text, table]
- For schools and child care facilities, capacity by age and number of teaches and employees [text, table]

Period

In some instances, the most overall trips people would take to and from a proposed project, may occur at different periods (a.m., midday, post p.m. peak, and/or weekend) for smaller geographic areas (e.g., a segment of a street) in existing conditions or as a result of the project, or the project may result in substantial disparity in travel demand at different periods (e.g., special events). In these instances, the methodology may substantiate the use of different periods in addition to or other than the weekday p.m. peak. The methodology should also use the weekday daily time period as a unit of analysis to examine the overall daily activity travel patterns and behavior of a project in its entirety. Trip generation rates to estimate the number of project person trips during an atypical peak period must be justified and in consultation with the department. Refer to Chapter 6 of Attachment B for a.m. peak hour trip generation rates based on the department data collection in spring 2017.

Counts

The methodology should include counts of people approaching and leaving sites with similar characteristics (e.g. project size and use) and location as those of the proposed project in order to estimate trip generation. The methodology may include prior counts collected from other studies or sources combined with (e.g., an average of three different dates with counts at sites with similar characteristics) or counts collected specifically for the project. To conduct a full accounting of person trips to and from individual sites, the methodology may conduct video counts of all access and egress points to a site (e.g. pedestrian entryways to garages and pedestrian doors with exterior access). Refer to Chapter 3 of Attachment B for an example of the department's effort to conduct video counts collection. The use of prior counts or the counts collection approach must be justified and in consultation with the department.

Intercept Survey

The intercept survey should gather two key pieces of information: how an individual arriving at the survey site traveled to that site and where they traveled from. In the case of individuals intercepted while leaving the site, the survey should ask how they are traveling to their next destination and location of that destination. These data points allow for an assessment of both mode split and trip distribution at the site level. Refer to Chapter 3 of Attachment B for an example intercept survey.

Methodology

The methodology to calculate demand for freight and delivery, and passenger loading could vary for atypical land uses. In those instances, the department will determine the appropriate methodology.

Cumulative

For certain projects, reasonably foreseeable projects in the study area may affect mode split for the project. Examples include major transit projects such as new or increased service or a significant change in density nearby. In these cases, trip generation and trip distribution assumptions would remain the same as existing conditions. However, the analysis could consider changes to the mode split under cumulative conditions derived through approaches such as modeling future travel behaviors with SFCTA's travel demand model or based on policy goals.

Area Plans

For area plans, the methodology would require running a travel demand model with the project's proposed land use and/or infrastructure improvement to estimate trip generation, mode split, and trip distribution. The planning department will determine whether to use a list –based, projections-based, or modified approach to identify a list of cumulative projects in the project study area to include in the cumulative model run. Refer to the guidelines for direction on developing a list of and or modeling reasonably foreseeable projects.

Substantial Rezoning Outside of Area Plans

On occasion, project sponsors may propose redevelopment of large areas consisting of multi-structure, multi-phased development. The methodology to estimate travel demand for these rezoning projects would mostly remain the same as the typical land uses, except that these rezoning projects shall also account for the number of person trips that may remain inside the project area, also known as trip internalization. Trip internalization is mostly relevant to large, mixed-use developments that include various land uses that would produce a significant number of trips that remain within the development. Refer to Attachment D for an example steps on how to estimate trip internalization.

As noted above, should the travel demand methodology choose to substantiate the use of periods in addition to or other than the weekday p.m. peak, the methodology must also substantiate how to estimate these different period's trip generation rates. Examples include using Chapter 6 of Attachment B, the existing *Institute of Transportation Engineers Trip Generation Manual* to calculate a.m. percentage of daily trip rates, or if a land use has a majority of outbound trips in the a.m. peak period and a majority of p.m. inbound trips in the p.m. peak period, such as a residential use, the methodology may choose to reverse the distribution of the p.m. peak period to estimate a.m. peak distribution. The department will determine the appropriate approach based on the characteristics of the project.

ATTACHMENT A

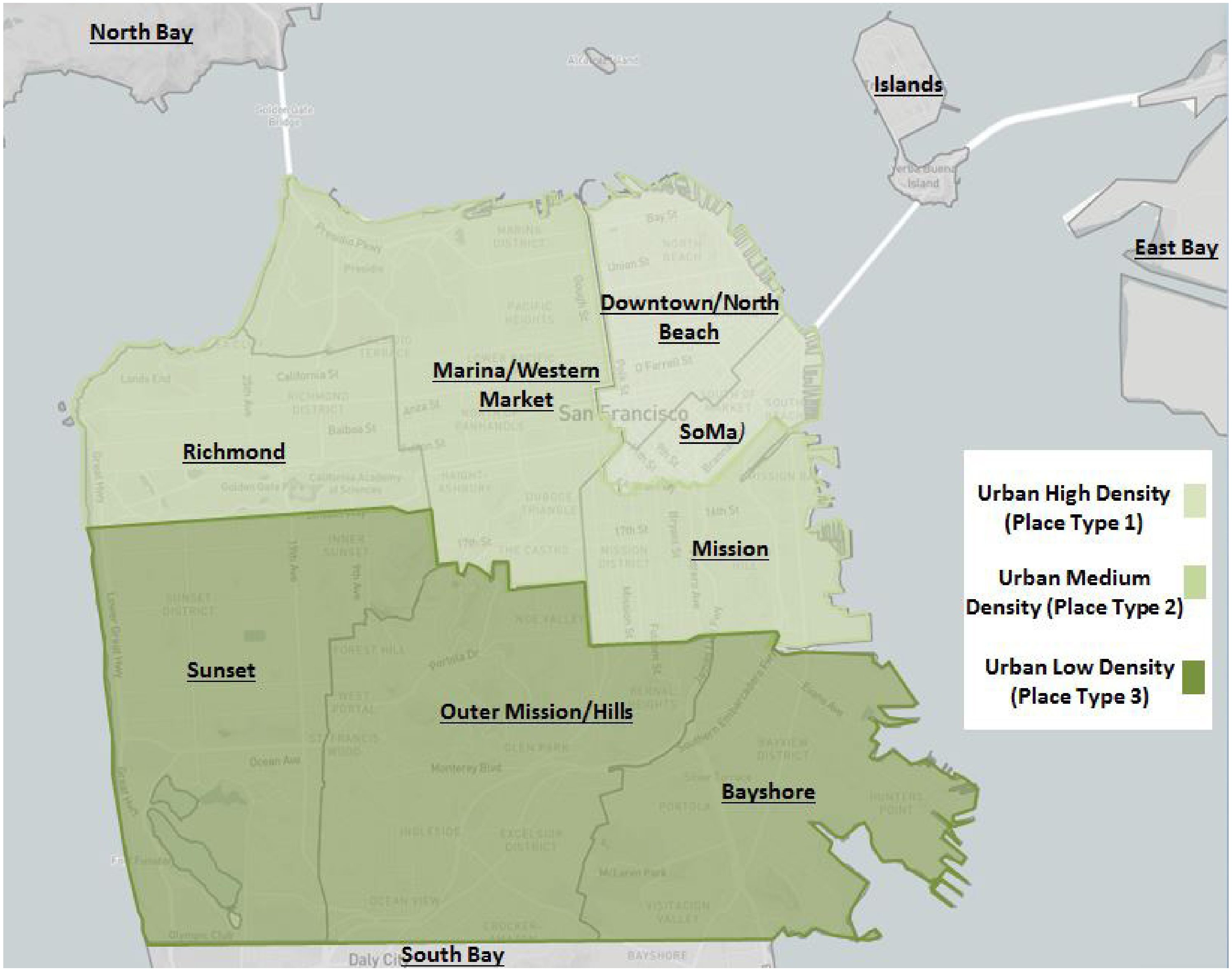
Travel Demand Geographic Unit of Analysis Maps

FIGURE 1

Neighborhood District Boundaries Map

FIGURE 2

Placetype Map



ATTACHMENT B

San Francisco Travel Demand Update: Data Collection and Analysis

Prepared for

San Francisco
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332 Pine Street, Floor 4
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San Francisco Travel Demand Update:

Data Collection and Analysis

SF15-0864

June 29, 2018

Table of Contents

Chapter 1. Introduction ... 1

1.1 General Approach ... 1

1.1.1 Land Uses Included ... 3

1.1.2 Time Period for Mode Choice ... 6

1.2 Data Collected ... 7

1.2.1 Person Trip Generation ... 7

1.2.2 Mode Choice ... 7

1.2.3 Origins and Destinations ... 8

1.2.4 Loading Demand ... 8

Chapter 2. Overview of Data Sources ... 10

Chapter 3. Data Collection ... 14

3.1 Site Selection ... 14

3.1.1 General Considerations for Data Collection Sites ... 14

3.1.2 Site Selection: Person Trip Generation ... 16

3.1.3 Site Selection: Intercept Surveys ... 18

3.2 Video Data Collection ... 20

3.3 Intercept Surveys ... 20

Chapter 4. Supplemental Data Sources ... 23

4.1 California Household Travel Survey ... 23

4.1.1 Trip Distribution ... 24

4.1.2 Trip Distribution by Mode ... 26

4.1.3 Vehicle Occupancy ... 26

4.1.4 Residential Trip Generation ... 28

Chapter 5. Geographic Analysis ... 30

5.1 Superdistricts ... 30

5.1.1 Advantages and Disadvantages ... 30

5.2 Traffic Analysis Zones ... 33

5.2.1 Advantages and Disadvantages ... 33

5.3 Place Types by TAZ Auto Mode Share ... 35

5.3.1 Advantages and Disadvantages ... 35

5.4 SF-CHAMP Neighborhoods ... 38

5.4.1 Advantages and Disadvantages ... 38

5.5 Place Types by SF-CHAMP Neighborhood ... 40

5.5.1 Advantages and Disadvantages ... 40

5.6 Recommended Geographic Analysis ... 42

Chapter 6. Findings 44
6.1 Person Trip Generation 44
6.1.1 Office 47
6.1.2 Retail 50
6.1.3 Residential 54
6.1.4 Hotel 62
6.2 Extended PM Peak Mode Split 64
6.2.1 Office 68
6.2.2 Retail 70
6.2.3 Residential 72
6.2.4 Hotel 74
6.3 Trip Distribution 76
6.3.1 Survey Data 76
6.3.2 CHTS Data at Place Type Level 78
6.3.3 Blended Data at Place Type Level 79
6.3.4 CHTS Data at Neighborhood Level 90
Chapter 7. Loading Demand 91
7.1 Key Terms and Concepts 92
7.1.1 Vehicle Types 92
7.1.2 Activity Types 95
7.1.3 Loading Facility Types 98
7.1.4 Summary 102
7.2 Loading Analysis Methodology 103
7.2.1 Loading Observations 103
7.2.2 Intercept Surveys 105
7.2.3 Additional Observations 105
7.3 Loading Findings 106
7.3.1 Loading Zone Occupancy 106
7.3.2 Truck Loading Observations 110
7.3.3 Intercept Survey Data 112
7.3.4 Length of Stay 114
7.4 Recommended Methodology Updates 116
7.4.1 Recommendations 116
7.4.2 Example Projects and Methodology Calibration 120
7.4.3 Validation via Alternative Methodology 122
7.4.4 Validation Based on Additional Study Site 125
7.4.5 Summary of Validation and Next Steps 126

Chapter 8. Conclusions and Next Steps 127
8.1 Limitations of this Study 127
8.2 Potential Uses of These Findings 130
Appendices 131

List of Figures

Figure 1: Survey Instructions 13
Figure 2: Excerpt of site reconnaissance form for 2121 3rd Street. 16
Figure 3: Map of Sites (Person Trip Generation) 17
Figure 4: Map of Sites (Intercept Surveys) 19
Figure 5: Map of Superdistricts 31
Figure 6: Map of Greater Regions 32
Figure 7: Example Map of TAZs 34
Figure 8: Place Types by TAZ Auto Mode Share 37
Figure 9: Map of SF-CHAMP Neighborhoods 39
Figure 10: Map of Place Types from SF-CHAMP Neighborhoods 41
Figure 11: Person Trips by Time of Day, All Sites – Office 45
Figure 12: Person Trips by Time of Day, All Sites – Retail 45
Figure 13: Person Trips by Time of Day, All Sites – Residential 46
Figure 14: Person Trips by Time of Day, All Trips – Hotel 46
Figure 15: Daily Person Trip Generation – Office 48
Figure 16: AM Peak Hour Person Trip Generation – Office 49
Figure 17: PM Peak Hour Person Trip Generation – Office 49
Figure 18: Daily Person Trip Generation – Retail 51
Figure 19: AM Peak Hour Person Trip Generation – Retail 51
Figure 20: PM Peak Hour Person Trip Generation – Retail 52
Figure 21: Daily Person Trip Generation per du– Residential 57
Figure 22: AM Peak Hour Person Trip Generation per du – Residential 58
Figure 23: PM Peak Hour Person Trip Generation per du – Residential 58
Figure 24: Daily Person Trip Generation per Bedroom – Residential 60
Figure 25: AM Peak Hour Person Trip Generation by Bedroom – Residential 60
Figure 26: PM Peak Hour Person Trip Generation by Bedroom – Residential 61
Figure 27: Daily Person Trip Generation – Hotel 63
Figure 28: AM Peak Hour Person Trip Generation – Hotel 63
Figure 29: PM Peak Hour Person Trip Generation – Hotel 64
Figure 30: Mode Splits by Place Type – Office 69
Figure 31: Auto Mode Share Scatter – Office 69
Figure 32: Mode Splits by Place Type – Retail 70
Figure 33: Auto Mode Share Scatter – Retail 71
Figure 34: Mode Splits by Place Type – Residential 72
Figure 35: Auto Mode Share Scatter – Residential 73
Figure 36: Mode Splits by Place Type – Hotel 74

Figure 37: Auto Mode Share Scatter – Hotel 75
Figure 38: Trip Distribution – Office – Place Type 1 81
Figure 39: Trip Distribution – Office – Place Type 2 82
Figure 40: Trip Distribution – Office – Place Type 3 83
Figure 41: Trip Distribution – Retail – Place Type 1 84
Figure 42: Trip Distribution – Retail – Place Type 2 85
Figure 43: Trip Distribution – Retail – Place Type 3 86
Figure 44: Trip Distribution – Residential – Place Type 1 87
Figure 45: Trip Distribution – Residential – Place Type 2 88
Figure 46: Trip Distribution – Residential – Place Type 3 89
Figure 47: A typical heavy truck. 93
Figure 48: Two typical light trucks. 94
Figure 49: A small panel van 94
Figure 50: A typical (off-street) freight loading instance 96
Figure 51: A typical package delivery loading instance 97
Figure 52: A typical passenger loading instance 98
Figure 53: A typical off-street freight loading facility 100
Figure 54: A typical off-street passenger loading facility 101
Figure 55: Two typical on-street loading facilities 101
Figure 56: Loading activities occurring in bicycle facilities 102
Figure 57: Average Loading Space Occupancy by Time of Day, All Spaces 106
Figure 58: Average Loading Space Occupancy by Time of Day, Curb Spaces Only 108
Figure 59: Percentage of Loading Zones at Capacity by Time of Day 109
Figure 60: Total Observed Loading Zone Occupancy by Select Vehicle Classes at Each Land Use by Hour 111
Figure 61: Observed Truck Loading Arrivals by Hour, All Data Collection Sites 112
Figure 62: Loading Flowchart 117

List of Tables

Table 1: CHTS Trip Purposes and Land Use-type Flags 25
Table 2: Average Vehicle Occupancy by Land Use-type and Geography 28
Table 3: Person-Trip Generation Rates – Office 48
Table 4: Person-Trip Generation Rates – Retail 50
Table 5: Comparison of Potential Retail Cutpoints 53
Table 6: PM Peak Hour Residential Trip Generation By Methodology 55
Table 7: Daily Peak Hour Residential Trip Generation By Methodology 55
Table 8: Person-Trip Generation Rates – Residential 57
Table 9: Person-Trip Generation Rates per Bedroom – Residential 59
Table 10: Person-Trip Generation Rates – Hotel 62
Table 11: Mode Split by Place Type and Land Use 66
Table 12: Mode Split by Place Type and Land Use (Summary) 67
Table 13: Trip Distribution - Office, by Place Type 76
Table 14: Trip Distribution - Retail, by Place Type 77
Table 15: Trip Distribution - Residential, by Place Type 77
Table 16: Trip Distribution - Hotel, by Place Type 77
Table 17: Trip Distribution "Office-type", by Place Type 78
Table 18: Trip Distribution "Retail-type", by Place Type 78
Table 19: Trip Distribution “Residential-type”, by Place Type 79
Table 20: Trip Distribution Office, by Place Type (Blended) 79
Table 21: Trip Distribution Retail, by Place Type (Blended) 80
Table 22: Trip Distribution Residential, by Place Type (Blended) 80
Table 23: Examples of Loading Activities by Location and Type 99
Table 24: Peaking Factors for Freight Activity 112
Table 25: Loading-type PM Peak Period Mode Splits by Land Use and Geography 113
Table 26: Dwell Time by Vehicle Type and Activity (hours: minutes: seconds) 114
Table 27: Initial Validation Results 121
Table 28: Simple Peaking Factor vs. Poisson Distribution (Passenger Loading Case) 124
Table 29: Revised Curb Loading Demand Estimates Based on Reduced Delivery Loading Duration 125

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Chapter 1. Introduction

In 2015, the San Francisco Planning Department ("SF Planning") hired Fehr & Peers to assist with an update to the trip generation, trip distribution, mode-split and loading demand methodologies contained within SF Planning's Transportation Impact Analysis Guidelines for Environmental Review ("SF Guidelines"). The current SF Guidelines were published in 2002, and the data on which they are based date to the 1980s and 1990s. The specific tasks were to update the existing SF Guidelines with new data (including primary data collection and analysis); derive updated parameters including trip generation rates, trip distribution tables, mode splits, and loading demand rates; review the current geographic analysis structure; and examine whether any major assumptions built into the SF Guidelines need revisiting. In addition to SF Planning, the San Francisco Municipal Transportation Agency and San Francisco County Transportation Authority also provided feedback on this effort.

This report summarizes the data collection and analysis methodologies used in this process, and provides the results of the data analysis in the form of tables addressing trip generation, mode split, trip distribution, and loading demand. The report discusses the data collection plan (Chapter 1), analytical framework (Chapter 2), and data collection methodology, including site selection (Chapter 3). Data sources beyond the newly collected data are discussed (Chapter 4), and the pros and cons of a range of geographic analysis units are considered (Chapter 5). The details and results of the data analyses are presented for both travel demand (Chapter 6) and loading demand (Chapter 7), and conclusions and next steps are discussed (Chapter 8).

This report largely presents the methodology and data results in a stand-alone fashion for initial review and informational purposes; it is intended to be a succinct presentation of both process and findings. It does not directly address the degree of change these rates represent compared to the existing SF Guidelines except in the case of trip generation, nor does it present detailed policy recommendations. Planning Department staff have separately prepared case studies showing how updates to travel demand rates, mode split percentages, and trip distribution could affect analysis for hypothetical projects.

1.1 General Approach

Fehr & Peers worked with SF Planning staff to identify key areas of concern and data points in need of updated information. The scope of work for this effort (included as **Appendix A**) was developed in order to efficiently provide quantitative backing for updates to the most common land uses among new development considered in San Francisco both now and in the future.

The overall approach to this data collection effort was to focus on updating information regarding the following analysis categories:

- **Trip Generation**, or the number of person trips to and from a project, per unit of land use;
- **Mode Choice**, or the method by which people travel to and from a project;
- **Trip Distribution**, or where people are traveling to or from; and
- **Loading Demand**, or how much passenger and freight loading activity is associated with a project, per unit of land use.

The first three elements above are used in travel demand analysis to calculate vehicle trips (including for-hire vehicles, such as taxis and Transportation Network Company[1] a.k.a TNC trips), transit trips (both public transit and private transit, such as employer shuttles), walk trips, and bike trips, including those trips' common origins and destinations. This process forms the backbone of transportation impact analysis under the current SF Guidelines.

The overall approach to updating these data points was to collect direct data from sites that represent typical development in San Francisco, via a combination of 24-hour video counts and in-person intercept surveys during an extended PM peak period (3:00 to 7:00 PM).[2] The video counts provide a full accounting of the number of people entering or exiting an individual development, while the intercept surveys provide insight into how and where people travel to and from the site. This direct data collection allows for a recent, targeted look at travel patterns specifically at a building level. Where appropriate, secondary data sources, including census data and household travel survey data, were integrated into the analysis to supplement initial findings.

In order to focus the data collection effort, emphasis was placed on updating the most frequently used rates, and capturing the types of development that reflect ongoing development patterns in San Francisco. A secondary emphasis was placed on identifying land uses where common sources for trip making behavior (such as census journey-to-work data) were unable to fully capture trip-making patterns, as is the case for hotel uses, which are primarily visited by non-residents of San Francisco. This resulted in the identification of four key land use categories for which new travel data were collected.

[1] Transportation Network Companies (TNCs) are regulated by the California Public Utilities Commission and act as dispatchers of large numbers of private cars in taxi-like operation that are hailed via phone or phone/ computer application.

[2] The rationale for selecting an extended PM peak period of 3:00 to 7:00 PM is discussed in section 1.1.2.

1.1.1 Land Uses Included

Four land uses were identified as most frequently being included in development applications: office, retail, residential, and hotel. While many sites in San Francisco include more than one land use, this study looked only at single land uses with individual access points. This decision was made to help focus solely on single uses; future policy direction and analysis may determine how travel demand for multi-use projects should be calculated from single-use rates.

Office

The office land use category consists of traditional office buildings, i.e. buildings whose space is used primarily for administrative, clerical, consulting, or other professional service work. Office land uses are concentrated in downtown San Francisco, particularly the Financial District and SoMa, but large and small office land uses can be found throughout the city. Two typical office data collection sites are shown in **Inset Figure 1**.

Inset Figure 1: Two typical office data collection sites. Left: 535 Mission Street; right: 221 Pine Street. Source: Google Street View, 2017.

The office land use category is also often used as a proxy for less traditional employment uses (such as to calculate travel demand for employees at schools, for instance, or for non-traditional work spaces such as co-working space or live-work units). Traditionally, travel demand for office uses has been calculated based on thousand square feet of development area (ksf), with supplementary information on how many square feet are provided per employee. This data collection effort continues to analyze office trip generation on the basis of trips per thousand square feet, and has not updated the assumed number of square feet per employee.[3]

Retail

The retail land use category consists of general shops, pharmacies, department stores, convenience stores, laundromats, dry cleaners, and some types of restaurants (such as coffee shops). A 'typical' retail use is a store that sells goods or services directly to visitors, however the term is generally used as an umbrella category, particularly in development applications where specific retail tenants have not yet been identified. Given that there are many different types of retail uses, this umbrella category encompasses a wide array of potential uses. The most common type of retail varies by city neighborhood; in the Financial District, there may be a higher rate of convenience stores, small pharmacies, and formula retail, while in more residential neighborhoods like the Sunset or Balboa Park there may be more stand-alone facilities and locally serving commercial. Two typical retail data collection sites are shown in **Inset Figure 2**. Traditionally, travel demand for retail uses has been calculated based on thousand square feet of development area (ksf).

Inset Figure 2: Two typical retail data collection sites. Top: 535 Valencia Street; bottom: 3001 Taraval Street. Source: Google Street View, 2017.

Most trips generated to retail sites are made by visitors, though a substantial number of trips may also be made by employees. However, many of the most readily available secondary sources of information on transportation mode are focused on employee trips only. As such, intercept surveys represent an opportunity to collect more information that is not available through secondary sources, particularly for

[3] Historically, some applicants have chosen to adjust parking demand if they suspect their employee density, or number of employees per thousand square feet, is noticeably higher or lower than the assumptions in the Guidelines. We have opted to focus on observed trips per ksf rather than rates based on number of employees, as it represents the most easily analyzed unit at the environmental analysis stage, when office tenants are often not yet identified; additionally, employee counts were not available for many of the study locations. Other studies have found that employee densities may be around 8 to 9 percent lower than current estimates used in the SF Guidelines (October 2017 Report to Planning Commission on Jobs-Housing Capacity & Growth; http://commissions.sfplanning.org/cpcpackets/Jobs%20Housing%20Capacity%20Informational%20Oct2017_FINAL.pdf)

retail uses that tend to generate a high share of "pass-by" trips, i.e. trips that are made en route between two primary locations, such as home and work.

Residential

The residential land use category includes single family and multifamily homes, including houses, apartments, townhomes, and condominiums. The residential sites that were the focus of the present data collection effort were multifamily sites, as it would be inefficient to collect video count and intercept survey data at single-family homes, and single-family developments do not represent the typical construction type subject to transportation review. Two typical residential data collection sites are shown in **Inset Figure 3**.

Fehr and Peers has expressed residential land use intensity in terms of dwelling units (du) and the number of bedrooms in each du, which serves as a proxy for household size. Section 6.1.3 discusses how trip generation rate results differed between these analysis units in greater detail.

Inset Figure 3: Two typical residential data collection sites. Top: 1998 Market Street; bottom: 55 Chumasero Street. Source: Google Street View, 2017.

Hotel

The hotel category includes hotels, motels, and any other use where rooms are provided on a nightly or weekly basis directly to visitors. Two typical hotel data collection sites are shown in **Inset Figure 4.**

Travel demand for hotel uses is analyzed on a per room basis. Because most hotel users are visitors to San Francisco, it can be difficult to accurately express trip mode and distribution due to a lack of secondary sources (for instance, census data would not capture hotel visitors who do not live in San Francisco). As such, intercept surveys and direct data collection represent the best potential source of data for travel patterns among hotel guests.

Inset Figure 4: Two typical hotel data collection sites. Top: 1500 Sutter Street; bottom: 1234 Great Highway. Source: Google Street View, 2017.

1.1.2 Time Period for Mode Choice

Intercept survey data collection occurred during the extended PM peak period, defined as the window from 3:00 to 7:00 PM. This window was selected because it includes the default analysis period for transportation impact analyses in San Francisco (i.e., the PM peak hour, which is the hour falling between 4:00 and 6:00 PM with the highest traffic volumes) as well as including the PM Peak period reported in runs of SF-CHAMP, the City's activity-based travel demand model.[4]

SF Planning typically requires transportation analysis to analyze patterns during the PM peak hour because it represents the period when the transportation network is most congested across modes. This includes crowding on SFMTA transit service as well as congestion on local roadways. As the amount of travel activity within San Francisco continues to increase, congested conditions may occur outside the traditional PM peak

[4] SF-CHAMP, the San Francisco Chained Activity Modeling Process, is discussed in greater detail in section 0. The PM period analyzed in SF-CHAMP runs from 3:30 PM to 6:30 PM.

hour. A focus on the extended PM peak period helps ensure that intercept survey data are relevant to changing travel patterns.

1.2 Data Collected

As discussed in section 1.1, the emphasis of this data collection effort was to identify and collect data that were not readily available through other sources. The primary challenge in adapting other data sources is that they typically are not presented at a building level; that is, they may show overall choices in travel mode, or travel patterns, but do not represent a rate of trip making for one specific building or land use. They may also only capture a subset of trip types; for instance, census data asks only about commute trips, which represent only around one quarter to one third of all trips in the Bay Area, as estimated by the MTC travel model.[5]

1.2.1 Person Trip Generation

Person trip generation is the total number of person trips associated with a given amount of a land use; for instance, the number of people entering and leaving an office expressed as a rate per 1,000 square feet (ksf). In order to collect person trip data, Fehr & Peers contracted with data collection firm IDAX Data Solutions ("IDAX"). Using video technology, all trips in and out of doorways and driveways were tallied for each site. Trips via doorways are expressed directly in person trips, as access is on foot, while trips via driveways are expressed in vehicle trips. Person trips are calculated from vehicle trips via assumptions regarding average vehicle occupancy for each use; these assumptions are based on data from the California Household Travel Survey and calculated via methods described in section 4.1.1.[6]

1.2.2 Mode Choice

Mode choice represents the ways people travel from place to place. Historically, the SF Guidelines have represented these transportation modes as auto modes (driving alone or with passengers, taking a taxi, or riding a motorcycle), walking, transit (such as bus, light rail, BART, or Caltrain), and all other modes (which includes bicycling). Alternatively, mode choice can be thought of by the categories of private auto trips (driving alone or with passengers), taxi/TNC trips, public transit trips, private transit trips (such as private shuttles), walk trips, and bike trips; these categories provide a slightly higher level of nuance simply based on expanding the categories currently in use

[5] Data taken from estimations of regional trip purposes from MTC Travel Model One, v0.6.
[6] Direct observations of vehicle occupancy at driveways were not used due to difficulty in accurate assessment of the number of vehicle occupants from the level of quality found in data collection cameras.

Individuals choose a mode based on a wide array of factors, including the modes available to them for a certain trip (e.g., whether they have access to a car or bike, and whether the nearest bus travels to where they want to go), travel time for each mode, comfort, and the cost and convenience of each mode. Additionally, individuals may value time, cost, comfort, and convenience at different levels depending on a wide array of socio-economic factors or travel purpose; these values ultimately factor into their choice of mode for a given trip.

Mode choice is an input into determining how an individual person trip may affect the overall transportation system by indicating what vehicle, right-of-way, and termini that an individual may use.

1.2.3 Origins and Destinations

Origins and destinations represent where people traveled from immediately before arriving at a site (origin) and where they are traveling to immediately after leaving a site (destination). In combination with an individual's mode choice, knowing origin and destination helps to determine which transportation facilities they may use. For instance, if some individuals are identified as taking transit to a site in the San Francisco Financial District from the East Bay, they are likely using BART or AC Transit Transbay service. Knowing the individuals' specific origins and destinations (especially their proximity to BART stations) would enable a better assumption about which transit service they would likely use. In other cases, a large number of options may exist (such as driving trips along the high-connectivity urban street grid) and it may not be feasible to identify which transportation facilities would be used for such trips.

Knowing the origin or destination of individuals who drive or use other vehicle modes also provides the information necessary to estimate vehicle miles traveled (VMT) on a site basis. VMT provides a simple method for translating travel demand for a site into the amount and distance a project may cause people to drive[7].

1.2.4 Loading Demand

Loading demand represents how the trips generated by a site will affect the use of available loading space. This loading space may be off-street, such as in a loading dock or driveway, or it may be on-street and occur at the curb. Off-street loading activity may involve deliveries or larger service vehicles, while on-street

[7] The above statement applies to a trip-based method of calculating VMT, in which a site's vehicle trip generation is multiplied by the average vehicle trip length. This is the most rudimentary way of calculating VMT, as it does not account for differences in whether the site is producing trips or attracting trips, how many of the trips are "pass-by" or diverted trips, or whether development of the site affects travel behavior at other sites. More complicated VMT calculation methods often involve producing new model runs to reflect how land use changes affect all trip-making behavior in the vicinity.

loading activity may be either deliveries or passenger loading (such as when an individual is dropped off or picked up). Loading demand is expressed in terms of a number of expected loading instances during peak hours, along with an average expected length of stay. The loading analysis largely involves inspection of curb occupancy data, data from other sources, and some use of doorway intercept survey data. A full discussion of the loading data collection and analysis effort is presented in Chapter 7.

Chapter 2. Overview of Data Sources

Two primary data collection methods were used to collect the data points discussed in Chapter 1: video counts, which were used to capture person trip generation, and intercept surveys, which were used to collect information on individual travel behaviors. In addition, time lapse photography was used to collect loading observations and assess general occupancy levels of loading zones adjacent to study sites.

To conduct a full accounting for person trips to and from individual sites, Fehr & Peers contracted with IDAX to conduct video counts of all access and egress points to a site. If a site had direct access from a garage (e.g. interior doorways or elevators opening on to an indoor parking garage), cameras were directed at pedestrian entryways and at garage doors / driveways. If a site did not have direct access from a garage, cameras were directed at only pedestrian entryways from the street level.

Counts were collected at both pedestrian entryways and driveways over a 24-hour period using video cameras directed at each doorway, driveway, or other entrance. Sites identified for video counts of person trips were visited, and data collection sheets were provided to the count firm conducting the video counts (a sample data request sheet is included as **Appendix B**). The key limitation to the use of video counts for doorways is that they may capture multiple "non-trips" (such as employees taking breaks, people making multiple trips to carry a delivery, or other cases where someone is neither leaving nor arriving at the location in question) that still involve entering or exiting the building. By reporting the share of responses to surveys that indicated that no trip was being made, we can infer for each land use roughly how many of these cordon crossings were not the start or end of a trip.

Pedestrian Door Counts

For pedestrian doors with external access at all sites, individuals entering or exiting the door were counted in 15-minute increments. These counts included all individuals that crossed the doorway screenline as marked on the data request sheets provided to the data collection firm.

Garage Door Counts

At sites with garages that provide direct access to buildings, counts were also performed for driveways to ensure that all trips were counted; to avoid double counting at these sites, no person trip data were collected at interior doorways, such as those connecting a garage to a building lobby. The same principles for pedestrian doors were applied to garage doors, but counts were split into three modes: automobile, bike, and walk; person trips by walking had the associated mode split from corresponding intercept surveys applied to them. This was done to accurately record trips for modes that could not be easily surveyed, such as those arriving via car and proceeding directly to a private garage. This methodology was used only for sites where a full cordon could not be established without conducting garage/driveway counts; i.e., those that had direct access from a garage to the building interior.

Vehicle trips counted at garage doors and driveways were translated into person trips by multiplying by an average vehicle occupancy (AVO) figure. This AVO depended on the site's land use type and its geographic location within San Francisco. AVO ranged from 1. 13 to 2.31[8] persons per vehicle, and had an average of 1.61 persons per vehicle overall.

Intercept Surveys

The intercept survey instrument was intended to gather two key pieces of information: how an individual arriving at the survey site traveled to that site, and where they traveled from. In the case of individuals intercepted while leaving the site, the survey instead asked how they were traveling to their next destination, and where that destination was located. These data points allowed for an assessment of both mode split and trip distribution at the site level.

Intercept surveys were conducted by individual surveyors. Each site was subject to one day of surveying during the extended PM peak period of 3:00 to 7:00 PM. During this time, surveyors were instructed to engage individuals entering or exiting the site for a brief survey.

For the surveys, the instructions for which are provided in **Figure 1**, the basic procedure involved intercepting as many individuals entering and exiting the site as possible, asking about their primary mode of travel to and from the site, and recording their responses or marking them as 'No Response'. If a respondent answered with multiple modes or asked for clarification, it was specified that the respondent should give their most recent mode of travel from their previous destination or their expected travel mode to the next destination, excluding walking.[9] These responses were recorded in 15-minute intervals. In addition to the initial mode question, individuals who drove or had a package were asked if they were making a delivery. Additionally, individuals responding that they drove were asked if they had driven alone or if they had passengers; the former was recorded as 'Drive Alone' while the latter was recorded as 'HOV Driver.'[10]

[8] See section 4.1.3 for a detailed discussion of how this parameter was derived from California Household Travel Survey data.

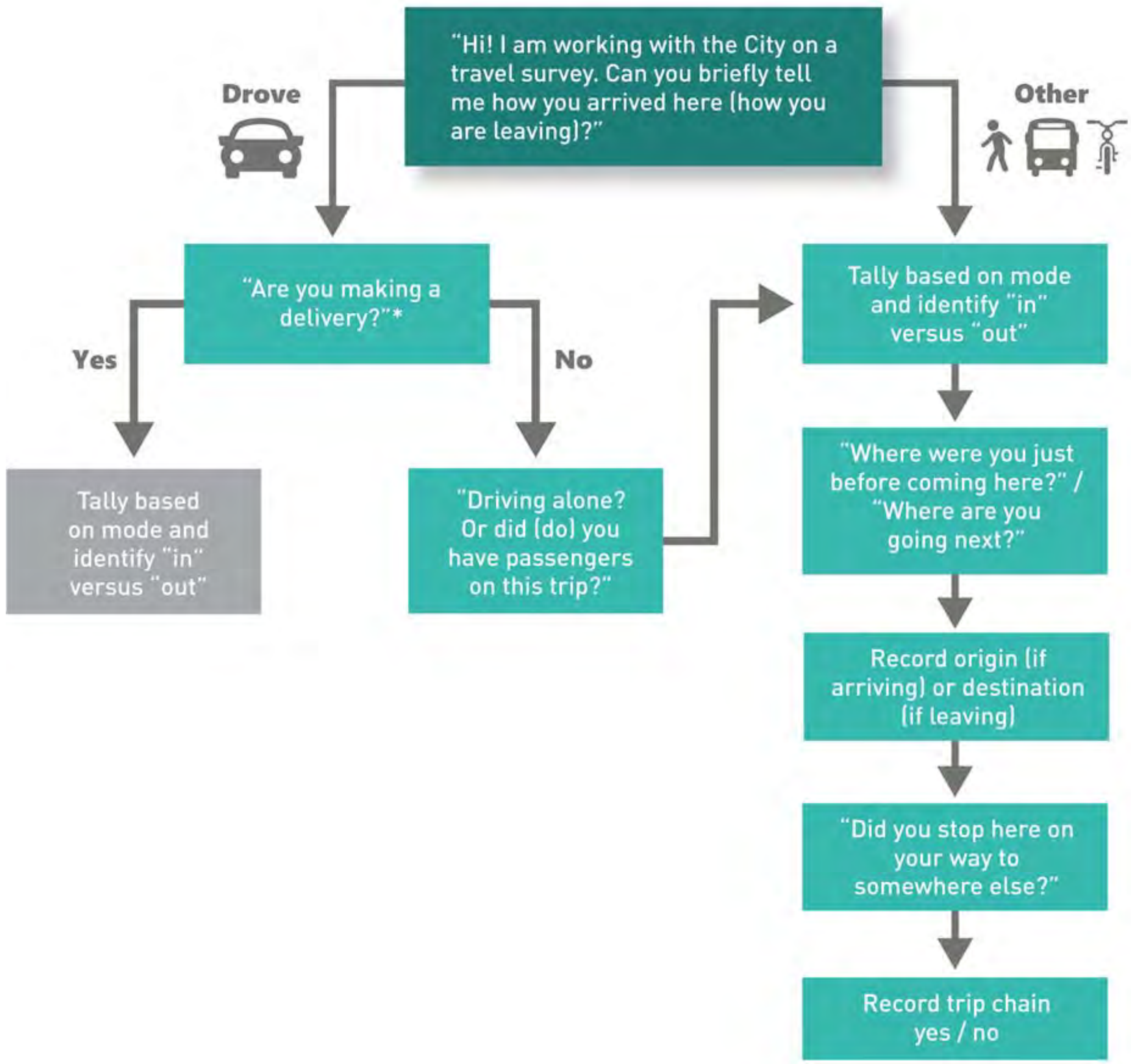
[9] The exception to this was if the entire trip was taken on foot. In such cases, 'Walk' was recorded as the mode of travel.

[10] At sites with driveways, the calculated AVO was applied to driveway trips to estimate the share of individuals arriving as solo drivers, HOV drivers, and HOV passengers.

Following the mode question, respondents were then asked where they came from immediately before arriving at the site (if they were making an inbound trip) or where they were travelling to immediately after leaving the site (if they were making an outbound trip). Surveyors were instructed to collect information based on an address or cross-street if possible, with the next highest priority being a neighborhood (if within San Francisco) or a city (if outside of San Francisco). Finally, respondents were asked whether they stopped at the site on their way to another location, allowing for estimation of what share of trips occurred as part of a larger trip chain (i.e., stopping at the store on the way home from work).

Responses were recorded on data collection sheets, with one response per line. These data collection sheets were then transferred into a Google spreadsheet for analysis at the person trip or site level. An example of the retail survey data recording sheet can be found in **Appendix C**.

Figure 1: Survey Instructions



*This question was also asked to non-drivers who were carrying a parcel, package, or food delivery. As such, some "delivery" trips were also flagged as bicycle or walk trips. The delivery flag serves as an additional indicator, and delivery trip mode was included in the sample based on the survey response.

Chapter 3. Data Collection

This chapter details the data collection process, including reconnaissance of sites and site identification and selection, preparations in advance of data collection, and notes on the data collection process itself.

3.1 Site Selection

Fehr & Peers worked in partnership with SF Planning staff to identify sites for data collection. Site selection began with a list of recently constructed buildings, based on a query of SF Planning records. Additional sites were identified through a combination of further permit database queries and manual examination of existing buildings to attempt to identify enough sites in a given category. In sum, a total of 199 potential sites for data collection were identified, of which 118 were deemed suitable for one or more methods of data collection, based on site reconnaissance. Ultimately, data were collected at 82 sites, with some sites having person trip data collected, some having interviews collected, and some having both collected.[11] **Appendix D** provides a full list of sites selected, including type of data collected, address, land use, and overall size.

Separate sets of sites were considered for the three data collection categories: person trip generation (i.e., counts), intercept surveys, and loading observations. Generally, sites were selected due to the potential to collect all three data elements at each site; however, following site reconnaissance, it was common to discover that a site's context made one or more of the data elements difficult to collect accurately. As an example, a site may have doorways situated such that person counts are easy to collect, but not have an easily visible loading zone adjacent to the site.

3.1.1 General Considerations for Data Collection Sites

Sites were selected using the following guidelines:

[11] Not all sites deemed suitable for data collection were ultimately selected for data collection. In some instances, there were more suitable sites than necessary for a given combination of land use and geography. In other instances, sites that initially appeared suitable proved to be infeasible upon further inspection or during data collection.

- Taken together, sites should provide adequate geographic coverage of the City
- Sites should represent a range of parking supply rates that are typical for the use in question
- Sites should represent a range of building sizes, including multi-family buildings with under 50 dwelling units or less than 10ksf of retail space
- Sites should be roughly generalizable to future development in terms of unit type, share of affordable housing, building age, and parking supply
- Sites should not have a shared parking garages[12]
- Sites should not contain multiple uses, or direct access between multiple uses (such as an office building with direct access from a café)
- Site entrances should be visible from and/or accessible from the public right-of-way when possible
- If possible, permission to survey should be provided by the property owner or property manager[13]

After this initial screening and prior to conducting counts and surveys, a site reconnaissance was conducted to confirm the viability of the sites. This was typically performed during the AM and/or PM peak period, so that pedestrian traffic volumes would be approximately consistent with the extended PM peak period, when surveys would be conducted (AM peak period site reconnaissance was limited to sites where we expected substantial trip-making in both the morning and evening; i.e., non-retail sites). The information collected during site reconnaissance included:

- General assessment of overall pedestrian traffic volumes, to determine appropriate surveyor staffing levels[14]
- Identification/verification of access points
- Identification of recommended surveyor and counter 'standing locations'

[12] Such sites were rejected because auto trips for the use in question could not be distinguished from auto trips generated by other uses, such as ground floor retail.

[13] For each site, we identified the property owner or manager via a combination of City records and web search and attempted to contact them via phone call. In addition, letters were provided to surveyors stating the general purpose of the surveys and providing contact information for City staff in the event of questions or concerns raised on the day of surveying.

[14] In particular, it was determined whether multiple surveyors would be needed due to a high volume of pedestrian activity.

- Observation of any other ambient circumstances or peculiarities of the site which would not be conducive to site surveying[15]

A sample of the data collected during site reconnaissance can be found in **Appendix E**. An excerpt of a completed site reconnaissance form is shown in Error! Reference source not found..

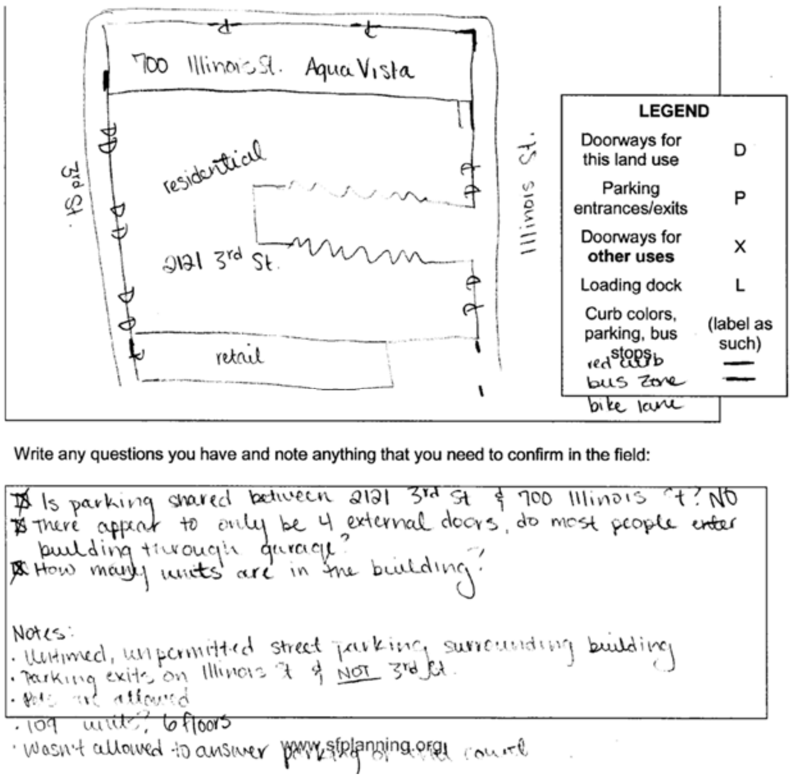
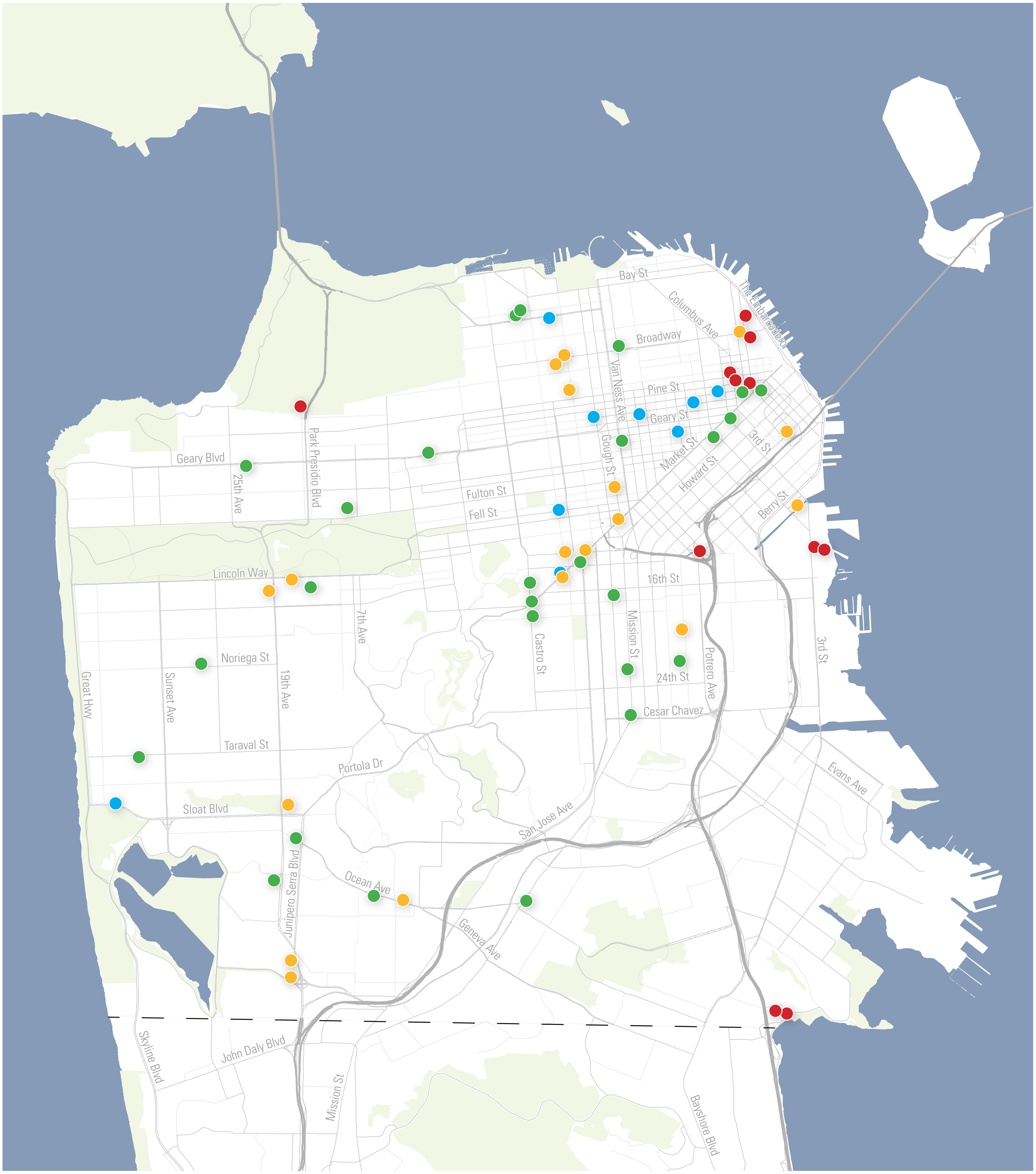


Figure 2: Excerpt of site reconnaissance form for 2121 3rd Street (site not ultimately included in data collection).

3.1.2 Site Selection: Person Trip Generation

In addition to the above considerations for data collection, sites selected for person trip generation data collection were required to have a clear line-of-sight of all access points from the public realm. This was to facilitate placement of cameras to conduct video counts at doorways and driveways. In total, 65 sites were selected for person trip generation data collection; their locations are shown in **Figure 3**.

[15] This could include construction activities, concerns for surveyor safety, or identification of additional doorways unsuitable for conducting counts.



Data Collection Sites by Land Use

- **Office** (11 sites)
- **Retail** (27 sites)
- **Residential** (19 sites)
- **Hotel** (9 sites)

Miles 0 1 2 NORTH

Figure 3

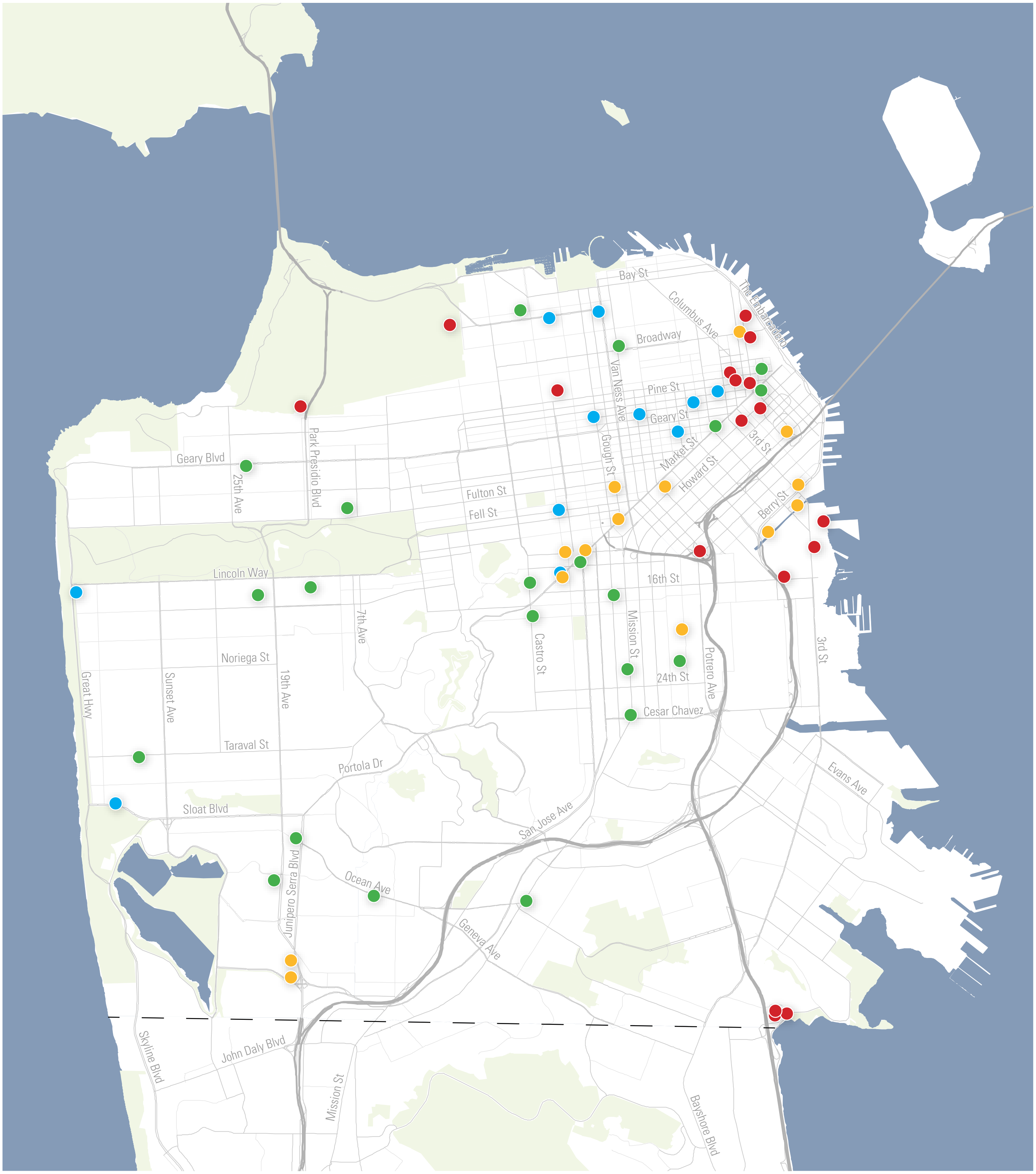
Sites with Person Trip Generation Data

3.1.3 Site Selection: Intercept Surveys

In addition to the above considerations for data collection, sites selected for intercept surveys were required to have direct access from the public right of way that included adequate space for a surveyor to stand and intercept pedestrians. Additional consideration was given to whether the building owner or primary tenant would allow surveyors site access and garage access when applicable to conduct surveys during business hours. This was of special concern for sites that provided direct access to the land use being studied from the garage. Because the intercept surveys collected origin and destination information in addition to mode, if surveyors did not have access to the garage the resulting distribution information would be biased away from driving patterns. While this concern was partially addressed through the integration of additional data sources, as discussed in section 4.1, efforts were made to choose data collection sites where direct surveying of individuals using the garage was feasible.

Additionally, due to the personal nature of intercept surveys, Fehr & Peers prioritized sites that had given permission for surveyor access at public doorways, or, at a minimum, sites where surveyors were able to reach a property manager or owner and inform them of survey efforts. The outreach effort included identifying property owners from City records as well as property managers or primary tenants via web search or direct contact (e.g.., asking at a retail store to speak with a manager during site reconnaissance). While there were several sites where we were unable to contact a representative, in most instances individuals were informed of survey efforts prior to the day of the surveys.

In total, 65 sites were selected for intercept survey data collection; their locations are shown in **Figure 4**.



Data Collection Sites by Land Use

- **Office** (18 sites)
- **Retail** (21 sites)
- **Residential** (15 sites)
- **Hotel** (11 sites)

Miles
0 1 2
NORTH

Figure 4

Sites with Intercept Survey Data

3.2 Video Data Collection

Video data collection occurred in spring 2017 and was conducted by IDAX. This included both loading observations and doorway and driveway counts at the sites selected for each. In two cases, counts were unable to be used for analysis due to construction activity blocking the camera. Person counts were deliberately collected on days other than when surveys occurred. This was to insure that surveyors did not block the screenline or affect individual movement patterns in the immediate vicinity of each doorway; as such, there is some risk that travel patterns differed between the dates of the surveys and the dates of counts.

Following data collection, data were processed by IDAX and provided to Fehr & Peers in spreadsheet format for each site. Fehr & Peers then performed basic quality checks on the data and aggregated the spreadsheets to allow for further analysis.

3.3 Intercept Surveys

Intercept surveys were conducted in two waves. The first occurred in fall 2016, consisted of 27 sites, and was performed by temporary staff managed by Fehr & Peers. The second wave occurred in spring 2017, consisted of 38 sites, and was performed by data collection firm Corey, Canapary & Galanis Research.

All survey staff in both waves were required to attend a training to ensure they had a thorough understanding of any data collection role they were performing. Training involved the following key elements:

- Ensuring surveyors have a proper understanding of the goal of the project – to determine total person counts, mode splits, and trip distribution
- Training surveyors on how to approach and engage the survey subject
- Emphasizing that minor variations of the survey questions were acceptable to render them more natural for each surveyor
- Acting out the survey process to identify any uncertainties new surveyors had
- Ensuring that the surveyors read all pertinent information by reviewing each sheet in the survey packet carefully
- Stressing the importance of clear documentation

Survey packets were created for each survey site the week before surveying occurred and were subsequently distributed to each surveyor by providing a link to a cloud-based storage system. The intention of the survey packets was to provide all surveyors with all instructions, information, and materials necessary to carry out their duties; an example survey packet is provided for reference in **Appendix F**. Each survey packet contained:

1. Cover sheet with information about:
    a. Name and phone number of all surveyors and supervisors
    b. Roles and timeslots for each surveyor and supervisor
    c. Building contact and instructions for day-of check-in if necessary or requested
2. Key instructions and reminders
3. List of survey packet contents and supply checklist
4. Diagram of site with:
    a. Numbered entrances/exits and garage doors
    b. Suggested surveyor standing positions
5. Materials relevant to recording data:
    a. Relevant data recording sheets
    b. Flowcharts and tables of survey procedure for each type of role
    c. Examples of completed sheets for each type of role
6. Post-survey instructions

After selecting survey sites and identifying the number of staff required to conduct the surveys, the sites were entered into a schedule where staff members were assigned shifts; scheduling was required to adhere to certain conditions, described in the section below, to ensure data quality and consistency. Once chosen, survey dates were also finalized with building or property managers, where possible.

In recognition of the fact that many events can impact travel choices, this effort took care to:

1. Conduct data collection only on Tuesdays, Wednesdays, and Thursdays. Mondays and Fridays were avoided because travel schedules on these days are more variable and less comparable to mid-week days
2. Avoid weeks with holidays
3. Avoid days with street fairs, sporting events, or parades that may affect the travel patterns on and around the site
4. Watch for anticipated severe weather and change data collection days accordingly

Data collection was planned for the extended PM peak period, from 3:00 PM to 7:00 PM, as discussed in section 1.1.2.

Common issues that arose during the surveying process include:

- Concerns from property owners, security guards, and managers. Efforts were made to contact representatives from each site prior to the survey date; however, if permission was not secured in advance, survey staff were instructed to politely inform concerned individuals that surveys were being conducted in the public right-of-way, but to cease surveying if the individual continued to express concerns. Property manager concerns resulted in a total of two sites being removed from the survey schedule.
- Language barriers. At some locations, there were larger populations of individuals who were not comfortable responding to English-language surveys. These populations may have different travel patterns than English-speakers; however, this analysis does not include responses provided in a language other than English.
- Unresponsive populations. Some sites had higher response rates than others, and may therefore be oversampled. The response rate represents the number of individuals asked to take the survey who completed it over the number of all individuals arriving at or leaving the site.
  - Overall, an average response rate of 67% was achieved. Individual sites' response rates ranged from 34% (Trader Joe's, 265 Winston Drive) to 100% (1600 Market Street and 1234 Great Highway).
  - The average survey response rate at retail sites (59%) was lower than at hotel (72%), office (73%), or residential sites (76%).
  - Because no demographic data were collected, it is not possible to examine whether individuals' sociodemographic affiliations affected their likelihood of responding to the intercept survey or analyzing their travel demand characteristics.
- Weather. While effort was made to avoid surveying on rainy days, late 2016 to early 2017 were uncharacteristically rainy, which affected the survey schedule (due to canceled surveys from inclement weather) as well as potentially affecting travel patterns (on days with light rain when surveys were conducted).

Chapter 4. Supplemental Data Sources

In addition to the video trip counts, intercept surveys, and time-lapse loading data collected for the Travel Demand Update as summarized in Chapter 3, the California Household Travel Survey (CHTS) was used as a means of filling in gaps in the survey data and providing additional context due to a wider breadth of applicability. Because the overall data collection effort detailed in Chapter 3 was focused on individual sites, there was the potential that more generalized travel patterns common to existing San Francisco residents may not be captured. This was especially pertinent for items captured via survey response, such as origin and destination for trips, trip chaining behaviors, and mode choice. By incorporating the larger data set of the CHTS, which included 12,094 trips made to, from, or within San Francisco, Fehr & Peers was able to provide a higher level of confidence in this data source.

4.1 California Household Travel Survey

The California Household Travel Survey (CHTS) is a statewide dataset of multi-modal travel behavior and household demographics. Historically, the CHTS is conducted by Caltrans approximately every ten years. The most recent CHTS ("2012 CHTS") was initiated in 2010 and concluded in 2013, with the majority of data being collected during 2012.

The 2012 CHTS includes data from a total of 42,430 households, collected using telephone surveys and Global Positioning System (GPS) devices from all counties in California. The dataset consists of individual trip entries, each of which includes an identifier for the individual making the trip, travel purpose, duration, travel distance, travel time, origin, destination, and mode choice. Demographic data are also available for each individual making the trip; these data include household size, income, vehicle availability, and household members' ages. Data are provided for 331,540 trips statewide, of which 12,094 (3.6%) have at least one trip end in San Francisco.

Fehr & Peers staff have prepared a modified version of the 2012 CHTS, which has been cleaned and processed for use on multiple projects. The cleaning process was used to address the following items:

1. Identify and repair unreasonable or missing trip distances.
2. Identify and consolidate transit trip chains.
3. Identify trip purposes.
4. Impute missing household income data.
5. Recode certain variables.

6. Attach Metropolitan Planning Organization and Census Designated Place information to trip and household records.
7. Aggregate information about persons in the household to the household record.
8. Attach person-level data to the trip records.

Details on these data cleaning steps are provided in **Appendix G**.

Fehr & Peers incorporated 2012 CHTS data into the Travel Demand Update for three reasons. First, as discussed in section 4.1.1, CHTS data supplemented newly collected survey data for calculating trip distribution; the data filled potential gaps in new survey coverage, most notably including residential sites. Second, as discussed in section 4.1.3, the CHTS data provided a large-sample-size basis from which vehicle occupancy parameters necessary for analysis of the newly collected data could be derived. Third, as discussed in section 4.1.4, analysis of CHTS data provided a comparison point to validate new residential trip generation rates.

4.1.1 Trip Distribution

CHTS data were used to supplement newly collected intercept survey data in calculating trip distribution tables for each land use type. As presented in section 6.3 below, trip distribution tables were developed using three methods: new survey responses alone, CHTS trip records alone, and a blend of CHTS and new survey data. This process enabled Fehr & Peers to assess the reasonableness of the newly collected data, as well as supplement the new data with additional records. Adding CHTS data to the newly collected survey data most notably helped address small sample sizes from certain land use/geography types, and residential sites in Place Type 3.

Intercept surveys were conducted between 3:00 and 7:00 PM. To enable an apples-to-apples comparison, CHTS data were limited to trip records whose departure time was between 3:00 and 7:00 PM, a total of 3,982 records (3,968 of which were able to be associated with the geographic regions used in the trip distribution analysis).

The Fehr & Peers processed CHTS dataset includes seven trip purpose categories; these categories were associated with "office-type," "retail-type" and "residential-type" flags in order to facilitate the combination of CHTS and new survey data. **Table 1** shows the seven trip purpose categories and their association with the three "land use-type" flags.

Table 1: CHTS Trip Purposes and Land Use-type Flags

Trip Purpose	Office-type	Retail-type	Residential-type
Home-based College (HBC)			Yes
Home-based K-12 School (HBK)			Yes
Home-based Other (HBO)			Yes
Home-based Shop (HBS)		Yes	Yes
Home-based Work (HBW)	Yes		Yes
Non-home-based (NHB)		Yes	
Work-based Other (WBO)	Yes		

Source: CHTS, 2012; Fehr & Peers, 2018.

For each of the land use-type flags, a PivotTable was prepared in which trips' sample weightings were summed by origin and destination geographies.

The sum of the sample weightings of CHTS trip records relevant to PM extended peak trip distribution (4,265)[16] was similar to the number of survey responses with valid origin/destination locations (4,712). Therefore, the CHTS and new survey data were combined in a simple 1:1 fashion, in which the sum of CHTS sample weightings for a given origin/destination (O/D) pair was added to the count of new survey responses for that O/D pair to produce the blended trip distribution tables.

Limitations

Because Home-based Shop and Home-based Work trips are included in multiple land use-type tables, these trips are double-counted in the CHTS analysis. Of the 3,982 trip records included in this analysis, 326 (8.2%) were double-counted as Residential-type and Retail-type, and 712 (17.9%) were double-counted as Residential-type and Office-type. No records were triple-counted.

[16] Fehr and Peers used a statistical sample weighting to balance the CHTS survey sample to match county-level percentages for several variables (e.g. household income, number of workers per household) as reported in the 2012 American Community Survey to account for population groups that might over or underrepresent in the survey sample.

4.1.2 Trip Distribution by Mode

In addition to checking overall trip distribution against CHTS, SFCTA staff provided an assessment of neighborhood-to-neighborhood trip distribution by mode of travel, based on the full CHTS data set. This analysis, as prepared by the SFCTA, stratifies all trips between districts based on whether they were work trips or non-work trips, and by the mode used. Additional information on this analysis method is included as **Appendix H.**

Limitations

CHTS data stratified by both trip purpose (specifically work and non-work) as well as by origin-destination pairing results in small sample sizes for several O-D pairs and several modes of travel. This largely reflects that there is limited daily travel between certain districts of San Francisco, and that some districts have lower population levels than others (and thus fewer recorded total trips in the CHTS). Nonetheless, extrapolating from the CHTS sample may necessarily result in findings of zero percent distributions for certain O-D pairs.

4.1.3 Vehicle Occupancy

Five parameters pertaining to vehicle occupancy were extracted from CHTS data. These parameters were based on all trips beginning or ending in San Francisco and made by a private vehicular mode (Drive Alone, Drive Shared 2, Drive Shared 3, Drive Shared 4+). There were 6,385 trip records matching these criteria. These trip records were then de-duplicated in order to ensure that each vehicle trip appeared only once in the dataset. Approximately 1,400 trip records took place in the same vehicle as other records; most of these "duplicate" trips involved multiple members of the same household making the same vehicular trip. Records were de-duplicated by comparing the concatenation of household ID, trip start time (hour/minute), and trip end time (hour/minute).

The parameters below were used to supplement the newly collected data, particularly with regards to vehicle occupancy, which was not available through the data collection process due to limitations with video data collection.

- **Average vehicle occupancy (AVO)** was needed in order to transform driveway vehicle counts into person-trip counts for the trip generation analysis.

- o For each combination of land use[17] and geographic area,[18] AVO was calculated as the weighted average of all records' occupancy counts, weighted according to each trip's sample weight as calculated in the CHTS dataset.
- o The range of AVOs thus derived is shown in **Table 2** below.
  - ▪ Because hotel trips are not significantly represented in CHTS, the overall average AVO of 1.61 was used for all hotel sites.

- **Percentage of vehicle trips with one occupant (SOV %)** was needed to calculate the percentage of *person trips in vehicles* that are single-occupancy-vehicle (SOV) drivers, high-occupancy-vehicle (HOV) drivers, and HOV passengers.
  - o SOV % was calculated as the weighted proportion of de-duplicated trip records that were Drive Alone trips.
  - o SOV % was thus derived as 61.1%. In other words, 61 percent of vehicle trips are SOV trips.
- **Percentage of person trips in vehicles with one occupant (SOV Driver %)**, **percentage of person trips in vehicles that are high-occupancy vehicle driver (HOV Driver %)**, and **percentage of person trips in vehicles that are HOV passenger (HOV Pax %)** were needed in order to determine detailed mode splits for person trips observed at sites' driveways, when driveway/garage survey data were unavailable.
  - o SOV Driver % was calculated as the weighted proportion of vehicle person trips that were Drive Alone. using AVO and SOV %:
    - ▪ $SOV\ Driver\ \% = \frac{SOV\ \%}{AVO} = \frac{0.611}{1.61} = 0.380 = 38.0\%$
  - o HOV Driver % was also calculated using AVO and SOV %:
    - ▪ $HOV\ Driver\ \% = \frac{1-SOV\ \%}{AVO} = \frac{1-0.611}{1.61} = 0.242 = 24.2\%$
  - o The remainder of person trips in vehicles were therefore HOV passenger trips:
    - ▪ $HOV\ Pax\ \% = 1 - SOV\ Driver\ \% - HOV\ Driver\ \% = 1 - 0.380 - 0.242 = 0.378 = 37.8\%$

These data indicate that among all person trips in private vehicles, 38 percent are made by SOV drivers, and 62 percent are made by HOV drivers and passengers (i.e., carpools) combined.

These parameters were used in the mode split analysis to translate the count of person trips in vehicles into counts of person trips by SOV and HOV modes.

[17] This analysis used the same land use-type flags as the trip distribution analysis discussed in section 4.1.1 above.
[18] See section 5.6 below for a discussion of the geographic units used for this analysis.

Table 2: Average Vehicle Occupancy by Land Use-type and Geography

Geography	Land Use-type			
	Residential-type	Office-type	Retail-type	All
Place Type 1	1.45	1.25	2.05	**1.63**
Place Type 2	1.56	1.24	1.80	**1.61**
Place Type 3	1.56	1.22	1.71	**1.60**
North Bay	1.35	1.25	2.27	**1.55**
East Bay	1.66	1.44	2.31	**1.79**
South Bay	1.44	1.13	1.89	**1.51**
All	**1.53**	**1.23**	**1.85**	**1.61**

Source: California Household Travel Survey, 2012; Fehr & Peers, 2018.

Limitations

While AVO was calculated for each combination of land use-type and geography, the other parameters (SOV %, SOV Driver %, HOV Driver %, and HOV Pax %) were based on all CHTS auto-type trip records with at least one end in San Francisco. In other words, only one, citywide value was calculated for these parameters. In actuality, these parameters would vary across land uses and geographic areas; however, this variation would be relatively minor. Furthermore, the downstream applications of these parameters are themselves relatively minor, such that using a citywide value for these parameters does not materially affect the outputs of the analysis in question (mode split).

4.1.4 Residential Trip Generation

The 2012 CHTS dataset was used to validate the new residential trip generation rates calculated for the Travel Demand Update. Specifically, the average number of home-based trips per household was calculated. This metric was developed because it is analogous to daily residential trip generation.

Similar to the categorization of CHTS trip records in section 4.1.1 above, trips were coded as "home-based" (i.e. "Residential-type" as shown in Table 1) or not home-based. The CHTS "trips" table was used to calculate the count of home-based trips per household and weighted to obtain the average number of home-based trips per San Francisco household (HBT_{avg}) as follows:

$$HBT_{avg} = \frac{\sum(hb\_trips\_num \times hhweight^{19})}{\sum hhweight}$$

To ensure parallelism with the video data collected for the Travel Demand Update, which were collected on Tuesdays, Wednesdays, and Thursdays, the CHTS "households" table was filtered to include only households whose "trip day" (i.e. the day of the week for which household members reported trip activity) was Tuesday, Wednesday, or Thursday.

The above procedure was applied to daily, AM peak hour, and PM peak hour trips. To calculate the approximate number of AM and PM peak hour home-based trips, it was necessary to identify the AM and PM "peak hours" in the CHTS dataset. These peak hours (7:30-8:30 AM and 5:00-6:00 PM) were identified by taking the sum of trips (weighted based on sample weights for each household) for (1) home-based trip records (2) with at least one end in San Francisco (3) recorded on a Tuesday, Wednesday, or Thursday (4) whose departure times fell within the trailing hour for each 15-minute period of the day. This analytical methodology enabled the identification of "peak hours" that are closely analogous to how peak hours are identified in a typical transportation analysis.

To enable an apples-to-apples comparison, CHTS data were limited to trip records whose departure time was between 3:00 and 7:00 PM, a total of 3,982 records (3,968 of which were able to be associated with the geographic regions used in the trip distribution analysis). This total is similar to the number of residential survey responses received; as such, the CHTS and new survey data were combined in a simple 1:1 fashion.

[19] hb_trips_num represents the number of recorded trips by a household, while hhweight indicates the sample weight to account for demographic factors.

Chapter 5. **Geographic Analysis**

Any transportation analysis methodology must define some set of geographic units for its use. This chapter discusses several geographic units that were considered for the San Francisco Travel Demand Update, presents maps of those units, considers their advantages and disadvantages, and recommends a set of units for use in the future.

5.1 Superdistricts

Planners in the San Francisco Bay Area have developed and maintained a set of Transportation Analysis Zones (TAZs) for use in transportation analysis. Of the 2,245 TAZs used by SF-CHAMP, 981 are within San Francisco. Historically, SF Planning has used “superdistricts” as its major geographic unit for transportation impact analysis. These four large aggregations of TAZs roughly divide the city into four quadrants, whose boundaries approximately follow Van Ness Avenue, Golden Gate Park, Townsend Street, Market Street, and the crest of the several hills that run south from Twin Peaks. The four superdistricts are shown in **Figure 5**.

Figure 6 shows three regions outside of San Francisco: the North Bay, East Bay, and South Bay. These regions, which encompass the nine-county San Francisco Bay Area, remain the same across all the sets of geographic units under consideration.

5.1.1 Advantages and Disadvantages

The traditional superdistricts have three advantages as geographic zones for transportation analysis. First, they are currently in use for transportation impact analysis, so their use in the future would ensure continuity and reduce the level of effort required to publicize a change in geography. Second, the low number of zones (four San Francisco zones, plus three regions outside the city) presents a reasonable burden for staff (within the City Family and among consultants; the most frequent users/consumers of the current system) preparing transportation impact analyses: that is, a lower number of zones can correspond to a lower number of zone-to-zone pairs. Finally, a rough geographic direction is generally clear from zone to zone. For example, the entirety of Superdistrict 2 (SD2) lies to the west of SD1, so it is clear that a SD1-SD2 trip must be an east-west trip. This can help clarify trip assignment, including transit trip assignment.

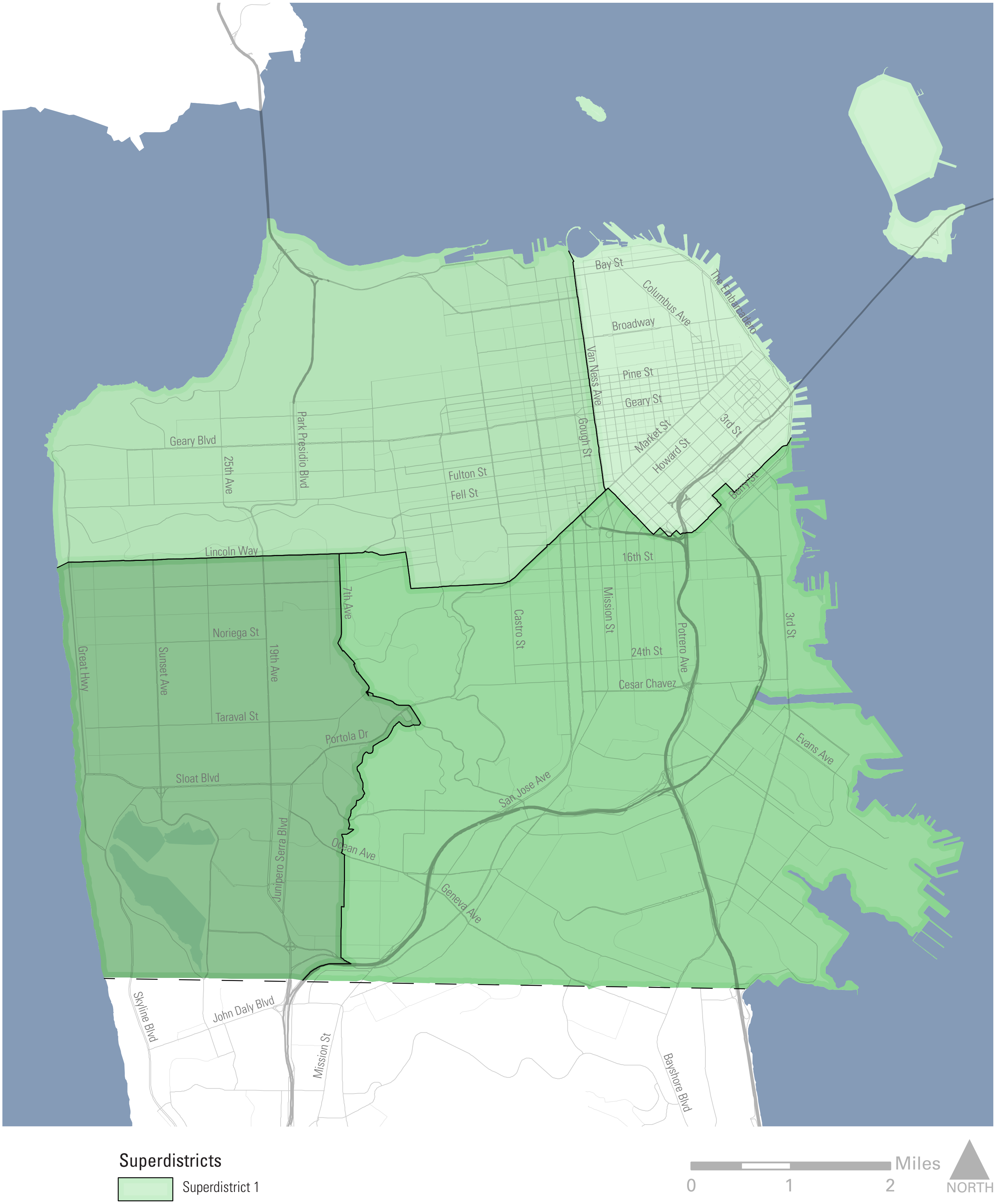


Figure 5

Superdistricts

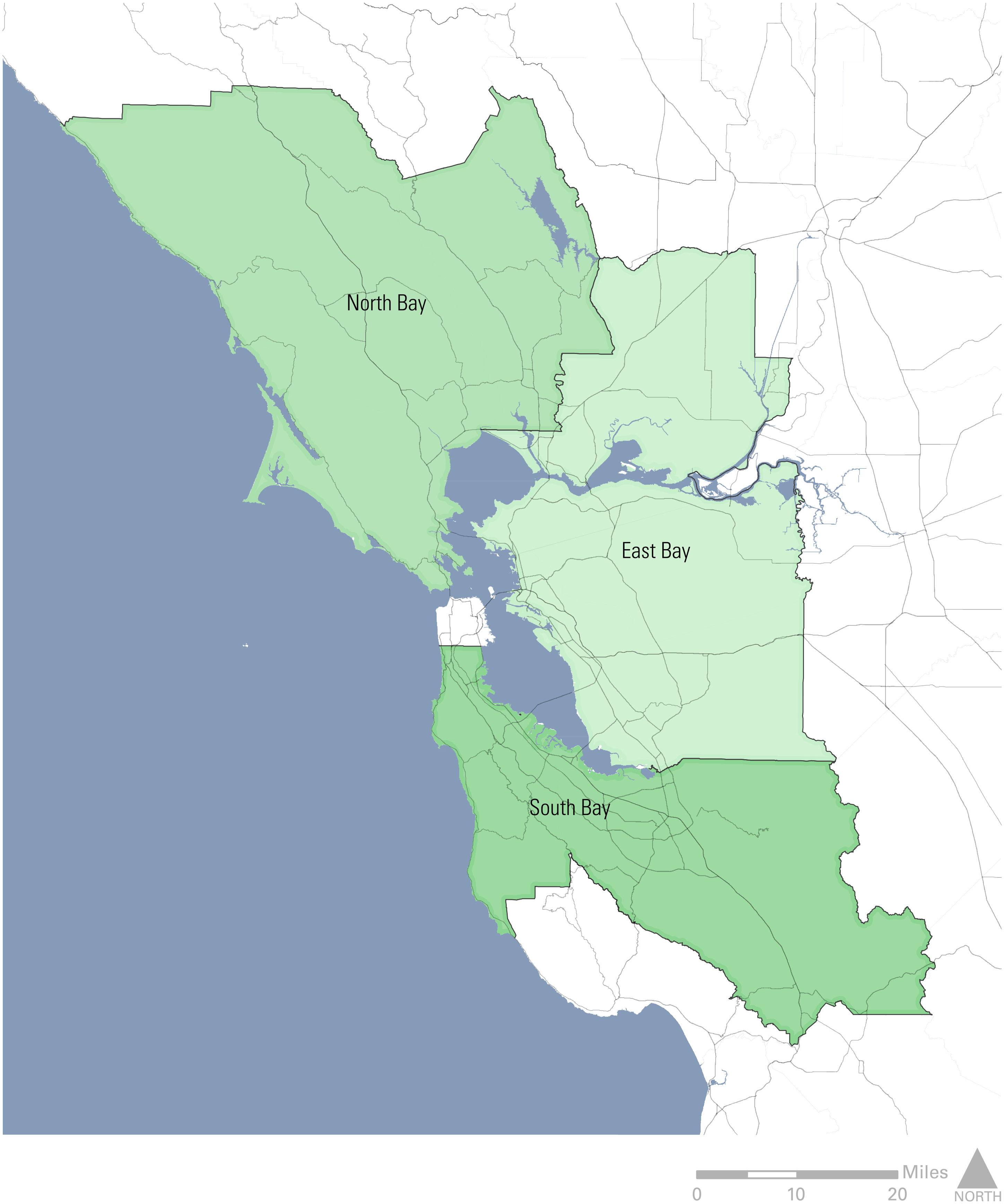


Figure 6

Regions Outside of San Francisco

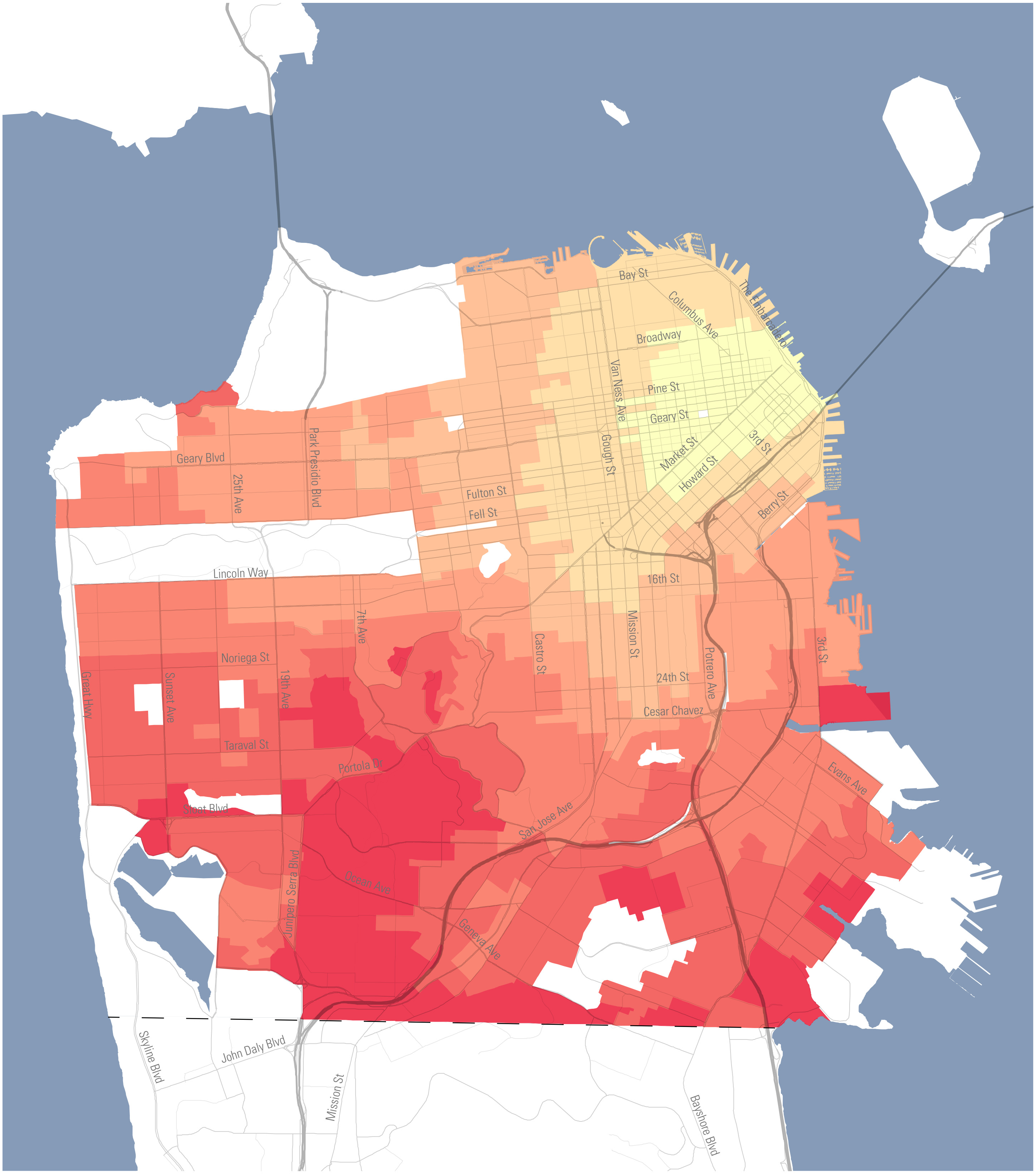
At the same time, the superdistricts have several disadvantages. Heterogeneity of land use and transportation characteristics within a given superdistrict has long been an issue, particularly as variables that affect travel behavior (land use density, transportation projects) may change specific locations within a superdistrict. This is especially true of SD3, which contains a mix of compact, low-VMT development in neighborhoods like Mission Bay, quasi-suburban areas such as Twin Peaks, mixed-income transit corridors through the Mission and Outer Mission, and new master-planned development in Hunters Point and Candlestick Point. As such, the mode split and trip distribution data for a superdistrict may not closely resemble the travel activity in any given neighborhood within that superdistrict. Furthermore, the large size of the superdistricts can make trip assignment more challenging. This is especially true of transit trip assignment, and especially with regard to SD3. While the geographic direction of an SD1-SD3 trip may be fairly clear, the transit corridor on which that trip would occur will vary dramatically depending on the specific destination within SD3.

5.2 Traffic Analysis Zones

Many of the limitations of superdistricts have to do with their large size. Therefore, the use of TAZs was considered. As mentioned above, SF-CHAMP models a system of TAZs, 981 of them within San Francisco. Each TAZ's auto mode share was available as an output of SF-CHAMP, resulting in a fine-grained picture of the gradient of travel characteristics across San Francisco. San Francisco's TAZs, symbologized according to auto mode share, are shown in **Figure 7**.

5.2.1 Advantages and Disadvantages

As a geographic unit, TAZs are well-suited for use in a travel model. Their small size enables local transportation characteristics to be represented. However, TAZs are much too small for use as geographic units for SF Planning's transportation impact analysis workflow. The geographic units used in the SF Guidelines must be sufficiently large to enable the calculation of average mode split and trip distribution based on a set of primary data collection sites. Given the statistical noise inherent in primary data collection, several sites per geographic unit are needed. It would therefore take thousands of data collection sites to properly determine travel characteristics for each of San Francisco's 981 TAZs. Additionally, it would be too cumbersome to handle trip distribution and assignment among almost a thousand zones; at this level of effort, direct use of the model would likely be more appropriate. The use of existing model outputs may, however, serve a valuable purpose in travel analysis by allowing for a more generalized mode share to be established based on prior model runs. The primary limitation of this data is that it reflects only the land use and transportation network recorded in the model; a new land use to a neighborhood may not have the same level of detailed information.



Auto Mode Share by TAZ

- No Data
- 22 - 28%
- 28 - 38%
- 38 - 48%
- 48 - 60%
- 60 - 69%
- 69 - 73%
- 73 - 80%

0 1 2 Miles
NORTH

Figure 7

Total Auto Mode Share by TAZ

5.3 Place Types by TAZ Auto Mode Share

The auto mode share estimates from SF-CHAMP, available at the TAZ level as the average of the TAZ and surrounding TAZs, provide a basis for grouping the TAZs into a set of "place types." The groups are labeled as "Urban High Density" (low auto mode share), "Urban Medium Density" (moderate auto mode share), and "Urban Low Density" (high auto mode share).[20] Auto mode share serves as a proxy for several other neighborhood characteristics, which include the level of high quality transit service, residential and employment density, and the overall mix of uses within a neighborhood.

Of the 981 TAZs within San Francisco, 895 have auto mode share data from SF-CHAMP.[21] These 895 TAZs were sorted by auto mode share and divided into terciles (three evenly sized groups), with cutpoints between groups located at 40% and 65% auto mode share. Next, the three groups were manually adjusted to ensure that all TAZs in a given group were geographically contiguous (very few TAZs required such recategorization). The resulting place types by TAZ auto mode share are shown in **Figure 8**.

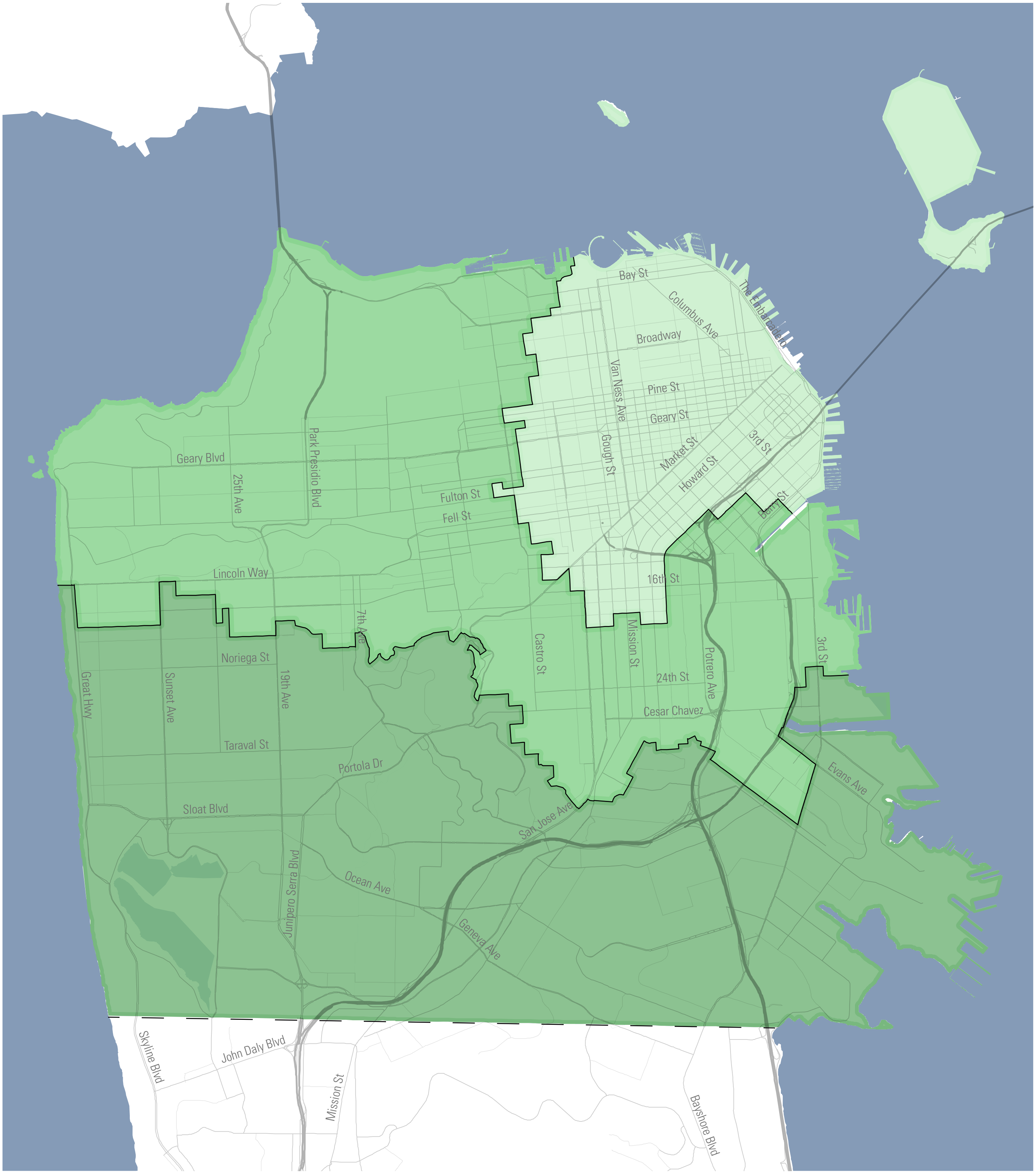
5.3.1 Advantages and Disadvantages

Place types defined by TAZs' auto mode share have several advantages. Because they are directly composed of TAZs according to each TAZ's auto mode share, such place types are very faithful to micro-level differences in transportation attributes. Categorizing the TAZs into only three zones means that trip distribution and assignment calculations can be performed with a reasonable level of effort, as is the case with the superdistricts used in the current SF Guidelines. A set of three zones is also very feasible to populate with observed data without requiring an excessive number of data collection sites. Also similar to the superdistricts, the Urban High place type is well-suited to a cordon-based assessment of transit impacts, as it approximates the location of the urban core in much the same manner as SD1, and would require minimal changes to assess transit travel along the maximum load points.[22]

Disadvantages of this set of place types include the fact that the breaks between the Urban High, Urban Medium, and Urban Low place types have no clear spatial or cultural basis. Without consulting the map of such place types, it would be difficult to judge in which zone a given project site is located. The three place types are shaped roughly like three concentric rings emanating from downtown San Francisco. While this

[20] This naming system was developed for the San Francisco Transportation Sustainability Program, for which these Place Types were originally developed according to a methodology very similar to this one.
[21] The remaining San Francisco TAZs are located either on the city's several islands; in the Presidio, which, as federally owned land, is generally excluded from City transportation analysis; or in large parks.
[22] Transit capacity analysis is currently calculated by assessing a project's effect in aggregate on SFMTA service "cordons" that combine multiple lines by their general directionality and approach to the urban core.

reflects the actual shape of the gradient of automobile use in the city, the concentric rings lack directionality: a trip originating in the Urban High zone and terminating in Urban Medium could be traveling directly south, or directly west, or anywhere in between. There remains a high amount of diversity among neighborhoods in each place type as well; although auto mode split within each of these zones may be more tightly clustered than within superdistricts, this could change over time as neighborhoods change. Finally, basing a set of place types on SF-CHAMP auto mode share estimates from a given year is an approach that is unlikely to age well. Future SF-CHAMP data are likely to change, and boundaries drawn based upon current-year SF-CHAMP data may come to seem arbitrary.



Place Types by TAZ Auto Mode Share

- Place Type 1
- Place Type 2
- Place Type 3

Figure 8

Place Types by TAZ Auto Mode Share

5.4 SF-CHAMP Neighborhoods

The SFCTA has developed a set of 13 neighborhoods (12 covering mainland San Francisco, plus an "Islands" neighborhood consisting of Treasure Island, Yerba Buena Island, Alcatraz, and the Farallons) that are collections of TAZs. These neighborhood boundaries, shown in **Figure 9**, were considered for use as transportation impact analysis geographies.

5.4.1 Advantages and Disadvantages

SF-CHAMP's neighborhood zones reasonably correspond to commonly understood districts of the city (although district names as recorded in SF-CHAMP may not fully reflect common nomenclature), and thus would be relatively easy to understand, particularly in cases where findings are presented to broader audiences such as community groups.

The use of these neighborhood zones in analysis introduces additional complications, as a set of 13 neighborhood zones is a relatively high number of zones for which to handle trip distribution and assignment. On the other hand, the neighborhoods are small enough that there would likely be only one or two plausible automotive or transit paths between a given pair of neighborhood zones, which would result in greater ease for analysts in assigning trips to either the roadway network or the transit network. The greater drawback with the SF-CHAMP neighborhoods is that populating 13 zones with empirically observed trip distribution and mode split data requires a larger set of data collection sites than that conducted here. As such, analysis of trip distribution by neighborhood used CHTS data points to inform the total trip distribution. While many neighborhood-to-neighborhood pairs had limited data, particularly when separated by mode, CHTS provides the most reliable source for identifying these patterns based on empirical data.

SF Planning's set of 36 neighborhoods was also briefly considered, but a set of 36 neighborhoods would have the same disadvantages as a set of 13 neighborhoods, but to a greater degree, while offering few new advantages.

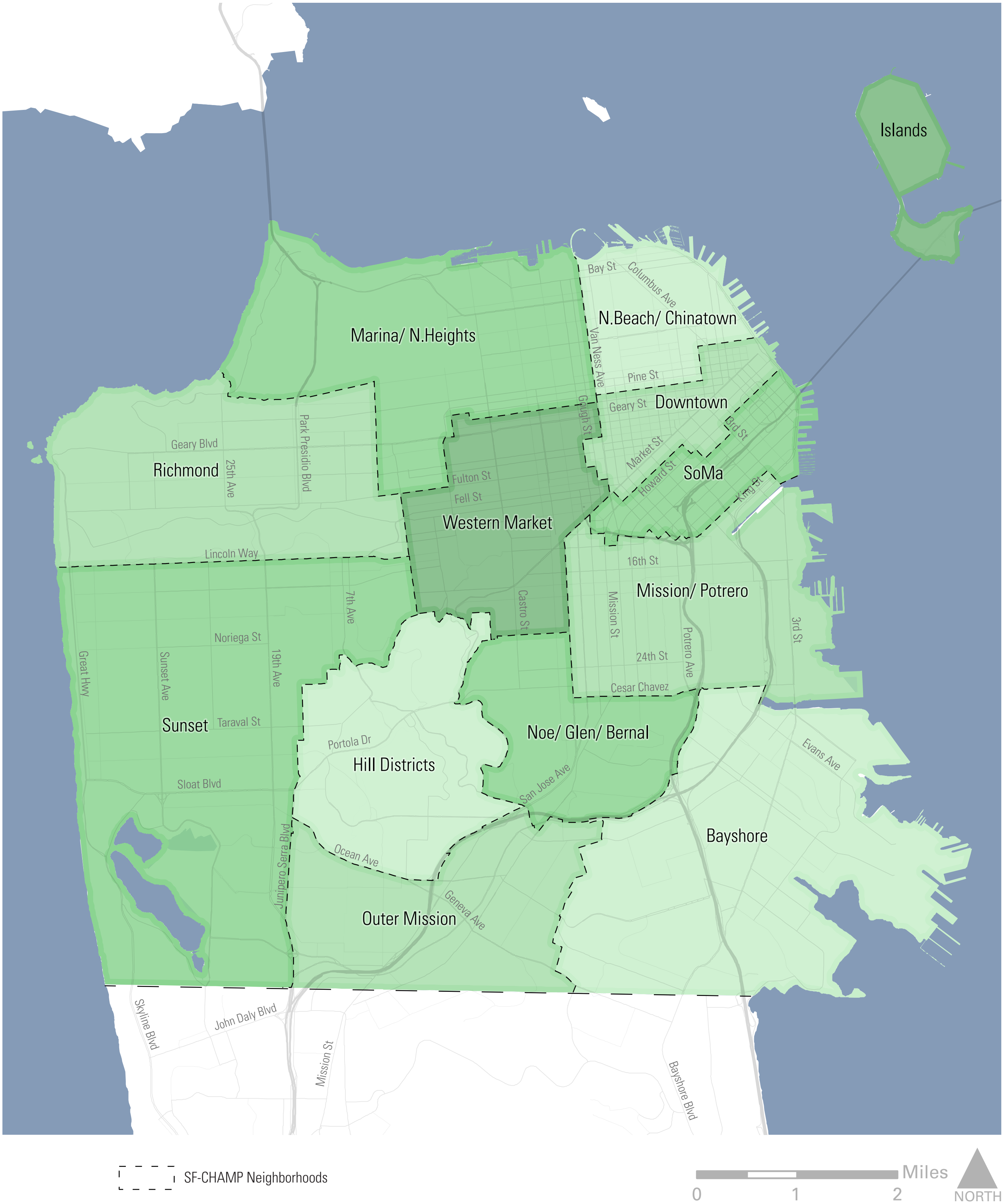


Figure 9

SF-CHAMP Neighborhoods

5.5 Place Types by SF-CHAMP Neighborhood

This geographical method sorts each of the 12 mainland San Francisco neighborhoods discussed in section 5.4 into one of three “place types” based on each neighborhood’s auto mode share. In a method similar to that used in section 5.3, each TAZ’s auto mode share was aggregated into an average auto mode share at the SF-CHAMP neighborhood level. The “cutpoints” for this sorting were reached based on a reasonable visual inspection of trends in neighborhood auto mode share; natural breaks occurred at approximately 40% and 60% auto mode share, while individual neighborhoods’ auto mode shares ranged from 25.2% (Downtown) to 74.4% (Hill Districts). The three place types based on SF-CHAMP neighborhoods are shown in **Figure 10**, including an overlay of the neighborhood boundaries and their auto mode shares. These place types were labeled “Place Type 1” (low auto mode share), “Place Type 2” (medium auto mode share), and “Place Type 3” (high auto mode share).

SF-CHAMP 2012 auto mode share data for the “Islands” neighborhood, which contains Yerba Buena Island and Treasure Island, as well as Alcatraz and the Farallon Islands (to and from which all travel must occur by boat), may not reflect future land use decisions in that area. Relatively few development projects requiring transportation impact analysis are anticipated on Treasure Island and Yerba Buena Island, because the Treasure Island Master Plan EIR covers the environmental analysis of almost all projected development on those islands. Nevertheless, it is prudent to classify the Islands into one of the three Place Types.

It was determined that future auto mode share on Treasure Island is likely to most closely resemble that of Place Type 2, because while a substantial transit mode share (via ferry and bus) is expected, and relatively dense development on Treasure Island will support non-vehicular trips within the island, bicycling and walking trips between San Francisco and the island are not possible. Therefore an auto mode share in the 40 to 60 percent range is probable, which corresponds well to the range of auto mode shares of Place Type 2. For this reason, the Islands were included in Place Type 2, as shown in Figure 10.

5.5.1 Advantages and Disadvantages

A set of place types based on SF-CHAMP neighborhoods’ average auto mode share offers many of the same advantages and disadvantages as the place types by TAZ auto mode share (see section 5.3 above) and some of the advantages of the SF-CHAMP neighborhoods themselves (see section 5.4 above). Again, a set of three place types makes it feasible, based upon the scope of the effort here, to collect sufficient real-world data to develop robust trip distribution and mode split tables for each place type (provided that the data collection sites include locations in each of the three place types). Furthermore, place types based on SF-CHAMP neighborhoods have more durable and less arbitrary boundaries than the rough outlines of TAZ-based place types.

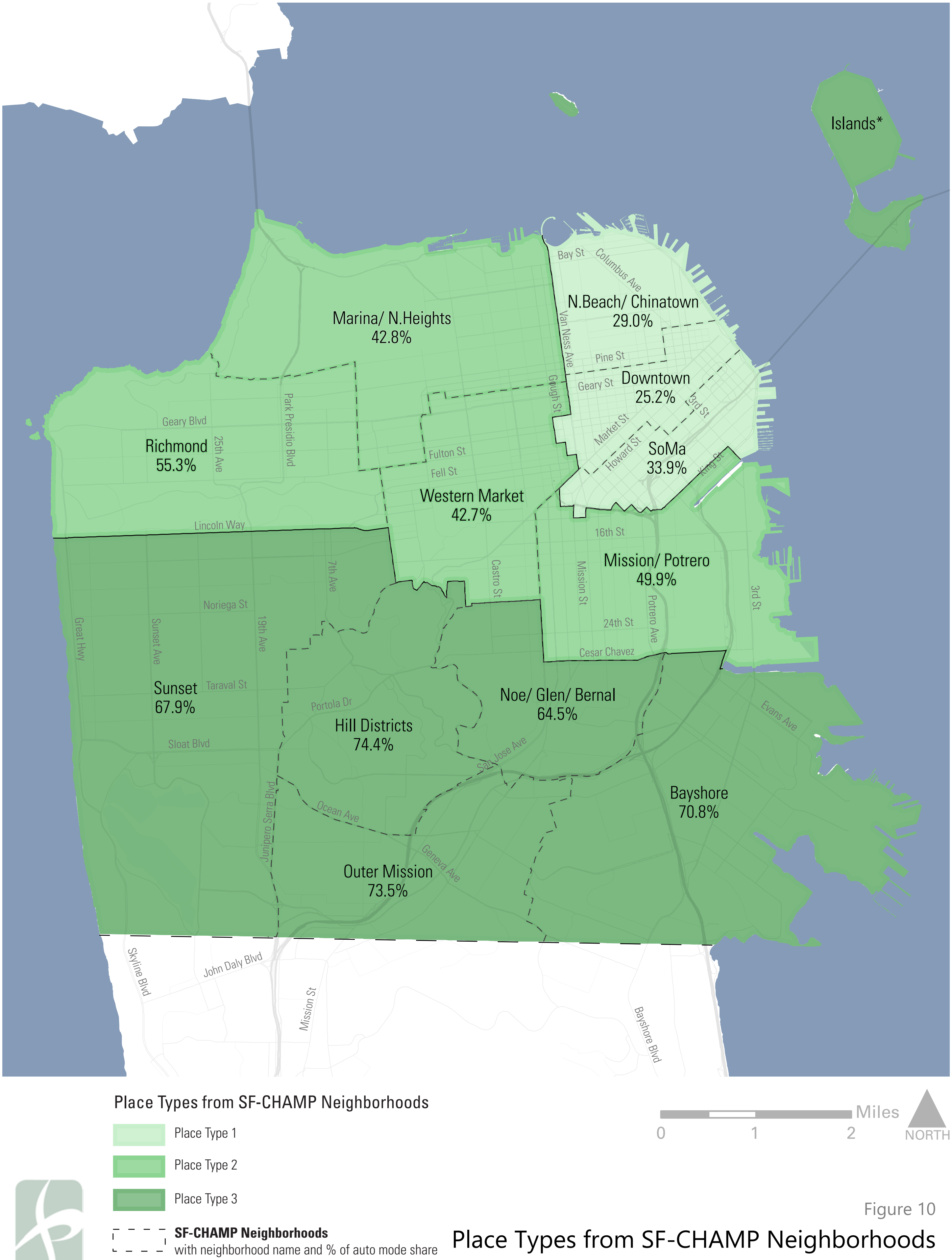


Figure 10

Place Types from SF-CHAMP Neighborhoods

Note: Development on Treasure Island is expected to substantionally change current auto mode share therefore AMS is not presented.

Like the other set of quasi-concentric place types, a set of place types by SF-CHAMP neighborhood does not have strong directionality in terms of trips between different place types. Also, the place types are quite geographically large, another feature that could confound vehicle and transit trip assignment. However, the fact that these place types are based on SF-CHAMP neighborhoods means that it would be feasible to compare with or use trip distribution derived by SF-CHAMP trip distribution tables or other neighborhood-based analysis in the future.

5.6 Recommended Geographic Analysis

Fehr & Peers recommends that SF Planning use the set of three place types based on SF-CHAMP neighborhoods for purposes of calculating trip generation and modal split. This set of geographic units is one for which empirical data can be feasibly collected to update this analysis in the future, and one for which our sample of survey sites is sufficient. The boundaries between adjacent zones have a basis in the city's cultural geography, which lend themselves to easy understanding. Like the set of SF-CHAMP neighborhoods themselves, the place types based on those neighborhoods offer the potential for integration with current and future SF-CHAMP model outputs. The primary limitation relates to trip distribution and assignment; the somewhat radial nature of the proposed geography may make it more challenging to assign trips to the roadway network based on place type-to-place type trip distributions.

This shortcoming may be partially addressed by integration with trip distribution outputs on the neighborhood level, as prepared by SFCTA staff, which could integrate cleanly with place-type level analysis. Providing a framework for distributing trips by each mode among these smaller neighborhood geographies would provide for an intuitive assignment of trips on a neighborhood-to-neighborhood basis.

Furthermore, as discussed in greater detail in section 6.2 below, the place types based on SF-CHAMP neighborhoods demarcate three regions within San Francisco in which travel characteristics (specifically, auto mode share) are substantially distinct, based on real-world data. **Appendix I** presents each data collection site's auto mode share, and separates the sites in three ways: by the existing superdistricts, by the place types based on TAZ auto mode share, and by the place types based on SF-CHAMP neighborhood auto mode share. This latter set of geographic units establishes clearer distinctions between the average auto mode share in each place type than methods using superdistrict or place types based on TAZ auto mode share.

For trips that include either an origin or destination outside of the City of San Francisco (such as trips between Oakland and San Francisco), we recommend continuing to use the aggregation of North Bay, East Bay, and South Bay for purposes of trip distribution and modal trip distribution. Because these geographies are both large and highly directional, an aggregation is useful for purposes of assigning trips to either the roadway network or to transit routes.

The remainder of this document uses the set of place types based on SF-CHAMP neighborhoods. That is, the analyses and results presented in Chapter 6 are based on these recommended geographic units.

Chapter 6. Findings

This chapter lays out the specific analytical processes by which key results were obtained from the raw video and survey data as well as the supplemental data sources, and presents the results of those analyses.

6.1 Person Trip Generation

Person trip generation was calculated for four land uses (office, retail, residential, and hotel, as discussed in section 1.1.1 above) and three time periods (daily, AM peak hour, and PM peak hour). The key primary data source was the video doorway and driveway counts, which were collected at 65 sites, each for a 24-hour period on a typical[23] Tuesday, Wednesday, or Thursday.[24] In addition to the video count data, the trip generation analysis relied on average vehicle occupancy assumptions, which were derived from CHTS data as discussed in section 4.1.1 above.

Each site's video doorway and driveway counts were input into a standardized processor in Excel. Driveway vehicle trips were converted to person trips using the assumed average vehicle occupancy. All doorway and driveway trips were added together and each site's AM and PM peak hours were identified. In accordance with standard trip generation analysis practices,[25] each site's AM peak hour was defined as the four consecutive 15-minute periods between 7:00 and 9:00 AM with the greatest number of person trips, and each site's PM peak hour was defined as the consecutive hour between 4:00 and 6:00 PM with the greatest number of person trips. In a master calculation spreadsheet, all sites' total daily, AM peak hour, and PM peak hour person trips were collected, along with the amount of land use (square feet of office or retail space, dwelling units, or hotel rooms) at each site.[26]

The temporal distribution of person trips at sites of each land use type is presented graphically in **Figures 11** through **14** below. The traditional "peaking" of trips around the AM and PM "peak" periods is evident for office and residential sites. Retail sites show fairly high activity throughout the day, with no visible AM

[23] Typical represents when San Francisco Unified Schools are in session and avoid local, state and federal holidays and events that draw from the San Francisco Bay Area region, such as parades.

[24] One of the 67 sites with video count data was unusable due to a truck blocking the doorway for large portions of the day; therefore, person trip generation rates are based on analysis of 66 data collection sites.

[25] See the *SF Guidelines (2002)*; *Trip Generation Manual, 4th Edition,* Institute of Transportation Engineers.

[26] Amount of land use was collected and aggregated from multiple sources, including direct information from property managers, review of environmental clearance documentation, and information from web sites. It is presented in Appendix D.

peak but a prominent PM peak period; hotel trip activity is more steady across the day, with more late evening trips.

Figure 11: Person Trips by Time of Day, All Sites – Office

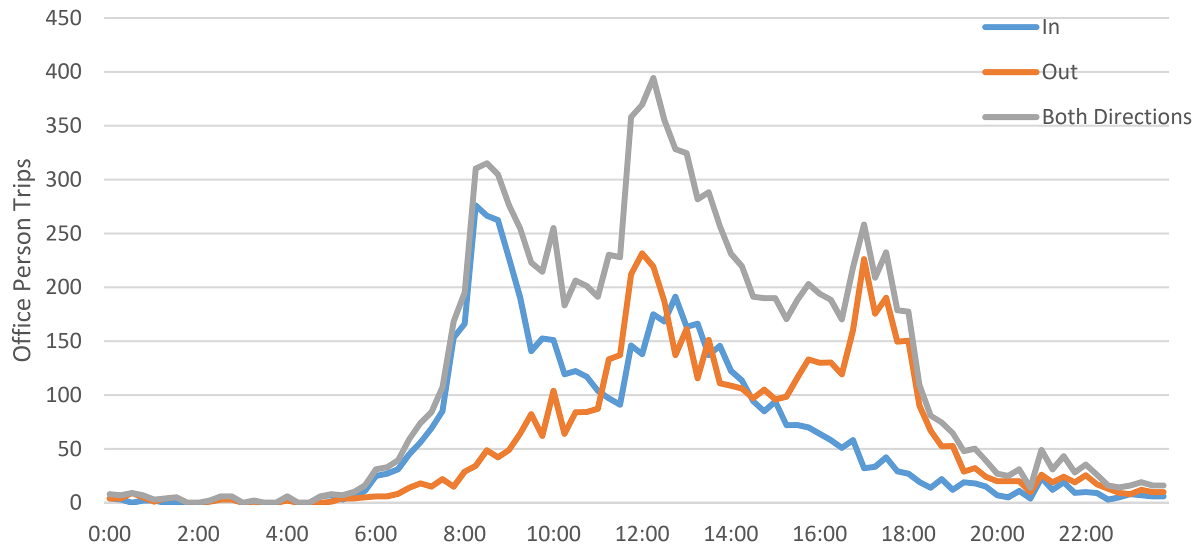


Figure 12: Person Trips by Time of Day, All Sites – Retail

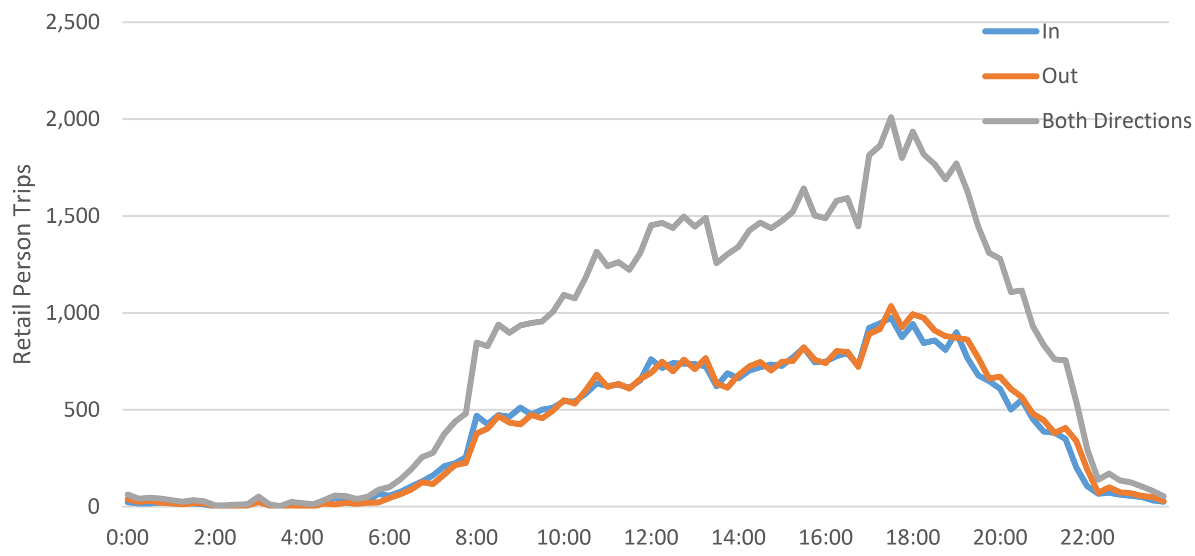


Figure 13: Person Trips by Time of Day, All Sites – Residential

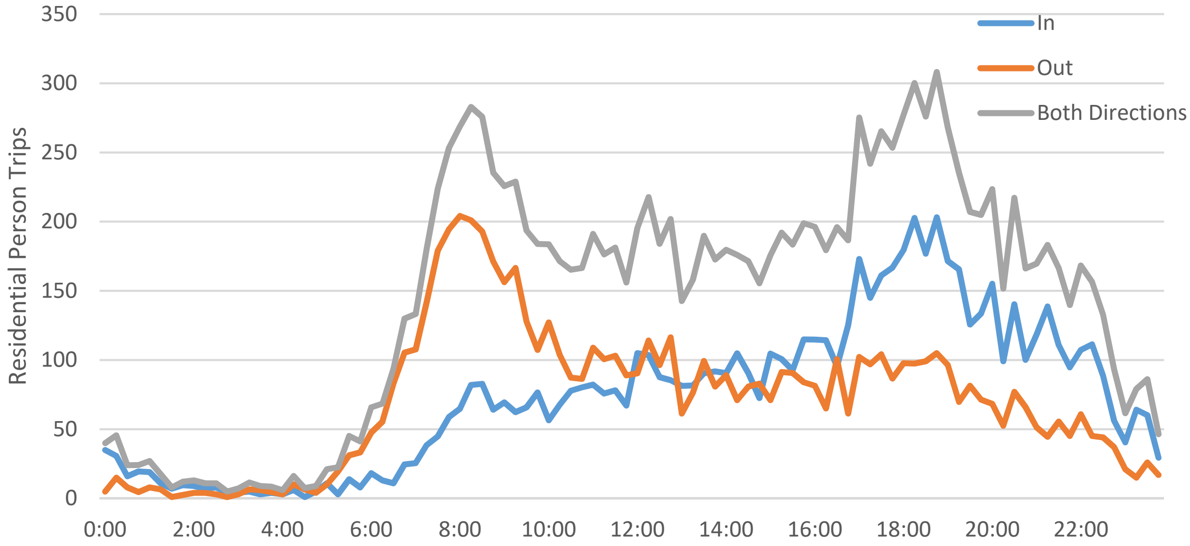
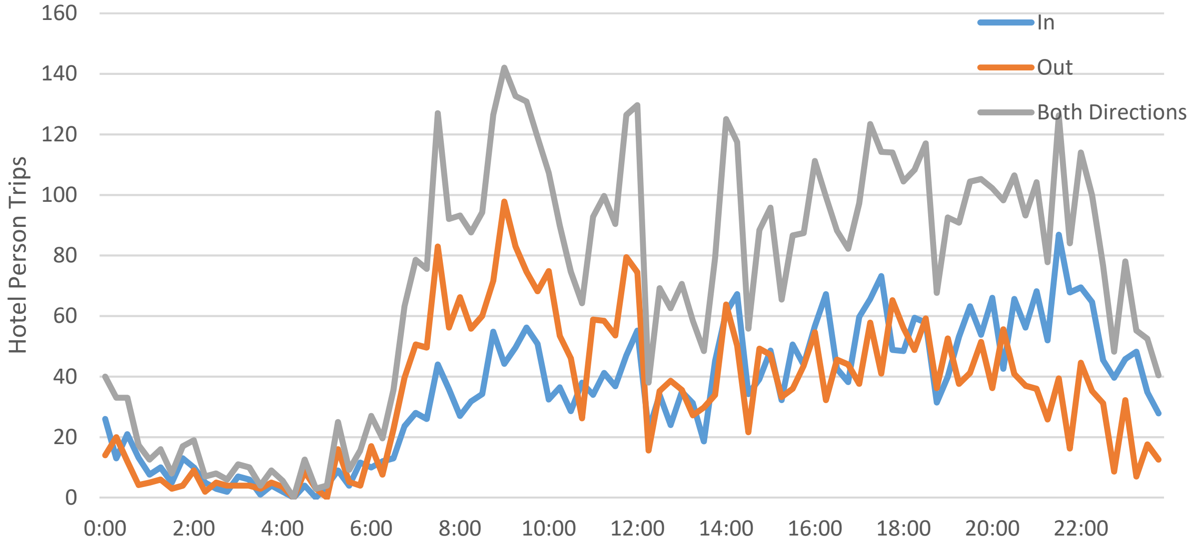


Figure 14: Person Trips by Time of Day, All Sites – Hotel



Each site's trip counts were divided by the amount of land use to identify that site's trip generation rates. To calculate an average trip generation rate for all sites of a given land use type, the person trips at all sites of that land use type were added together and divided by the sum of all land use amounts. For each land use, the 25th and 75th percentile trip generation rates were identified to indicate variability in trip rates. Averages were used rather than a fitted curve equation due to the modest sample size for each land use; additionally, this method insures that when rates are plotted they intersect the y-axis at zero (i.e., at zero land use, we would expect zero trips). This approach is similar to that used by the ITE *Trip Generation* manual.

The person trip generation rates by land use type calculated in this manner are presented in **Table 3** (office), **Table 4** (retail), **Table 8** (residential), and **Table 10** (hotel). These tables also present the rates currently presented for each land use in the existing SF Guidelines; for most uses, the existing SF Guidelines rates fall within the middle 50 percent of person trip generation at all sites, although the average observed trip generation is substantially different. For most land uses, the data collected indicate that peak period travel is spread across a larger period of time than when past surveys were conducted, and that there are correspondingly lower trip rates for the peak hour itself. **Figures 18** through **29** display each land use's individual sites, color-coded by place type, in comparison with the average trip generation rates for that land use.

Appendix J provides trip generation and mode split data at the individual site level, for every site for which data were collected.

6.1.1 Office

Office sites generated far fewer person trips per 1,000 square feet (ksf) than retail sites. Trip generation was roughly similar during the AM and PM peak hours, each of which accounted for about one tenth of total daily trips; this ratio is similar to the PM peak hour to daily person trip rates in the existing SF Guidelines. Office sites exhibited substantial variability in trip generation rates, with the 75th percentile rate approximately equaling three times the 25th percentile rate.

The observed office sites also generated substantially fewer person trips on a daily basis than presented in the existing SF Guidelines. Large office buildings in the financial district seemed to come closest to the trip generation rates currently in use, as shown in **Figure 15.** On average, however, sites sampled in this effort showed trip generation rates around half of the rates currently in use, and the existing rates presented in the SF Guidelines fall above the 75th percentile of surveyed sites. Only one site, at 417 Montgomery Street, exceeded the trip generation rates currently in use.

Table 3: Person-Trip Generation Rates – Office

Person-Trips per 1,000 Square Feet of Office Space				
Time Period	***25th Percentile***	***Average***	***75th Percentile***	***Current SF Guidelines Rate***
Daily	5.0	9.6	15.7	18.1
AM Peak	0.4	0.9	1.4	n/a
PM Peak	0.7	0.8	1.4	1.5

Source: Fehr & Peers, 2018.
Notes:
1. Rates reflect person trip counts conducted at 11 office sites throughout San Francisco.
2. A total of 11,538 person trips were observed.

Figure 15: Daily Person Trip Generation – Office

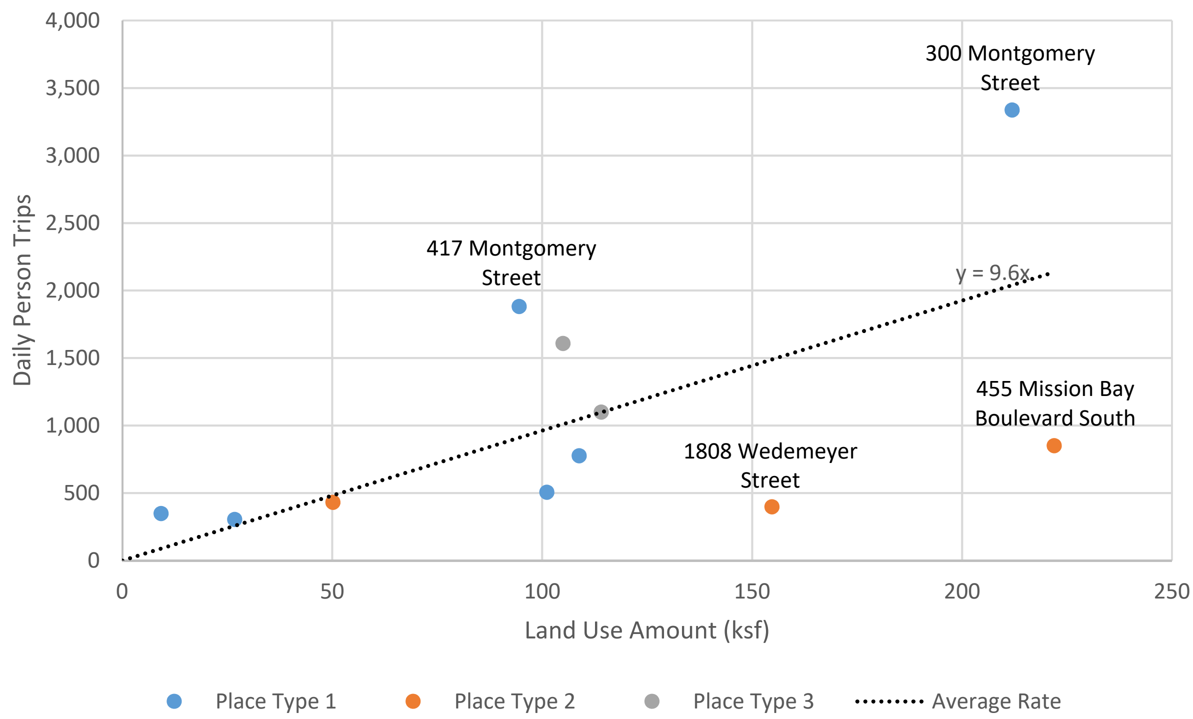


Figure 16: AM Peak Hour Person Trip Generation – Office

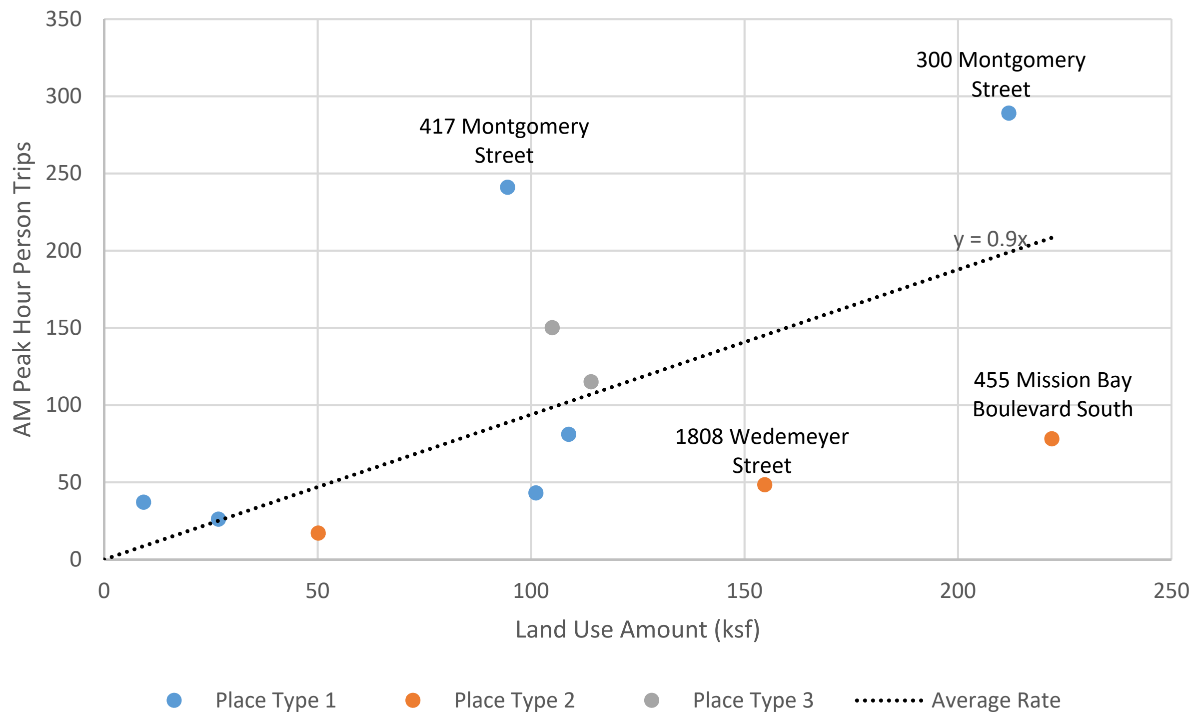
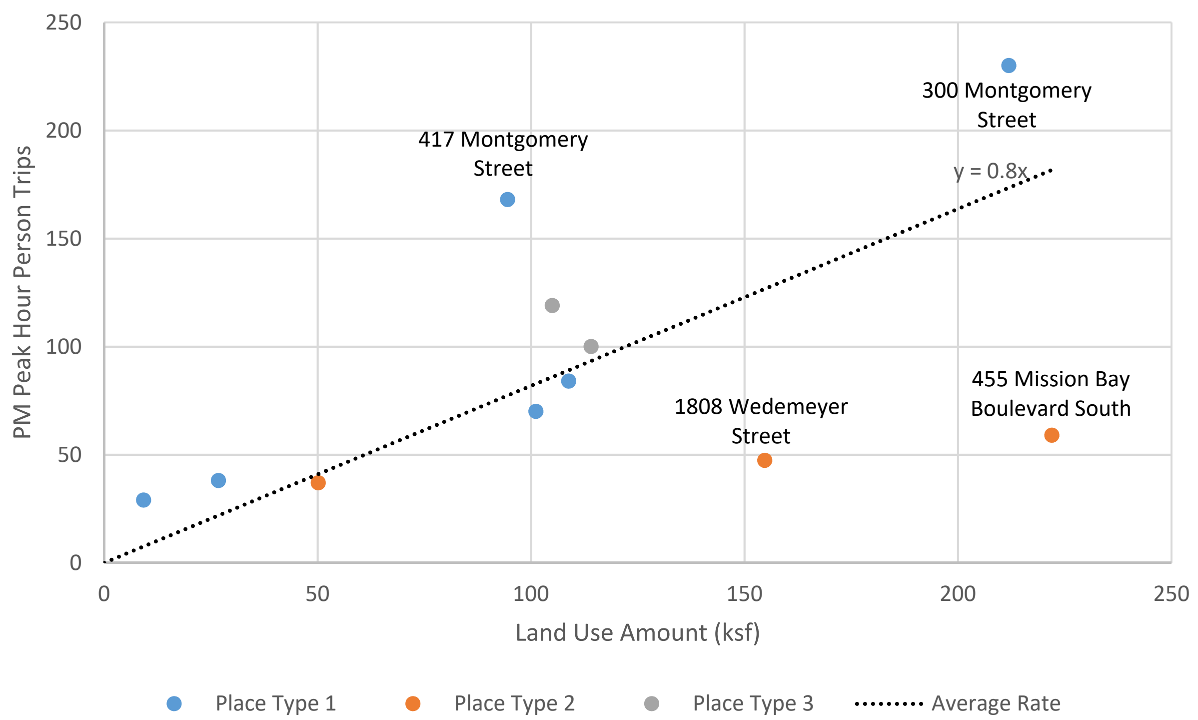


Figure 17: PM Peak Hour Person Trip Generation – Office



6.1.2 Retail

Retail uses generated a wide range of trips, between approximately 85 and 330 daily person trips per ksf of retail space, when looking at the 25th and 75th percentile. When comparing trip generation at different times of day, retail person trip generation was lower during the AM peak period compared to the PM peak period.

Compared to the current rates for general retail presented in the SF Guidelines (150 person trips per 1,000 square feet), the sites in the sample showed generally higher levels of trip making on both a daily and peak hour basis, although the current trip generation rates do fall within the middle 50 percent of rates among survey sites. This may be due to the types of retail sampled, which include several store types that tend to include high numbers of pass-by trips (such as corner stores and pharmacies), as well as several grocery stores.

Table 4: Person-Trip Generation Rates – Retail

Person-Trips per 1,000 Square Feet of Retail Space				
Time Period	***25th Percentile***	***Average***	***75th Percentile***	***Current SF Guidelines Rate***
Daily	85.7	252.3	331.4	150.0
AM Peak	--[3]	11.3	13.7	n/a
PM Peak	9.9	24.4	32.2	13.5

Source: Fehr & Peers, 2018.

Notes:
1. Rates reflect person trip counts conducted at 26 retail sites throughout San Francisco.
2. A total of 78,632 person trips were observed.
3. Many sites were not open during the AM peak hour and had zero values for AM trips, thus a 25th percentile number was not calculated

Figure 18: Daily Person Trip Generation – Retail

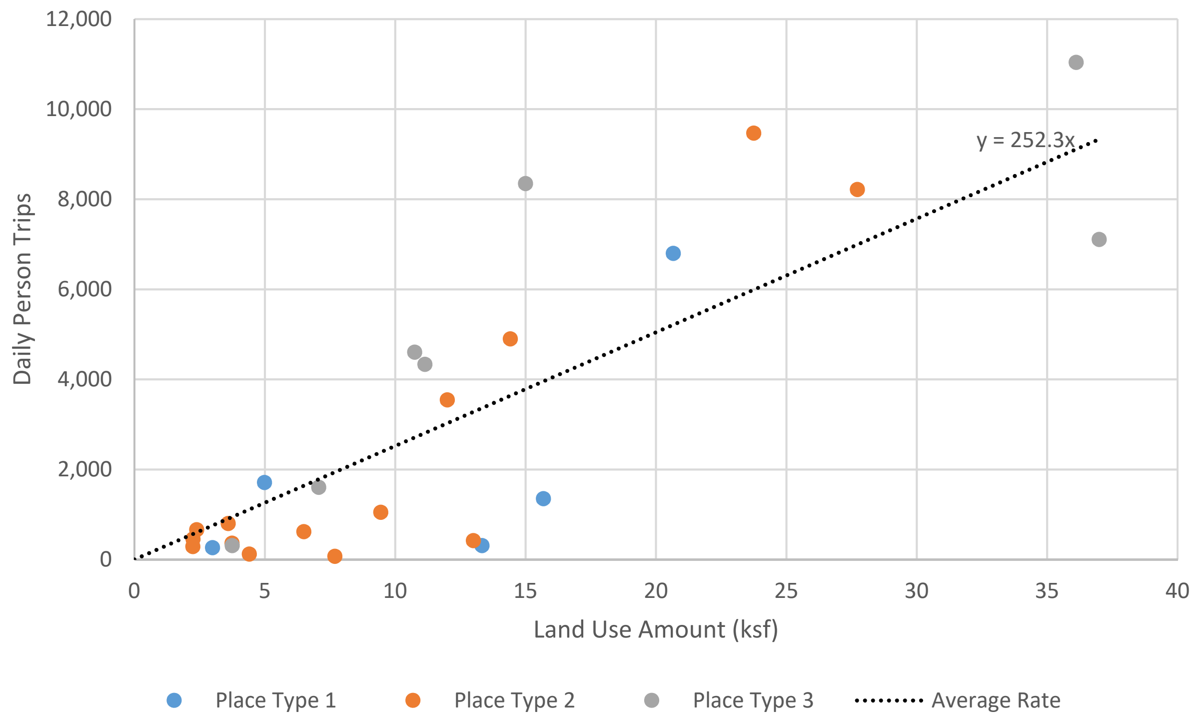


Figure 19: AM Peak Hour Person Trip Generation – Retail

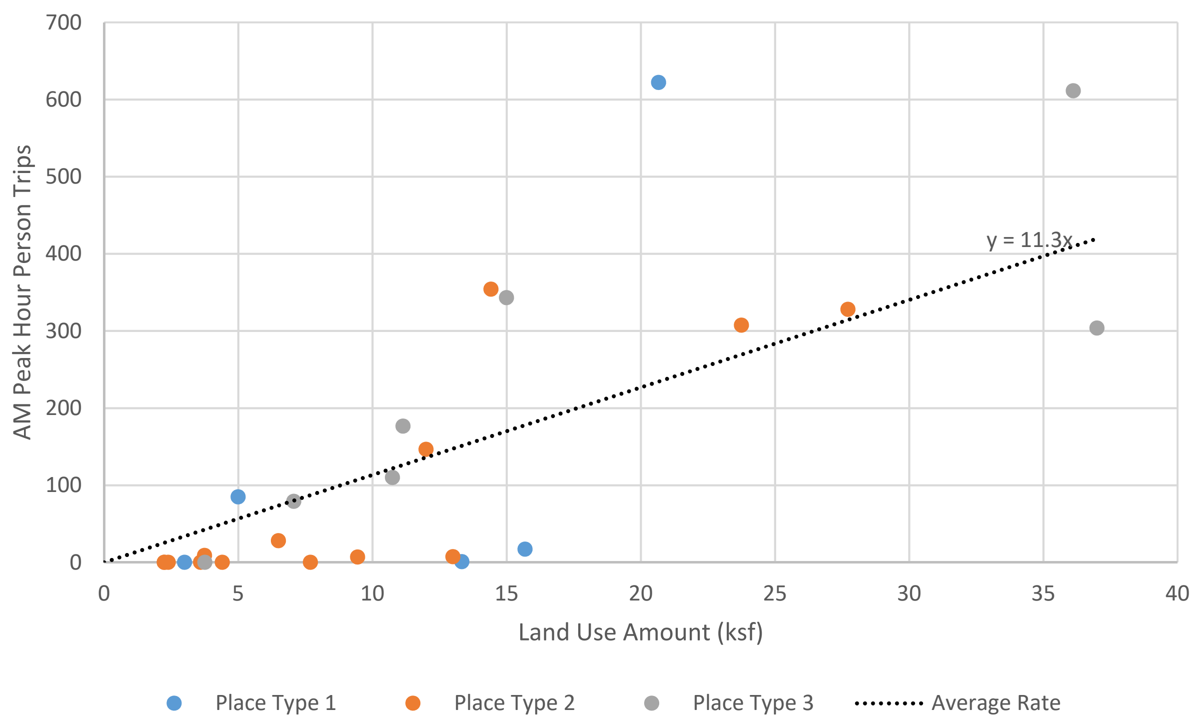
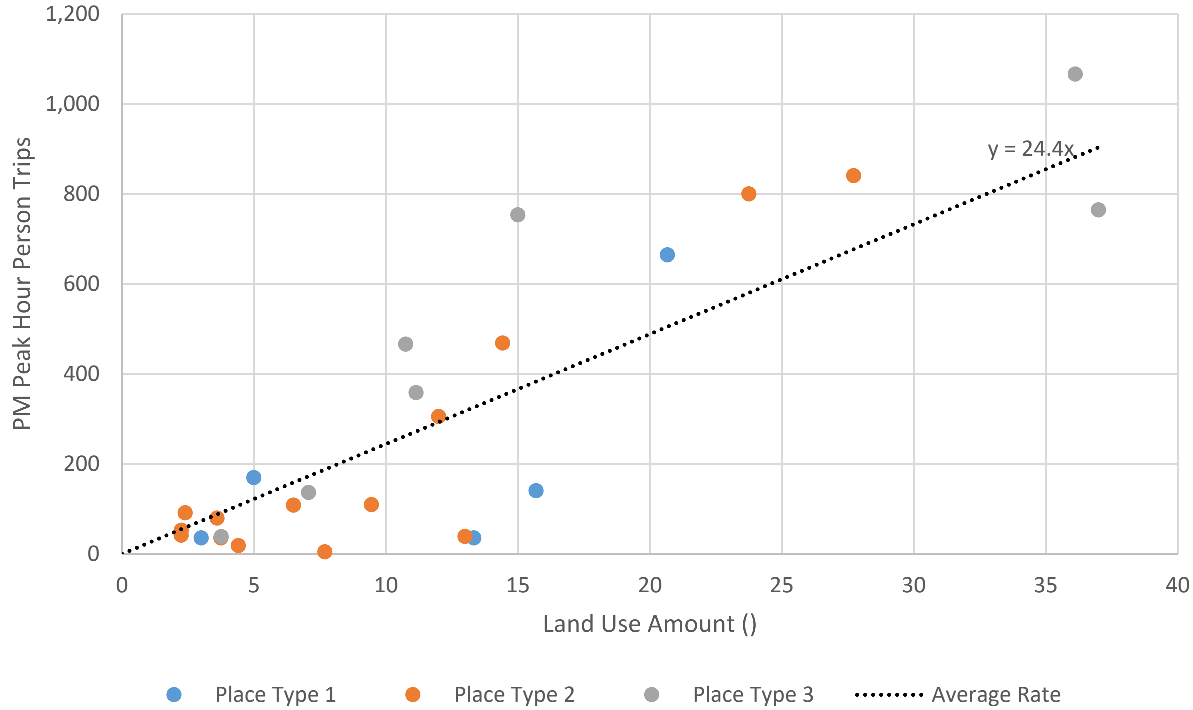


Figure 20: PM Peak Hour Person Trip Generation – Retail



Because the retail study sample included a wide variety of retail store types, a system that stratifies retail based on total floor area was tested. By visually examining the charts shown above, it does seem that trip generation patterns may be different for larger sites compared with smaller sites. First, larger stores are less likely to be closed during the AM peak hour, and have fewer AM peak hour zero values. Second, the very largest sites tended to generate trips at a somewhat higher rate than the sample as a whole.

In our data sample, the median site floor area was 10 ksf. We studied thirteen sites with more than 10 ksf of floor area, and 13 sites with fewer than 10 ksf of floor area. As shown in **Table 5**, based on the standard deviation and differences between rates for the two groups, there is some evidence that the study sites above the 10 ksf threshold have higher trip generation rate than those below. As such, we recommend the use of the average rates shown below for each retail grouping: 145.6 trips per ksf for retail sites under 10,000 square feet, and 282.2 trips per ksf for retail sites over 10,000 square feet.

Table 5: Comparison of Potential Retail Cutpoints

			Sites Below Cutpoint						Sites Above Cutpoint					
			Daily		AM		PM		Daily		AM		PM	
Cutpoint (ksf)	Sites Below	Sites Above	Average	StDev	Average	StDev	Average	StDev	Average	StDev	Average	StDev	Average	StDev
2.5	3	23	200.5	73.5	0.0	0.0	26.5	10.3	215.6	155.4	8.8	9.2	21.0	13.8
5	9	17	161.5	103.8	2.2	5.6	18.9	11.5	241.6	161.8	10.8	9.2	23.1	14.4
7	10	16	154.8	100.1	2.4	5.3	18.7	10.9	250.8	162.5	11.2	9.4	23.5	14.8
8	12	14	148.5	102.8	2.9	5.5	17.2	11.1	269.9	159.7	12.0	9.5	25.4	14.4
10	**13**	**13**	**145.6**	**98.9**	**2.7**	**5.3**	**16.8**	**10.8**	**282.2**	**159.2**	**12.9**	**9.3**	**26.5**	**14.4**
12	15	11	180.6	130.4	4.1	6.2	19.6	12.6	259.3	163.0	12.8	10.1	24.4	14.6
13	16	10	187.8	129.1	4.6	6.3	19.9	12.2	255.7	171.4	12.9	10.7	24.3	15.4
15	19	7	178.9	134.0	5.2	7.6	18.8	12.8	309.0	149.0	14.8	9.6	29.3	12.6
20	21	5	192.4	153.3	5.9	8.2	19.8	14.2	304.2	74.4	16.0	8.5	29.2	5.1

Source: Fehr & Peers, 2018

6.1.3 Residential

Fehr & Peers evaluated and compared several methodologies for calculating residential trip generation.

The simplest methodology is to calculate trip generation as a linear function of the number of dwelling units in a given residential building. This has the advantage that the required input (number of dwelling units) is easy to obtain and comprehend. However, this methodology does not account for the different trip-making characteristics of households in differently sized units. For example, we would expect that a three-bedroom unit would likely generate more trips than a studio.

Historically, SF Planning has calculated residential trip generation in a bivariate fashion: studio, junior one-bedroom, and one-bedroom units are assigned one trip generation rate, while two-bedroom, three-bedroom, and larger units are assigned a different, higher rate. For this approach (referred to below as "01-23"), it is necessary to know a development's unit mix. The unit mix is a standard piece of data provided to SF Planning as part of a development proposal, and therefore approaches that consider differently sized units separately are unproblematic from a data availability perspective.

Another methodology assigns different trip generation rates at a finer level than SF Planning's historic approach. For example, four rates could be determined, for studios and junior one-bedroom units; one-bedroom units; two-bedroom units; and three-or-more bedroom units. The major downside of such a granular methodology (referred to below as "0-1-2-3") is that the large number of input variables requires a large number of study sites (buildings whose unit mix is known and whose trip generation has been directly observed) to determine accurate trip generation rates for each subgroup of dwelling units.

Finally, it is possible to consider residential trip generation as a univariate function not of the number of dwelling units, but the number of *bedrooms*. Given a development's unit mix, it is simple to calculate the total number of bedrooms, which can then be multiplied by a trip generation rate. This methodology effectively accounts for different unit sizes while at the same time functioning well given a smaller set of study sites.

Fehr & Peers calculated trip generation rates according to the four approaches listed above. The study set included 13 residential sites with known unit mix and trip generation data. These sites ranged in size from 24 to 320 dwelling units. For the bedroom-based analysis, the total number of bedrooms was calculated using detailed unit mix information and was based on the following mapping:

- "0 bedroom units," i.e. studios and junior 1 bedrooms: 1 bedroom
- 1 bedroom units: 1 bedroom

- 2 bedroom units: 2 bedrooms
- 3+ bedroom units: 3.2 bedrooms (because some units will have more than 3 bedrooms)

The results of this analysis, including the coefficients for each unit type, the statistical goodness of fit of each approach, and a comparison to the current SF Planning TIA Guidelines, are presented in **Table 6**.

Table 6: PM Peak Hour Residential Trip Generation By Methodology

Person-Trips per Unit of Each Type					
Methodology	**Studio**	**1 BR**	**2 BR**	**3+ BR**	**Goodness of Fit**
SF Guidelines	1.298		1.730		-
Dwelling Units	0.494*				0.795
0-1-2-3	0.330	0.205	0.752*	0.980	0.757
01-23	0.257		0.744*		0.800
Bedrooms	0.331*		0.662*	0.993*	0.816

Notes:
1. "Studio" includes Junior 1 Bedroom.
2. "Goodness of Fit" refers to Adjusted R-Squared, a statistical measure that ranges from 0 to 1, where 0 signifies no relationship and 1 signifies a very strong relationship.
3. * indicates the coefficient is statistically significant.

Table 7: Daily Residential Trip Generation By Methodology

Person-Trips per Unit of Each Type					
Methodology	**Studio**	**1 BR**	**2 BR**	**3+ BR**	**Goodness of Fit**
SF Guidelines	7.5		10.0		-
Dwelling Units	6.2*				0.800
0-1-2-3	0.0	4.5	9.7*	9.4	0.790
01-23	2.3		10.4*		0.823
Bedrooms	4.2*		8.4*	12.6*	0.829

Notes:
1. "Studio" includes Junior 1 Bedroom.
2. "Goodness of Fit" refers to Adjusted R-Squared, a statistical measure that ranges from 0 to 1, where 0 signifies no relationship and 1 signifies a very strong relationship.
3. * indicates the coefficient is statistically significant.

The multivariate regressions (# of units of each size) were not exceptionally successful: adjusted R-squared values, which express the predictive power of the model, were not substantially higher than the univariate regression of person trips per dwelling unit. Furthermore, the coefficients of each explanatory variable were somewhat nonsensical; for example, one model estimated that each additional two-bedroom unit would generate four times as many person trips as each additional one-bedroom unit.

However, the approach of performing a simple linear regression of person trips by the total number of bedrooms was very successful. Holding the y-intercept at zero, this approach determined that each bedroom generated 4.2 daily person trips, 0.32 AM peak hour person trips, and 0.33 PM peak hour person trips. Adjusted R-squared values were higher for this approach than for any other approach, and the coefficients for daily, AM peak hour, and PM peak hour person trip generation are all sensical and highly statistically significant.

It is possible that given a larger sample set of residential sites, especially sites with a broad range of unit sizes, the coefficients in the 01-23 and 0-1-2-3 analyses could become more plausible and more statistically significant. However, given the available sample set, Fehr & Peers recommends the use of either a dwelling units-based or a bedrooms-based approach to residential trip generation.

Residential Trip Generation Results by Dwelling Unit

Residential sites were found to generate approximately six person trips per dwelling unit in a given 24-hour period. The variation in residential trip generation rates was narrower than for other land uses: the AM and PM peak hours' 75^{th} percentile rates were about twice the 25^{th} percentile rates, and daily trip generation displayed an even tighter grouping, as shown in **Figure 21** below.

When compared to the rates currently in use for one bedroom and studio apartments in the SF Guidelines, daily rates of trip making are similar but somewhat lower (with the daily trip generation presented in the SF Guidelines still falling within the middle 50 percent of surveyed sites), and the number of trips occurring in the PM peak period is much lower. This may reflect a tendency for trips to shift outside of the PM peak period, or it may reflect different demographics in the types of buildings surveyed under this effort (which tended to be newer construction, market rate buildings).).

The residential person-trip generation rates derived from newly collected video data are similar to rates calculated using 2012 CHTS data (see section 4.1.4 above). Daily trip generation is slightly higher than in CHTS (5.9 vs 5.6 daily person trips per dwelling unit), while the AM peak hour rate is slightly below and the PM peak hour rate is very close to the corresponding rates from CHTS data.

Table 8: Person-Trip Generation Rates – Residential

Person-Trips per Residential Dwelling Unit					
Time Period	***25th Percentile***	***Average***	***75th Percentile***	***Current SF Guidelines Rate (1BR / studio)***	***2012 CHTS Rate***
Daily	4.6	5.7	7.8	7.5	5.6
AM Peak	0.4	0.5	0.7	n/a	0.6
PM Peak	0.4	0.4	0.6	1.3	0.5

Source: Fehr & Peers, 2018.

Notes:
1. Rates reflect person trip counts conducted at 19 residential sites throughout San Francisco.
2. A total of 13,886 person trips were observed.

Figure 21: Daily Person Trip Generation per du– Residential

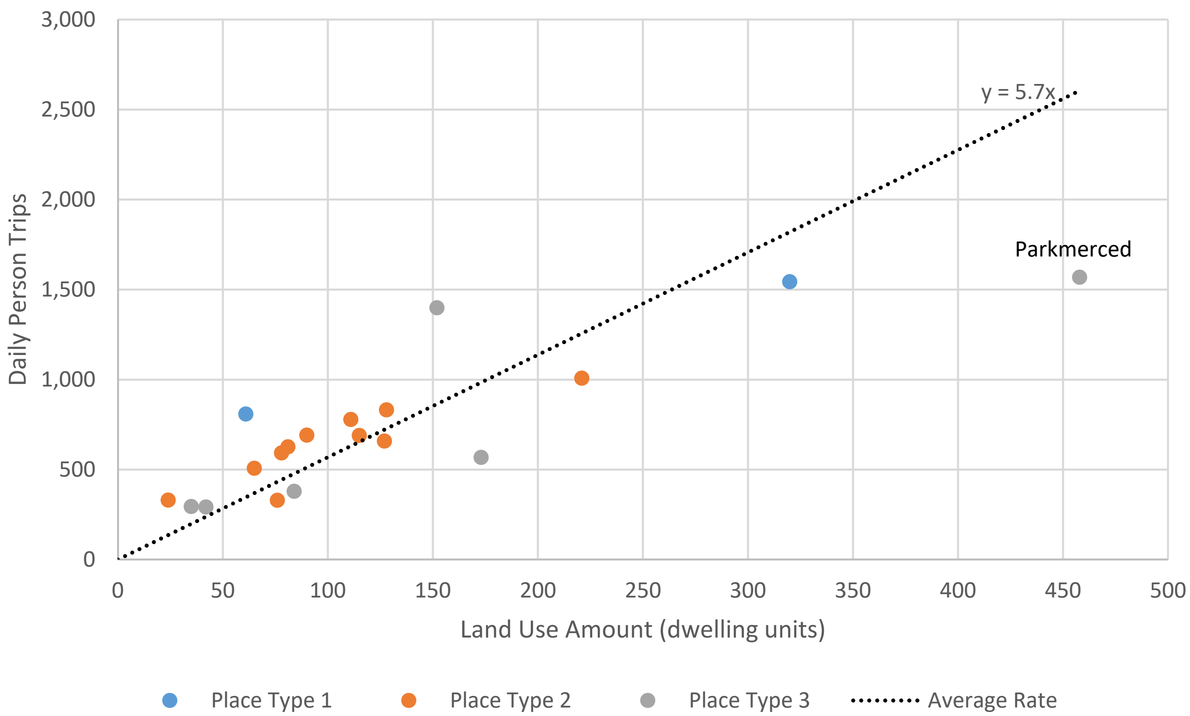


Figure 22: AM Peak Hour Person Trip Generation per du – Residential

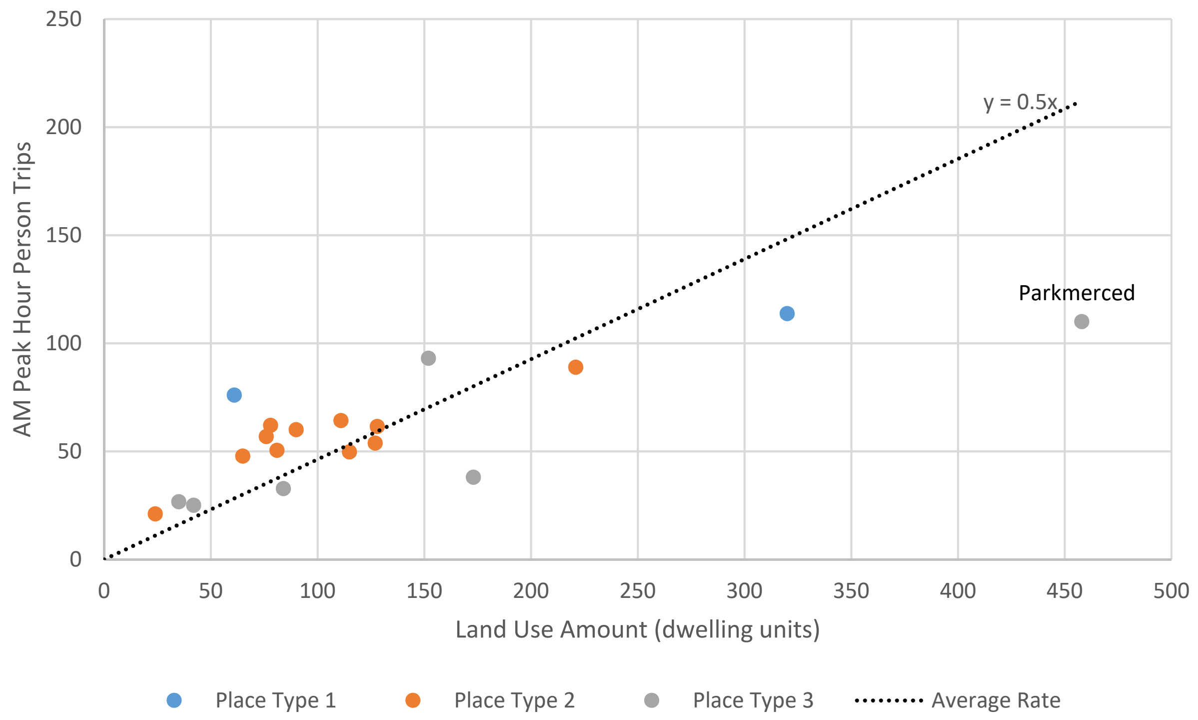
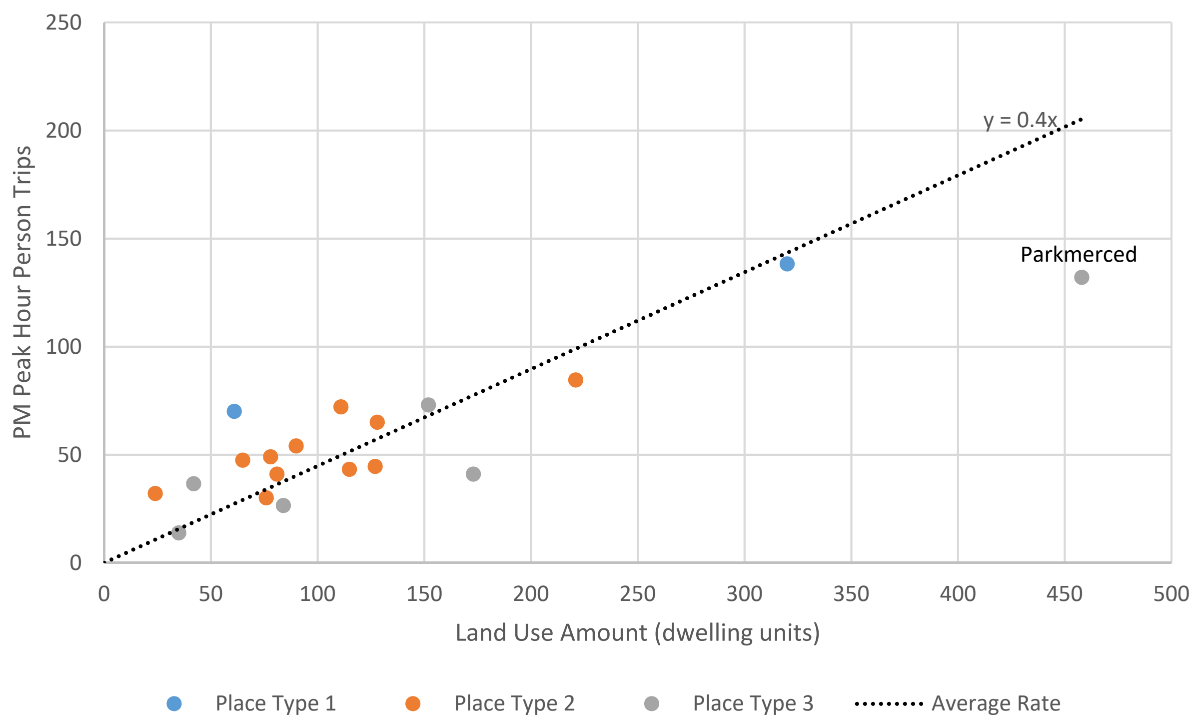


Figure 23: PM Peak Hour Person Trip Generation per du – Residential



Residential Trip Generation Results by Bedroom Count

Residential sites were found to generate approximately four person trips per bedroom in a given 24-hour period, as discussed above. The resulting average, 25th, and 75th percentile rates are presented in **Table 9** and fitted curves are shown in **Figure 24**, **Figure 25**, and **Figure 26**.

When compared to the rates currently in use for one bedroom and studio apartments in the SF Guidelines, daily rates of trip making are lower, with the one bedroom and studio rates exceeding the 75th percentile per bedroom rates at our surveyed sites. This pattern also holds true for the AM and PM peak periods.

The residential person-trip generation rates derived from newly collected video data are slightly lower than rates calculated using 2012 CHTS data (see section 4.1.4). This is to be expected, as CHTS data are on a per household basis, and many households live in units with more than one bedroom.

Table 9: Person-Trip Generation Rates per Bedroom – Residential

Person-Trips per Residential Bedroom					
Time Period	***25th Percentile***	***Average***	***75th Percentile***	***Current SF Guidelines Rate (1BR / studio)***	***2012 CHTS Rate (per household)***
Daily	4.0	4.9	6.1	7.5	5.6
AM Peak	0.3	0.4	0.5	n/a	0.6
PM Peak	0.3	0.4	0.5	1.3	0.5

Source: Fehr & Peers, 2018.

Notes:
1. Rates reflect person trip counts conducted at 19 residential sites throughout San Francisco.
2. A total of 13,886 person trips were observed.

Figure 24: Daily Person Trip Generation per Bedroom – Residential[27]

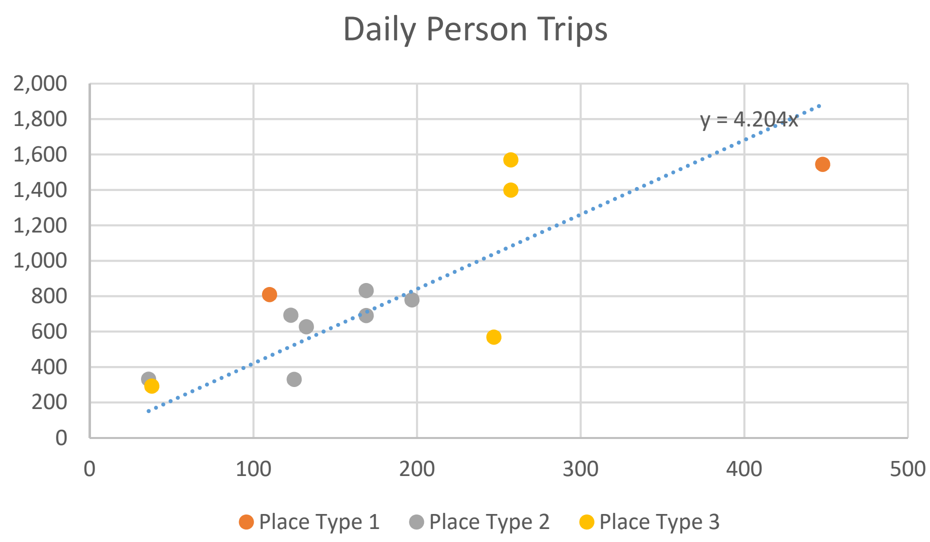
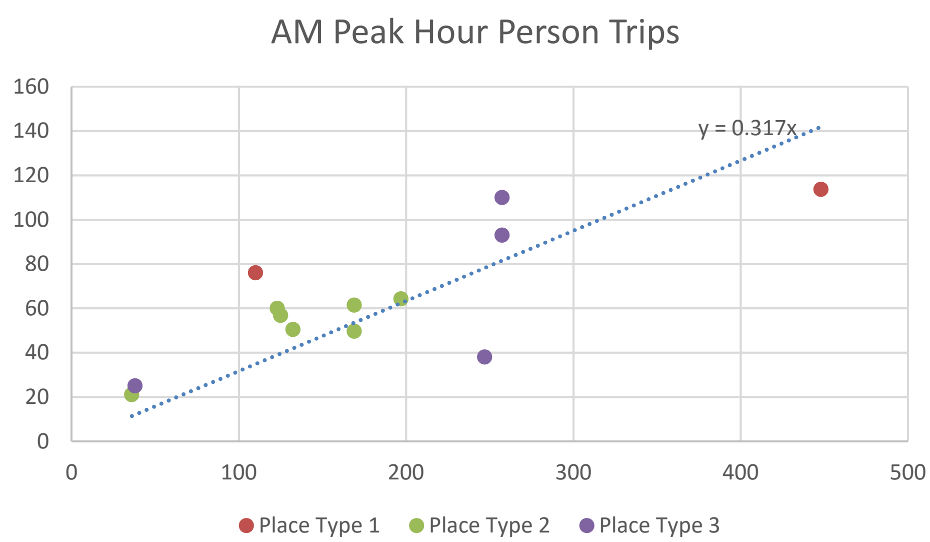
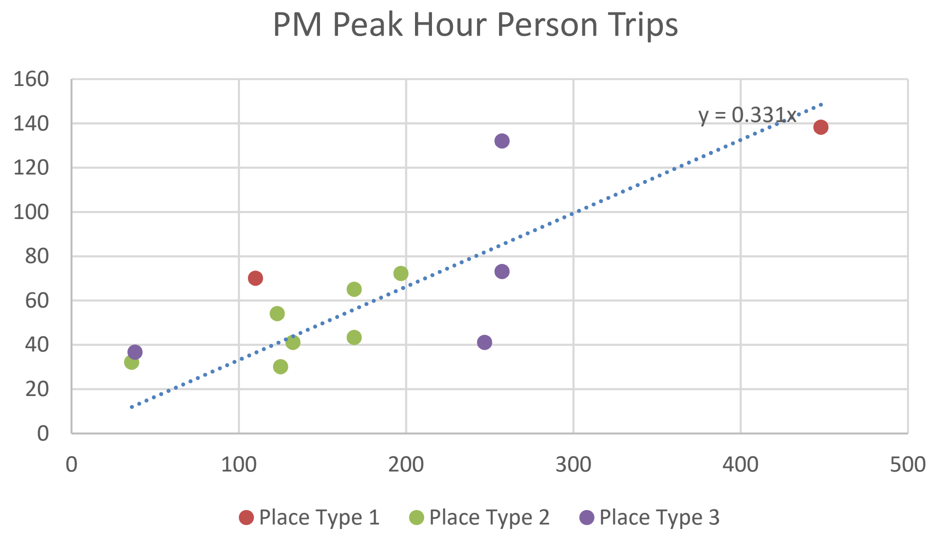


Figure 25: AM Peak Hour Person Trip Generation by Bedroom – Residential[27]



[27] For residential trips per bedroom, the fitted curve coefficient was used rather than the average rate.

Figure 26: PM Peak Hour Person Trip Generation by Bedroom – Residential[27]



6.1.4 Hotel

Hotel sites generated an average of approximately nine person trips per day per room. Compared with the other land uses examined in this report, hotels' trip generation was less temporally peaked, with the AM and PM peak hours accounting for about seven percent of daily trip generation each. The variability of hotel sites' trip generation rates was also relatively narrow, approximately similar to that of residential sites.

The hotel sites surveyed had similar rates of person trip generation compared to the rates currently in use in the SF Guidelines, with slightly higher levels of daily trip making and slightly fewer trips occurring during the PM peak period. For both daily trips and trips in the PM peak hour, the rates currently in use fall within the 25th to 75th percentile range of surveyed sites.

Table 10: Person-Trip Generation Rates – Hotel

Person-Trips per Hotel Room				
Time Period	***25th Percentile***	***Average***	***75th Percentile***	***Current SF Guidelines Rate***
Daily	6.1	8.4	10.8	7.0
AM Peak	0.4	0.6	0.8	n/a
PM Peak	0.4	0.6	0.7	0.7

Source: Fehr & Peers, 2018.

Notes:
1. Rates reflect person trip counts conducted at 9 hotel sites throughout San Francisco.
2. A total of 6,773 person trips were observed.

Figure 27: Daily Person Trip Generation – Hotel

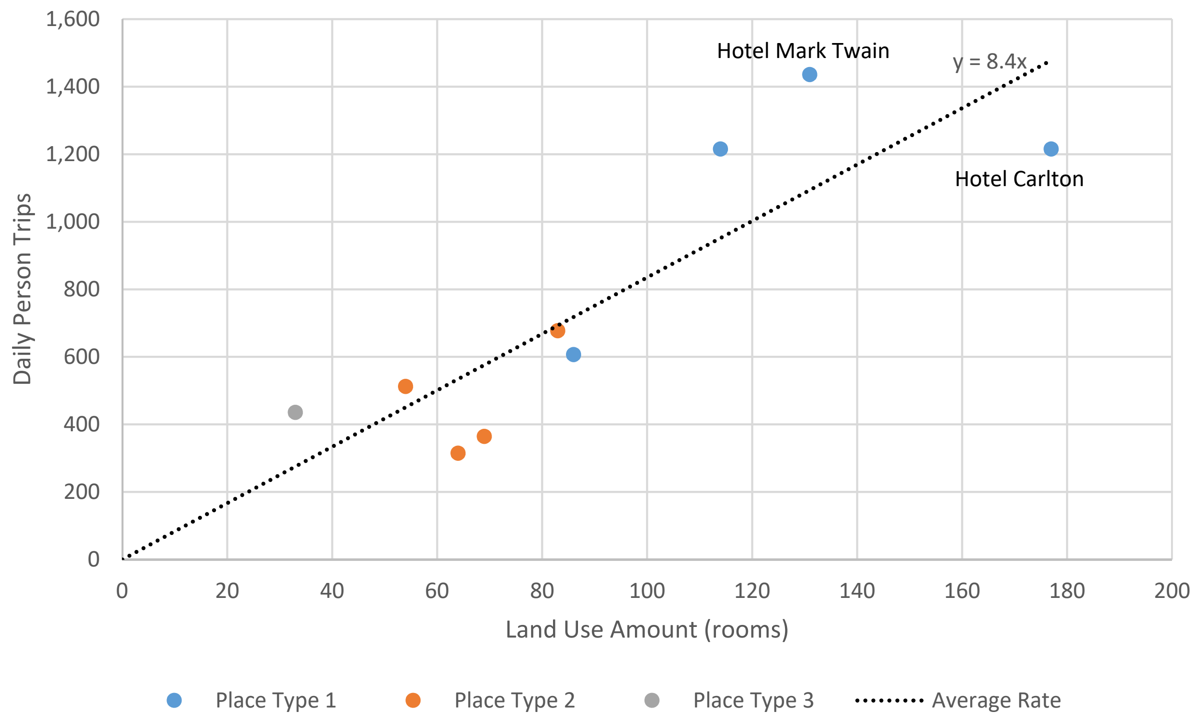


Figure 28: AM Peak Hour Person Trip Generation – Hotel

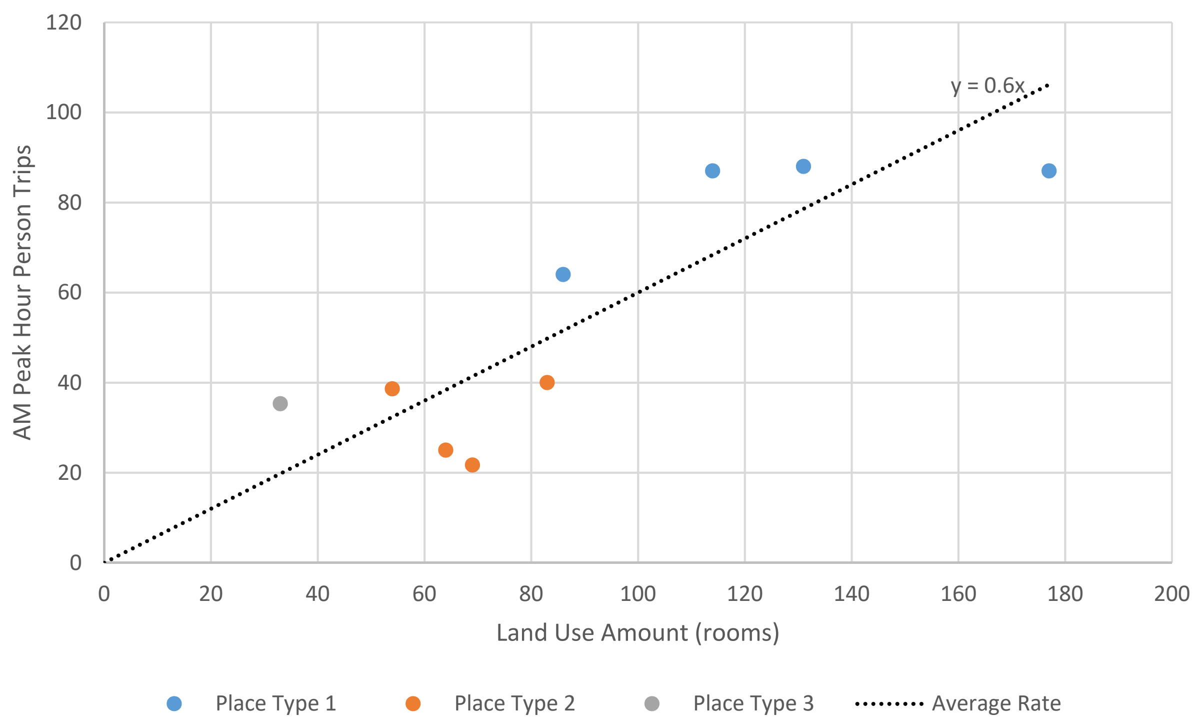
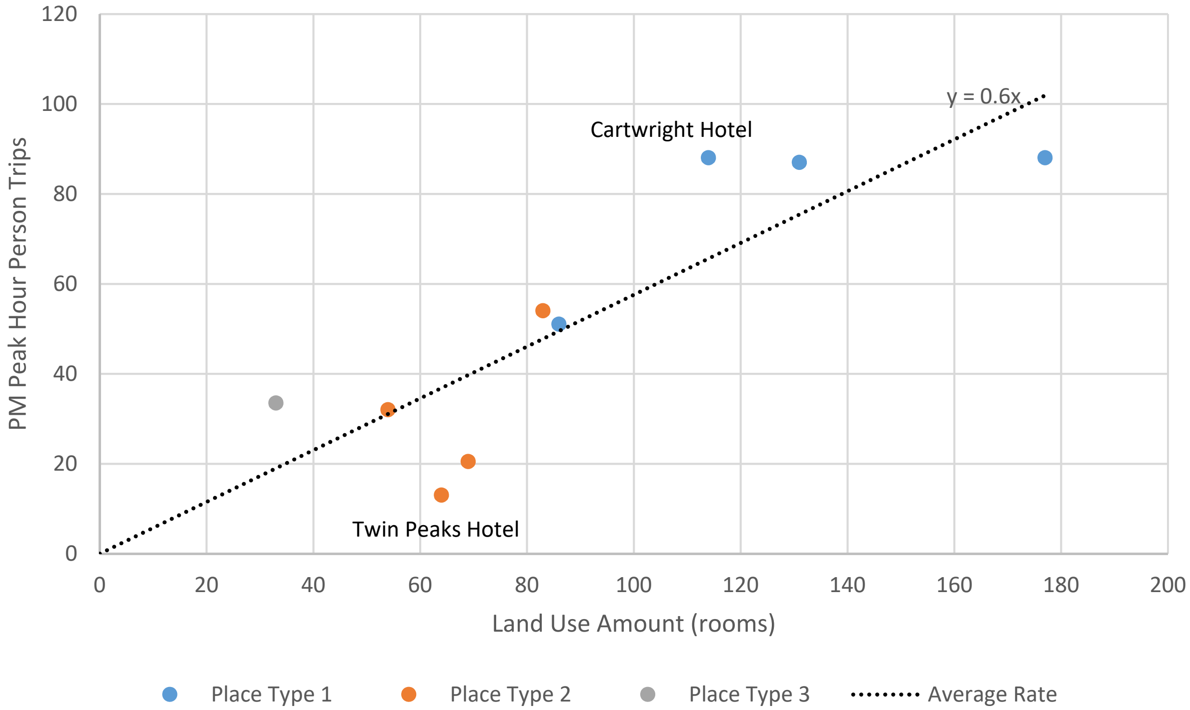


Figure 29: PM Peak Hour Person Trip Generation – Hotel



6.2 Extended PM Peak Mode Split

Fehr & Peers calculated the mode split (the share of individuals using each of the modes presented in the travel survey) for the extended PM peak period (3:00 to 7:00 PM) at each of the data collection sites where surveys were conducted. These mode splits were then further aggregated at the individual trip level, based on both land use and location within San Francisco.

Mode splits were calculated based on intercept survey data, which were collected at 65 sites during the extended PM peak period; therefore, the mode splits presented in this analysis reflect travel patterns during that time period. CHTS data were used to supplement mode split data for residential uses only. In addition, garage and driveway vehicle counts were used to provide additional information on vehicle modes for sites where we could not conduct intercept surveys due to direct access between the building and garage.

A total of 9,913 survey responses were collected, of which 6,014 indicated a travel mode and were therefore suitable for inclusion in this analysis. At sites where no interior parking garage was present (16 sites), or where permission was obtained to survey at both interior and exterior doorways (five sites), the intercept survey data were the sole source of mode split information. Where interior parking was present and surveying at interior doorways was not feasible, additional calculations were performed; these calculations drew on the video person trip count data and parameters from CHTS. Ultimately, a total of 65 sites were included in the mode split analysis.

The mode split analysis inherits all assumptions used in the trip generation analysis discussed in section 6.1 above. Additionally, assumptions were made regarding the breakdown of vehicle trip types (Drive Alone/HOV Driver/HOV Pax). These assumptions came from analysis of CHTS data, as discussed in section 4.1.1 above.

Mode splits were first calculated at the individual site level. The methodology was as follows:[28]

1. Calculate the site's survey mode splits. Each survey mode split was equal to the number of survey responses indicating a given mode divided by the total number of site survey responses indicating any mode.
2. Apply these survey mode splits to the count of doorway person trips (collected via video counts).
3. Apply the vehicle trip type breakdown (drive alone vs. HOV) derived from CHTS data to the count of driveway vehicle trips (This step is not applicable to sites where no interior parking garage was present or where permission was obtained to survey at both interior and exterior doorways)
4. Sum up total person trip counts for each mode.
5. Calculate the site's final mode split as the number of person trips for a given mode divided by the total number of person trips for all modes.

Sites were then aggregated by place type and land use, with average mode splits being calculated as a simple average of each site's mode splits.

The results of the mode split analysis are presented in **Table 11**. A summary table, which aggregates individual modes into Auto (Drive Alone, HOV Driver, and HOV Pax), Taxi/TNC, Public Transit (Bus, Light Rail, and Heavy Rail), Private Transit (Private Shuttle), Walk, and Bike, is shown in **Table 12**.

[28] The methodology presented here is the more complex one employed at sites with interior parking present for which interior survey data were unavailable.

Table 11: Mode Split by Place Type and Land Use

Land Use	Place Type	Number of Sites	Number of Survey Responses	Drive Alone %	HOV Driver %	HOV Pass-enger %	Walk %	Taxi / TNC %	Bike %	Bus[1] %	Light Rail[2] %	Heavy Rail[3] %	Private Shuttle[4] %
Office	Place Type 1	8	942	12.2%	3.7%	2.5%	42.3%	6.1%	3.7%	7.1%	3.2%	18.5%	0.6%
	Place Type 2	7	893	27.6%	5.3%	4.5%	17.1%	11.1%	2.8%	8.1%	2.0%	8.5%	12.9%
	Place Type 3	3	413	56.1%	3.2%	10.1%	5.7%	2.0%	0.6%	0.3%	1.2%	2.1%	18.6%
Retail	Place Type 1	4	347	9.3%	0.2%	1.8%	54.9%	4.6%	3.7%	6.1%	7.9%	11.4%	0.0%
	Place Type 2	10	1,096	17.5%	5.1%	3.3%	57.6%	1.4%	2.8%	6.6%	2.2%	3.0%	0.5%
	Place Type 3	7	949	31.6%	13.8%	8.6%	27.8%	1.0%	1.1%	10.5%	3.7%	1.6%	0.3%
Residential	Place Type 1	4	366	15.6%	3.6%	5.6%	37.7%	6.0%	2.9%	14.9%	5.9%	7.2%	0.5%
	Place Type 2	9	392	27.3%	4.3%	7.3%	34.3%	3.5%	3.9%	8.2%	10.2%	0.6%	0.3%
	Place Type 3	2	177	18.6%	7.6%	5.3%	28.3%	4.2%	5.1%	15.7%	11.3%	2.7%	1.2%
Hotel	Place Type 1	4	196	5.3%	7.8%	4.4%	55.1%	19.6%	0.0%	1.6%	1.5%	2.8%	1.8%
	Place Type 2	5	187	11.3%	7.0%	8.6%	38.4%	15.7%	0.0%	7.2%	5.0%	2.5%	4.2%
	Place Type 3	2	56	21.7%	11.8%	12.0%	45.6%	7.5%	0.0%	0.0%	1.5%	0.0%	0.0%

Source: Fehr & Peers, 2018.

Notes:
1. Bus includes Muni bus service, AC Transit, SamTrans, and Golden Gate Transit.
2. Light Rail includes Muni Metro.
3. Heavy Rail includes BART and Caltrain.
4. Private Shuttle includes employer-operated shuttles (including long-haul “tech shuttles”), private bus operators such as Chariot, and short-haul shuttles operated by nonprofit or business groups (such as the University of California San Francisco, Executive Park, or the Mission Bay Transportation Management Association).

Table 12: Mode Split by Place Type and Land Use (Summary)

Land Use	Place Type	Number of Sites	Number of Survey Responses	Auto[1] %	Taxi / TNC %	Public Transit[2] %	Private Transit[3] %	Walk %	Bike %
Office	Place Type 1	8	942	18%	6%	29%	1%	42%	4%
	Place Type 2	7	893	37%	11%	19%	13%	17%	3%
	Place Type 3	3	413	69%	2%	4%	19%	6%	1%
Retail	Place Type 1	4	347	11%	5%	25%	0%	55%	4%
	Place Type 2	10	1096	26%	1%	12%	0%	58%	3%
	Place Type 3	7	949	54%	1%	16%	0%	28%	1%
Residential	Place Type 1	4	366	25%	6%	28%	0%	38%	3%
	Place Type 2	9	392	39%	4%	19%	0%	34%	4%
	Place Type 3	2	177	32%	4%	30%	1%	28%	5%
Hotel	Place Type 1	4	196	17%	20%	6%	2%	55%	0%
	Place Type 2	5	187	27%	16%	15%	4%	38%	0%
	Place Type 3	2	56	45%	7%	1%	0%	46%	0%

Source: Fehr & Peers, 2018.

Notes:
1. Auto includes Drive Alone, HOV Driver, and HOV Pax.
2. Public Transit includes Bus, Light Rail, and Heavy Rail.
3. Private Transit includes Private Shuttle.

6.2.1 Office

As shown in **Figure 30**, the extended PM peak period mode splits of office sites within Place Type 1 were dominated by transit and walking trips. Approximately a quarter of Place Type 1 office trips were made by auto or taxi/TNC. Office sites' auto mode share increased steadily from Place Type 1 to 2 and 3. Place Type 3's mode split reflects high auto activity and private transit ridership, and minimal public transit or active transportation (walk or bike) trips.

The relatively high proportion of office trips made by private transit reflects factors that are particular to individual sites. Several office sites in Place Types 2 and 3 were served by private transit: an office building in Mission Bay was adjacent to a Mission Bay Transportation Management Association bus stop, and multiple sites in Executive Park were near designated private employer shuttle stops. In the absence of proximity to such facilities, an office site in Place Type 2 or 3 might not exhibit very high private transit mode share. Whether those trips would otherwise be made by public transit, driving, or some other mode likely depends on other factors such as distance to high quality transit and parking pricing and availability. This may lead to an undercounting of car trips at similar, future office developments, particularly in areas without strong transit service, unless the office development also includes private shuttles.

Each individual office site's auto mode share is shown by Place Type in **Figure 31**. It is important to note that Figure 31, and the subsequent figures like it for the other land use categories, considers both Auto and Taxi/TNC to be part of "auto mode share," as they have similar implications for VMT, GHG emissions, and roadway congestion. This figure shows that with the exception of 1000 Brannan Street, which is located at the very edge of Place Type 1 and adjacent to freeway on- and off-ramps, Place Type 1 office sites were closely grouped around a low auto mode share. By contrast, there was substantial variation in auto mode share at office sites in Place Type 2. Place Type 3's office sites, while fewer in number of sites, auto mode share were relatively closely grouped.

Figure 30: Mode Splits by Place Type – Office

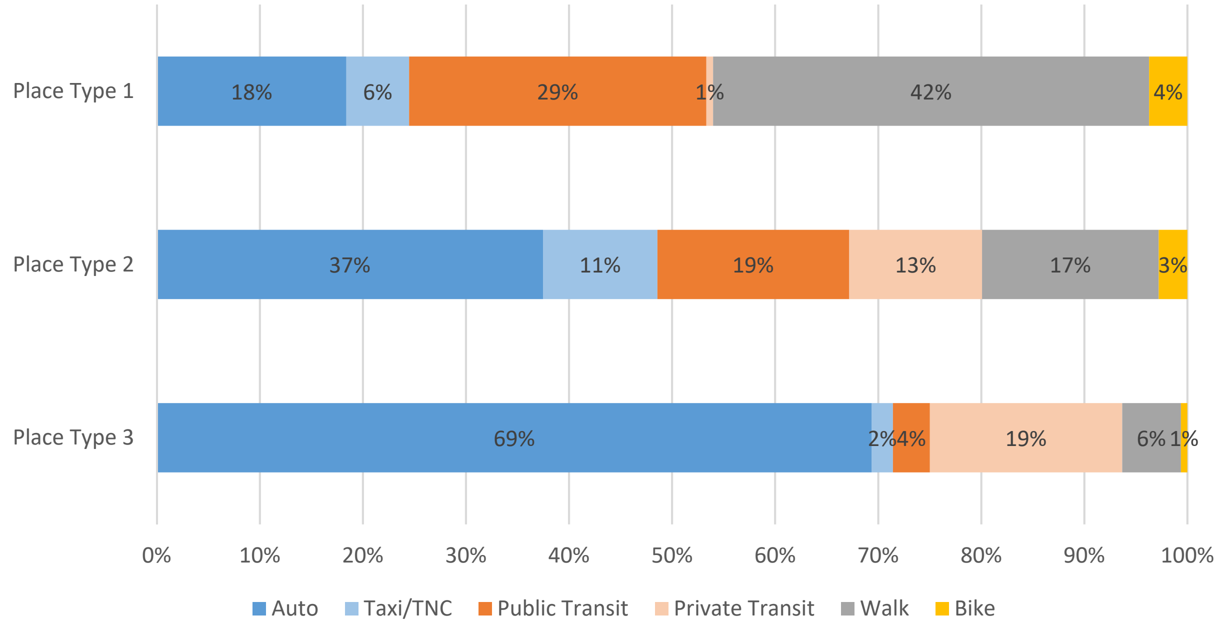


Figure 31: Auto Mode Share Scatter – Office

6.2.2 Retail

Throughout San Francisco, the extended PM peak period mode splits at retail sites reflect a high level of walking. As shown in **Figure 32**, a full 80 percent of trips at retail sites within Place Type 1 take place by walking or public transit. More than half of the retail mode splits in Place Type 2 are walking trips, while auto trips increase to make up for a reduced transit mode share. Within Place Type 3, auto trips are dominant, but nearly half of extended PM peak period trips to and from retail sites take place by public transit or walking. This high share of walking and transit trips likely reflects the prevalence of local-serving retail, which generates many trips due to pass-by activity (or people stopping on their way to another location).

Figure 33 shows each retail site's auto mode share. Of particular note is the fairly wide range of variability in Place Type 2, where sites' auto mode shares ranged from zero percent to more than 50 percent. Within Place Type 3, there was a clearer grouping of high auto mode share, with a couple of outliers.

Figure 32: Mode Splits by Place Type – Retail

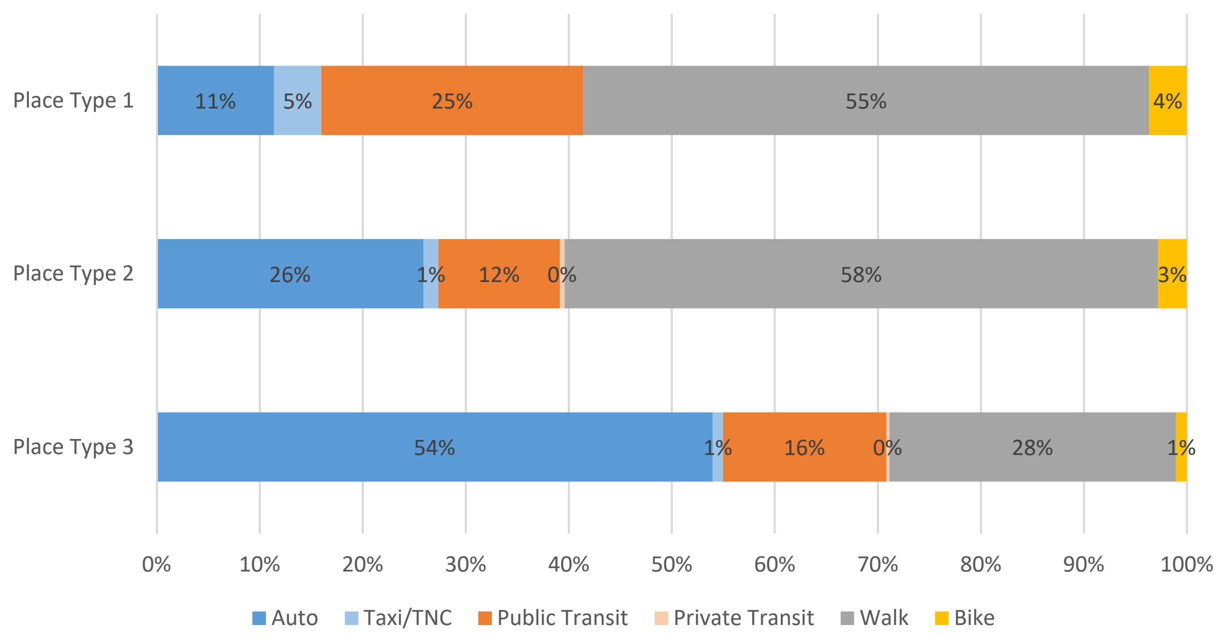
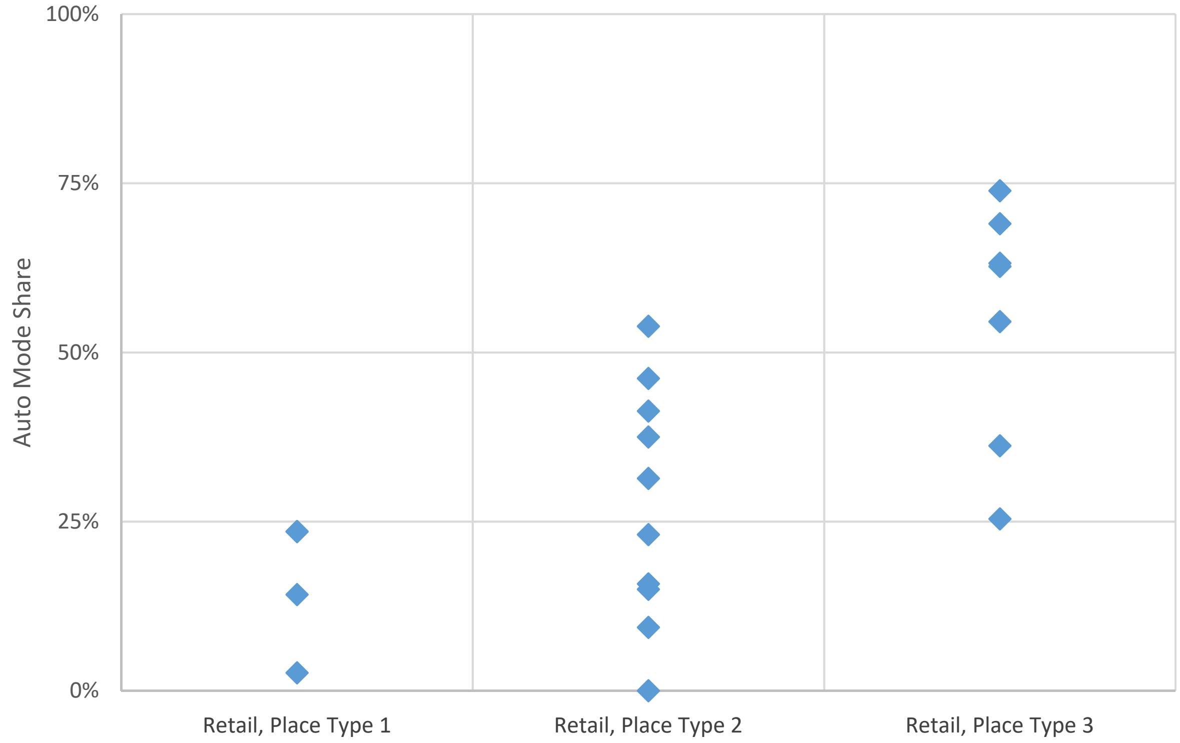


Figure 33: Auto Mode Share Scatter – Retail



6.2.3 Residential

The extended PM peak hour mode splits for residential sites in each of the three Place Types are presented graphically in **Figure 34**. Residential sites throughout San Francisco were served by a roughly equal mix of auto, public transit, and walking trips. Walk trips were most prevalent in Place Type 1. **Figure 35** shows each residential site's auto mode share (including Taxi/TNC trips). 45 Lansing Street, a high-rise building immediately adjacent to Bay Bridge on- and off-ramps, was an outlier within Place Type 1, whose other residential sites are concentrated around 20 percent auto mode share. As was the case with office and retail sites, the residential sites in Place Type 2 display a wide range of auto mode shares. This is likely due to the diversity of land use types and urban contexts within that place type

Because of the predominantly single-family makeup of the housing stock in Place Type 3, intercept surveying was conducted solely at two residential towers in Parkmerced. Because of the high rates of student occupancy at Parkmerced, and because students tend to make fewer auto trips than other residents, it is likely that mode splits at Parkmerced may differ from mode splits at other residential buildings in Place Type 3.

Figure 34: Mode Splits by Place Type – Residential

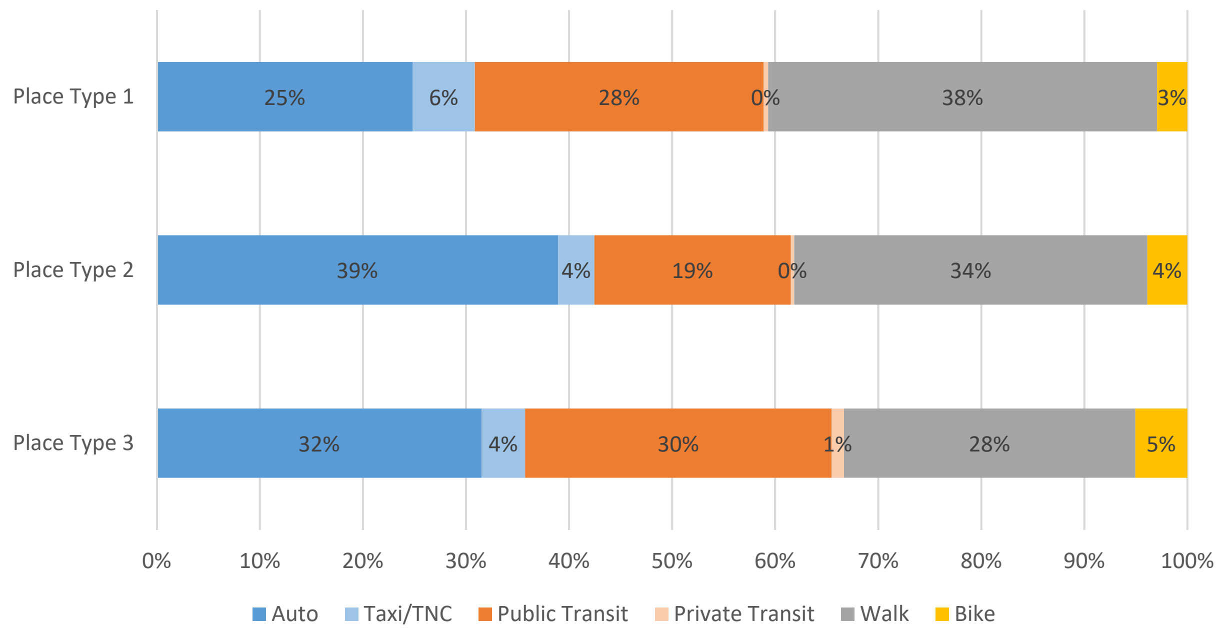
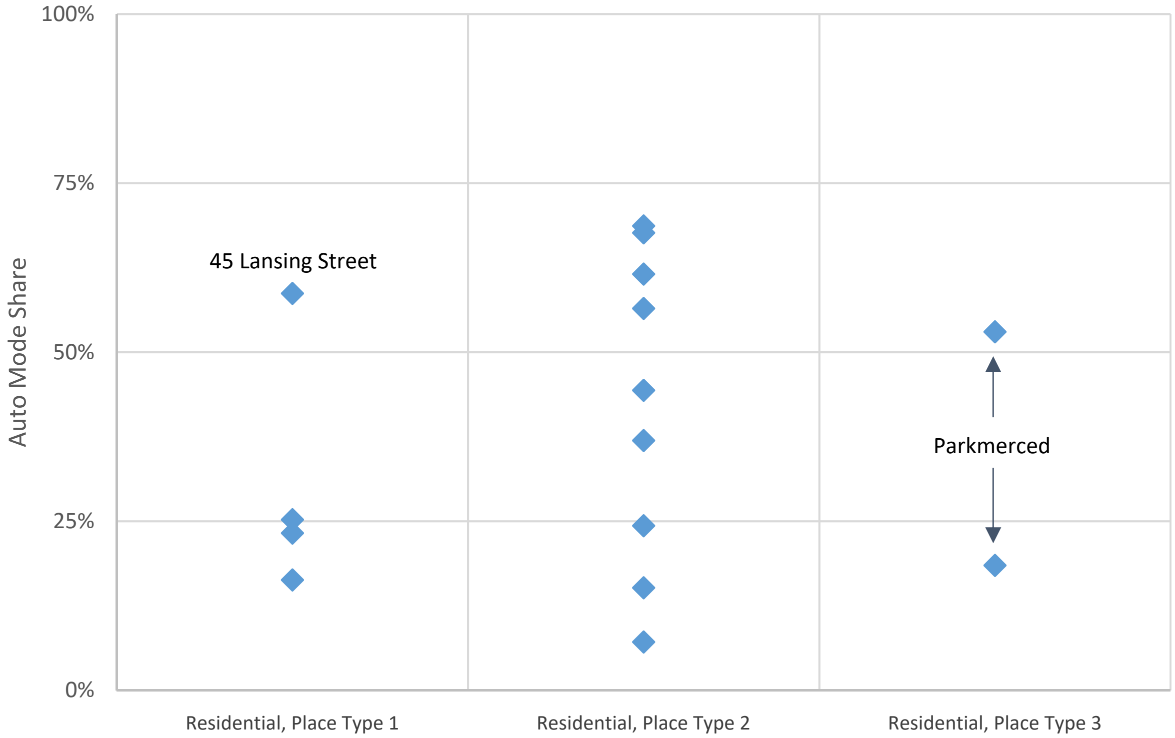


Figure 35: Auto Mode Share Scatter – Residential



6.2.4 Hotel

The average extended PM peak period mode splits for hotel sites by Place Type are shown in **Figure 36**. Walk trips were common at hotel sites across the city. Taxi and TNC trips were also a common travel mode at hotel sites, as would be expected given that hotel visitors are less likely to have access to a private car or bicycle, or to be familiar with local public transit.

Each hotel site's auto mode share (including Taxi/TNC) is shown in **Figure 37**. The hotel sites in Place Type 1 were divided between sites dominated by walking trips and sites with a large number of auto and TNC trips. Within Place Type 2, the Coventry Motor Inn is a substantial outlier in terms of auto mode share, although its name, marketing, and location along the portion of Lombard Street that is designated as part of US Highway 101 make its high auto mode share relatively unsurprising.

Figure 36: Mode Splits by Place Type – Hotel

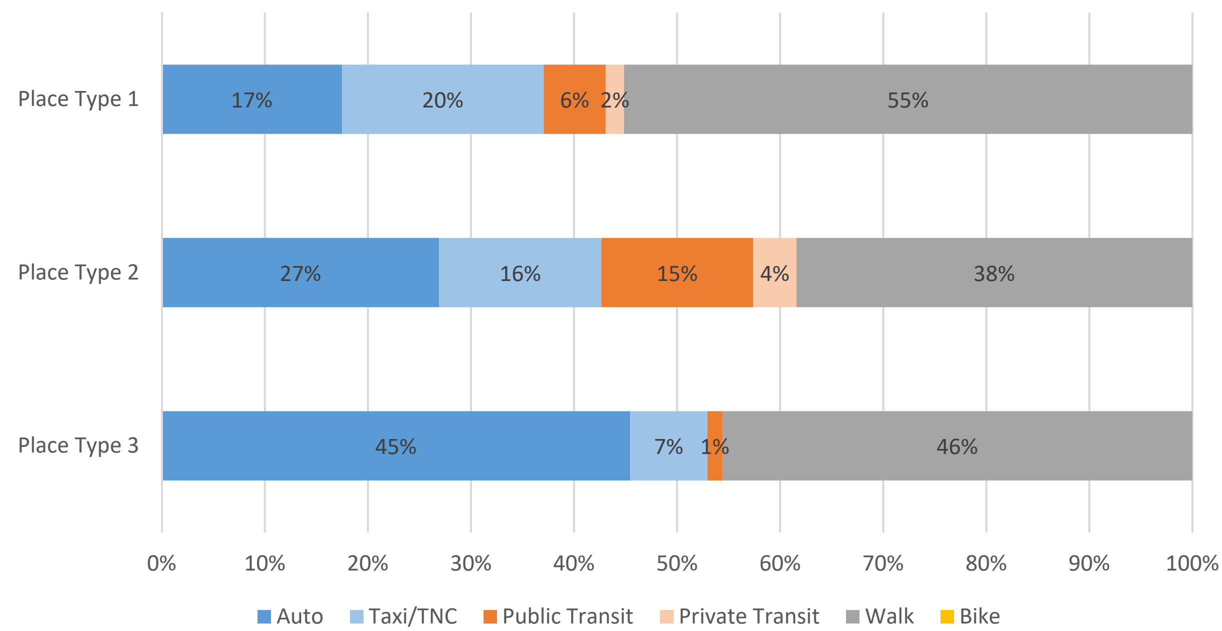
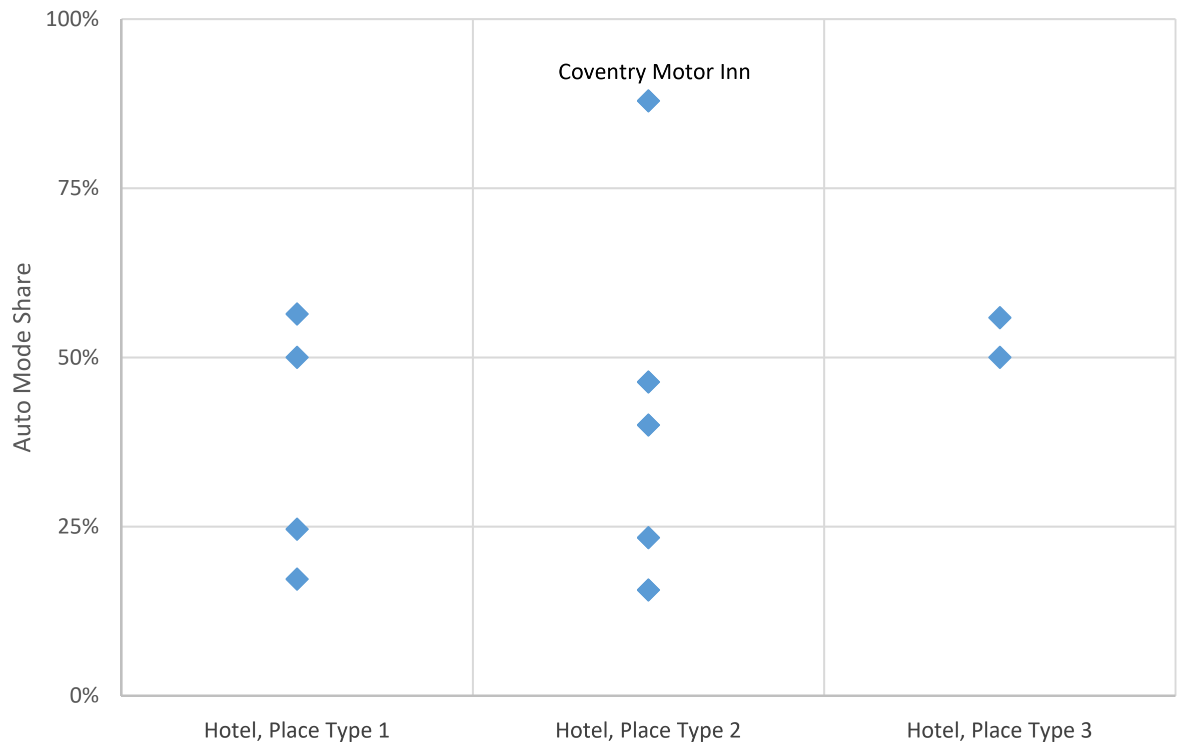


Figure 37: Auto Mode Share Scatter – Hotel



6.3 Trip Distribution

This section discusses three methodologies used to calculate trip distribution: one based solely on newly collected intercept survey data, one based on analysis of CHTS data, and one that incorporates both data sources.

6.3.1 Survey Data

The key data source for survey trip distribution calculations was the set of 9,913 intercept survey responses collected at 65 sites throughout San Francisco. As discussed above, these data were collected between 3:00 and 7:00 PM on typical Tuesdays, Wednesdays, and Thursdays. 4,712 survey records were ultimately found to contain useful responses to the question of where the respondent's immediately preceding or following origin or destination was located.

Survey responses were geocoded in ArcGIS using the United States Census Bureau's address locator files. Additional geocoding was performed manually. Responses that indicated a short distance (e.g. "I'm just coming from around the corner" or "a few blocks away") were assumed to refer to the same Place Type as the site where the record was collected.

Trip distribution was calculated at the Place Type level, using each site's Place Type as the trip's origin and each survey response's Place Type as the trip's destination for inbound trips, and the reverse for outbound trips. This analysis was performed via Excel PivotTable. The results of the survey-based trip distribution analysis, by land use and place type, are presented in **Tables 13** through **16** below.

Table 13: Trip Distribution - Office, by Place Type

Percent of Trips by Origin/Destination						
Destination / ***Origin***	***Place Type 1***	***Place Type 2***	***Place Type 3***	***North Bay***	***East Bay***	***South Bay***
Place Type 1	46%	18%	6%	1%	16%	12%
Place Type 2	25%	39%	5%	3%	16%	12%
Place Type 3	11%	11%	25%	3%	21%	29%

Source: Fehr & Peers, 2018.

Notes:
1. Rates reflect intercept surveys conducted at 18 office sites throughout San Francisco.
2. A total of 1,822 office survey responses indicated a geographic origin/destination.
3. Values may not sum to 100% due to rounding.

Table 14: Trip Distribution - Retail, by Place Type

Percent of Trips by Origin/Destination						
Destination / ***Origin***	***Place Type 1***	***Place Type 2***	***Place Type 3***	***North Bay***	***East Bay***	***South Bay***
Place Type 1	74%	15%	4%	1%	5%	1%
Place Type 2	8%	70%	16%	<1%	2%	4%
Place Type 3	6%	7%	78%	<1%	3%	6%

Source: Fehr & Peers, 2018.

Notes:
1. Rates reflect intercept surveys conducted at 21 retail sites throughout San Francisco.
2. A total of 1,866 retail survey responses indicated a geographic origin/destination.
3. Values may not sum to 100% due to rounding.

Table 15: Trip Distribution - Residential, by Place Type

Percent of Trips by Origin/Destination						
Destination / ***Origin***	***Place Type 1***	***Place Type 2***	***Place Type 3***	***North Bay***	***East Bay***	***South Bay***
Place Type 1	58%	23%	5%	1%	4%	8%
Place Type 2	27%	52%	8%	<1%	3%	9%
Place Type 3	21%	7%	65%	1%	<1%	6%

Source: Fehr & Peers, 2018.

Notes:
1. Rates reflect intercept surveys conducted at 15 residential sites throughout San Francisco.
2. A total of 689 residential survey responses indicated a geographic origin/destination.
3. Values may not sum to 100% due to rounding.

Table 16: Trip Distribution - Hotel, by Place Type

Percent of Trips by Origin/Destination						
Destination / ***Origin***	***Place Type 1***	***Place Type 2***	***Place Type 3***	***North Bay***	***East Bay***	***South Bay***
Place Type 1	73%	7%	1%	3%	1%	14%
Place Type 2	32%	46%	1%	4%	3%	14%
Place Type 3	7%	20%	53%	<1%	<1%	20%

Source: Fehr & Peers, 2018.

Notes:
1. Rates reflect intercept surveys conducted at 11 hotel sites throughout San Francisco.
2. A total of 335 hotel survey responses indicated a geographic origin/destination.
3. Values may not sum to 100% due to rounding.

6.3.2 CHTS Data at Place Type Level

Because of the relatively low number of survey sites in certain land use/Place Type combinations, the trip distribution patterns of CHTS data were examined.

CHTS Approach

Each trip's "land use type" was identified according to the methodology for associating each CHTS trip record with a "land use type" discussed in section 4.1.1 above. Trips' origin and destination Place Types were identified using a lookup table that associated the census tract geographies provided by CHTS.[29] A PivotTable analysis similar to the one used for newly collected intercept survey data was subsequently conducted in Excel. The results of this analysis for each of the three "land use types" are presented in **Tables 17** through **19** below.

Table 17: Trip Distribution "Office-type", by Place Type

Percent of Trips by Origin/Destination						
Destination / ***Origin***	***Place Type 1***	***Place Type 2***	***Place Type 3***	***North Bay***	***East Bay***	***South Bay***
Place Type 1	26%	21%	9%	4%	27%	12%
Place Type 2	29%	26%	19%	4%	11%	11%
Place Type 3	20%	29%	18%	3%	11%	19%

Source: California Household Travel Survey, 2012; Fehr & Peers, 2018.
Note: Values may not sum to 100% due to rounding

Table 18: Trip Distribution "Retail-type", by Place Type

Percent of Trips by Origin/Destination						
Destination / ***Origin***	***Place Type 1***	***Place Type 2***	***Place Type 3***	***North Bay***	***East Bay***	***South Bay***
Place Type 1	50%	28%	5%	2%	10%	5%
Place Type 2	21%	57%	13%	2%	5%	3%
Place Type 3	6%	22%	55%	1%	4%	12%

Source: California Household Travel Survey, 2012; Fehr & Peers, 2018.
Note: Values may not sum to 100% due to rounding

[29] Each Census tract was assigned to the Place Type or region that contained its centroid.

Table 19: Trip Distribution "Residential-type", by Place Type

Percent of Trips by Origin/Destination						
Destination / Origin	*Place Type 1*	*Place Type 2*	*Place Type 3*	*North Bay*	*East Bay*	*South Bay*
Place Type 1	26%	21%	12%	3%	24%	13%
Place Type 2	14%	47%	24%	3%	6%	7%
Place Type 3	10%	32%	39%	2%	5%	11%

Source: California Household Travel Survey, 2012; Fehr & Peers, 2018.
Note: Values may not sum to 100% due to rounding

6.3.3 Blended Data at Place Type Level

As discussed in section 4.1.1 above, the trip distribution tables derived from newly collected intercept survey data were combined with those derived from CHTS data to construct a maximally complete picture of trip distribution patterns.[30] When sample weights were applied, total trips in the CHTS data set were similar in number to the survey sample, and so data were combined in a simplistic 1-to-1 fashion. **Tables 20** through **22** below display the results of this blended trip distribution analysis.

Table 20: Trip Distribution Office, by Place Type (Blended)

Percent of Trips by Origin/Destination						
Destination / Origin	*Place Type 1*	*Place Type 2*	*Place Type 3*	*North Bay*	*East Bay*	*South Bay*
Place Type 1	36%	20%	8%	3%	22%	12%
Place Type 2	27%	33%	11%	4%	14%	12%
Place Type 3	15%	20%	22%	3%	16%	24%

Source: California Household Travel Survey, 2012; Fehr & Peers, 2018.
Note: Values may not sum to 100% due to rounding

[30] Because the California Household Travel Survey does not sample visitors from outside California, a category of traveler that constitutes a majority of visitors to San Francisco's hotels, CHTS data were not incorporated into the trip distribution calculations for Hotel sites.

Table 21: Trip Distribution Retail, by Place Type (Blended)

	Percent of Trips by Origin/Destination					
Destination / ***Origin***	***Place Type 1***	***Place Type 2***	***Place Type 3***	***North Bay***	***East Bay***	***South Bay***
Place Type 1	58%	24%	5%	1%	8%	4%
Place Type 2	14%	64%	14%	1%	4%	4%
Place Type 3	6%	13%	69%	<1%	3%	8%

Source: California Household Travel Survey, 2012; Fehr & Peers, 2018.
Note: Values may not sum to 100% due to rounding

Table 22: Trip Distribution Residential, by Place Type (Blended)

	Percent of Trips by Origin/Destination					
Destination / ***Origin***	***Place Type 1***	***Place Type 2***	***Place Type 3***	***North Bay***	***East Bay***	***South Bay***
Place Type 1	34%	22%	10%	3%	19%	12%
Place Type 2	16%	48%	21%	2%	6%	7%
Place Type 3	12%	29%	42%	2%	4%	11%

Source: California Household Travel Survey, 2012; Fehr & Peers, 2018.
Note: Values may not sum to 100% due to rounding

Figures 38 through **40** below visually compare the trip distribution for trips at office sites and office-type CHTS trips. Each figure shows the distribution of trips from or to a given place type, according to the survey data only, the CHTS data only, and the blended data. These figures demonstrate that the newly collected survey data captured more short-range trips (i.e. trips that start and end in the same Place Type) than the CHTS data did.

Possible explanations for this dynamic include the fact that CHTS trip data are based primarily on travel diaries in which participants recorded all their trip activity at the end of the day, and short-range trips (such as a quick walking trip from the workplace to the store) may have been underreported on those travel diaries, relative to more "major" trips such as the journey to work. Alternatively, it is possible that people on foot (who are likelier to make a shorter trip) were more likely to respond to the intercept surveys.

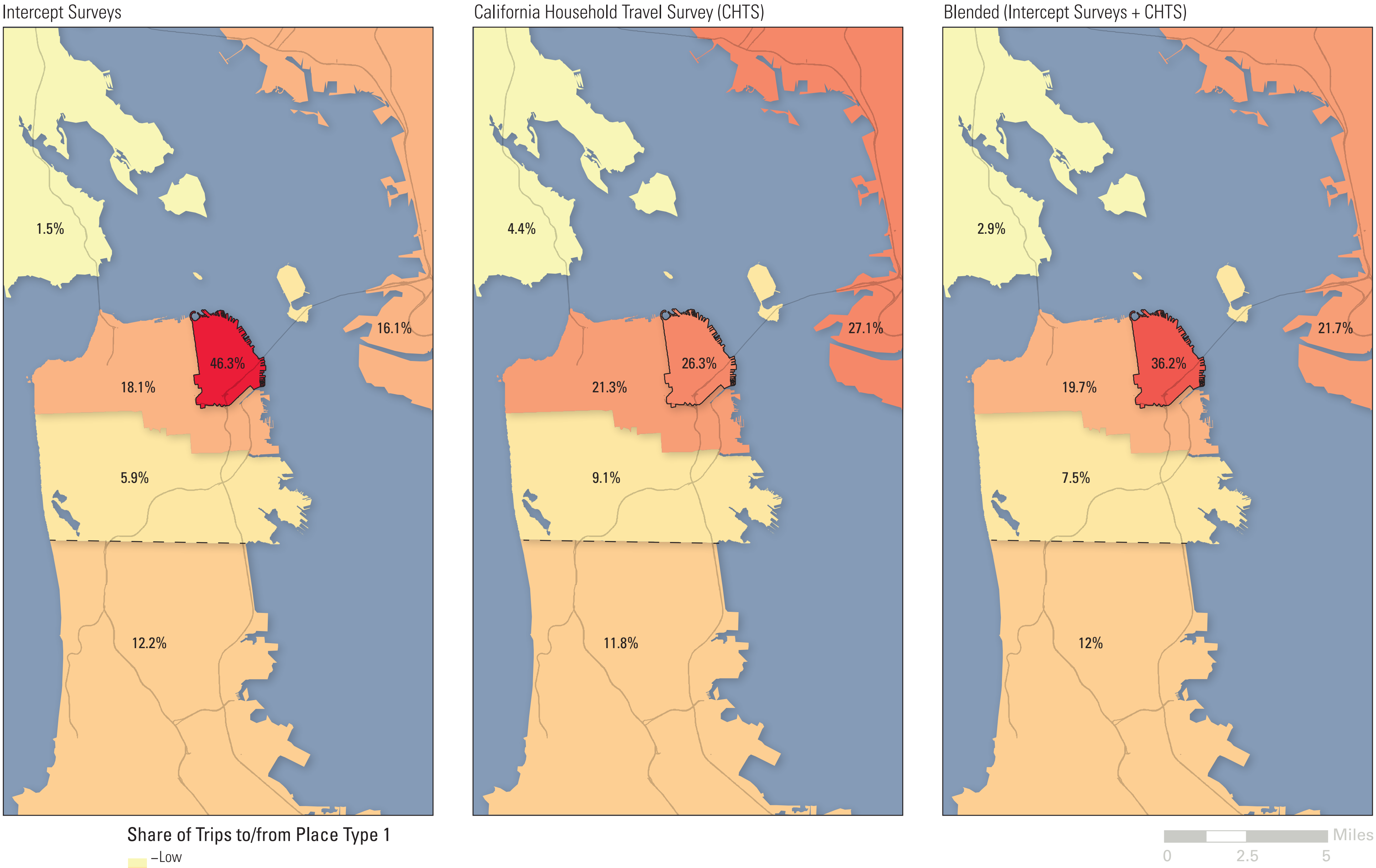


Figure 38

Trip Distribution - Office - Place Type 1

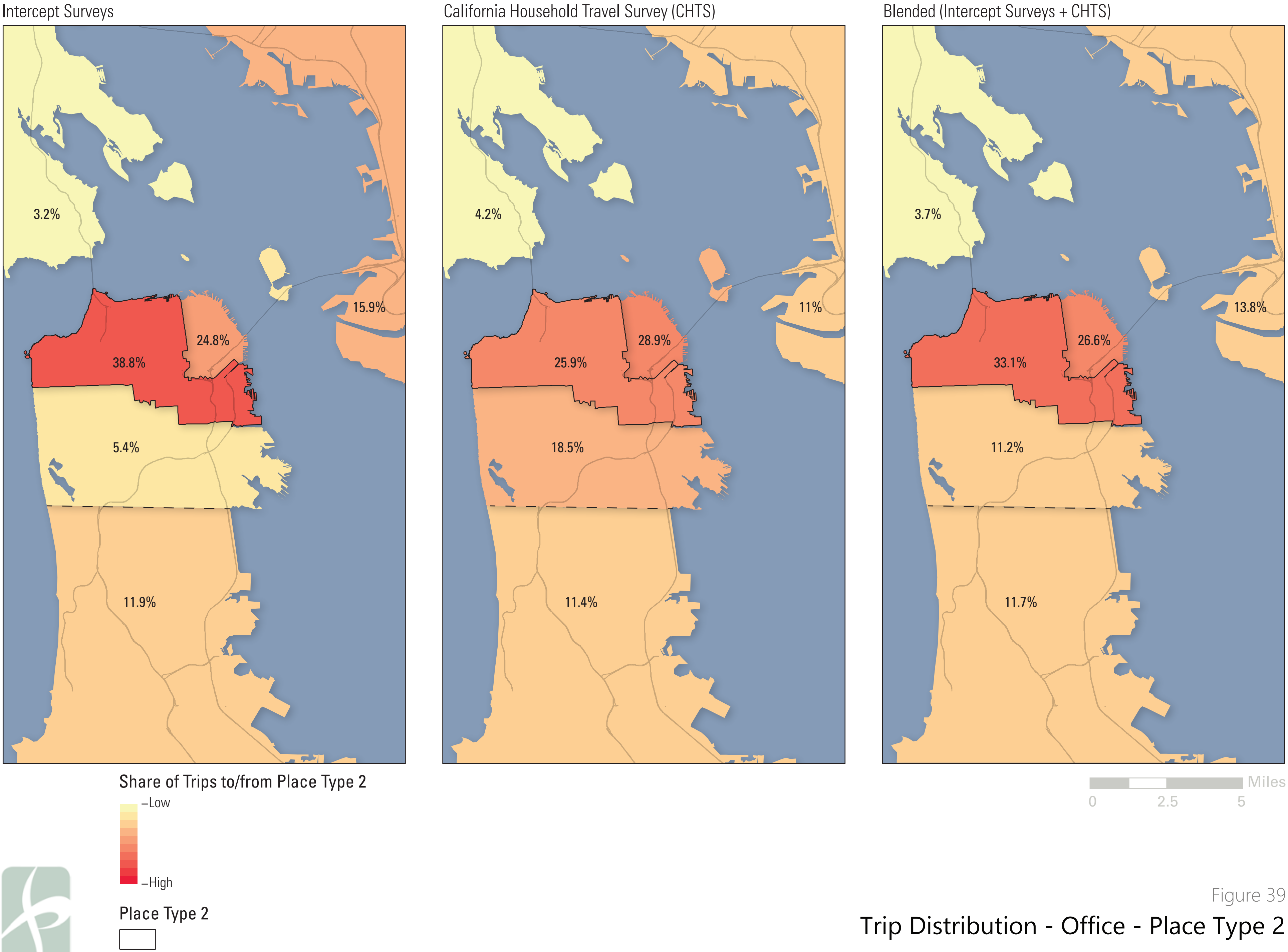


Figure 39

Trip Distribution - Office - Place Type 2

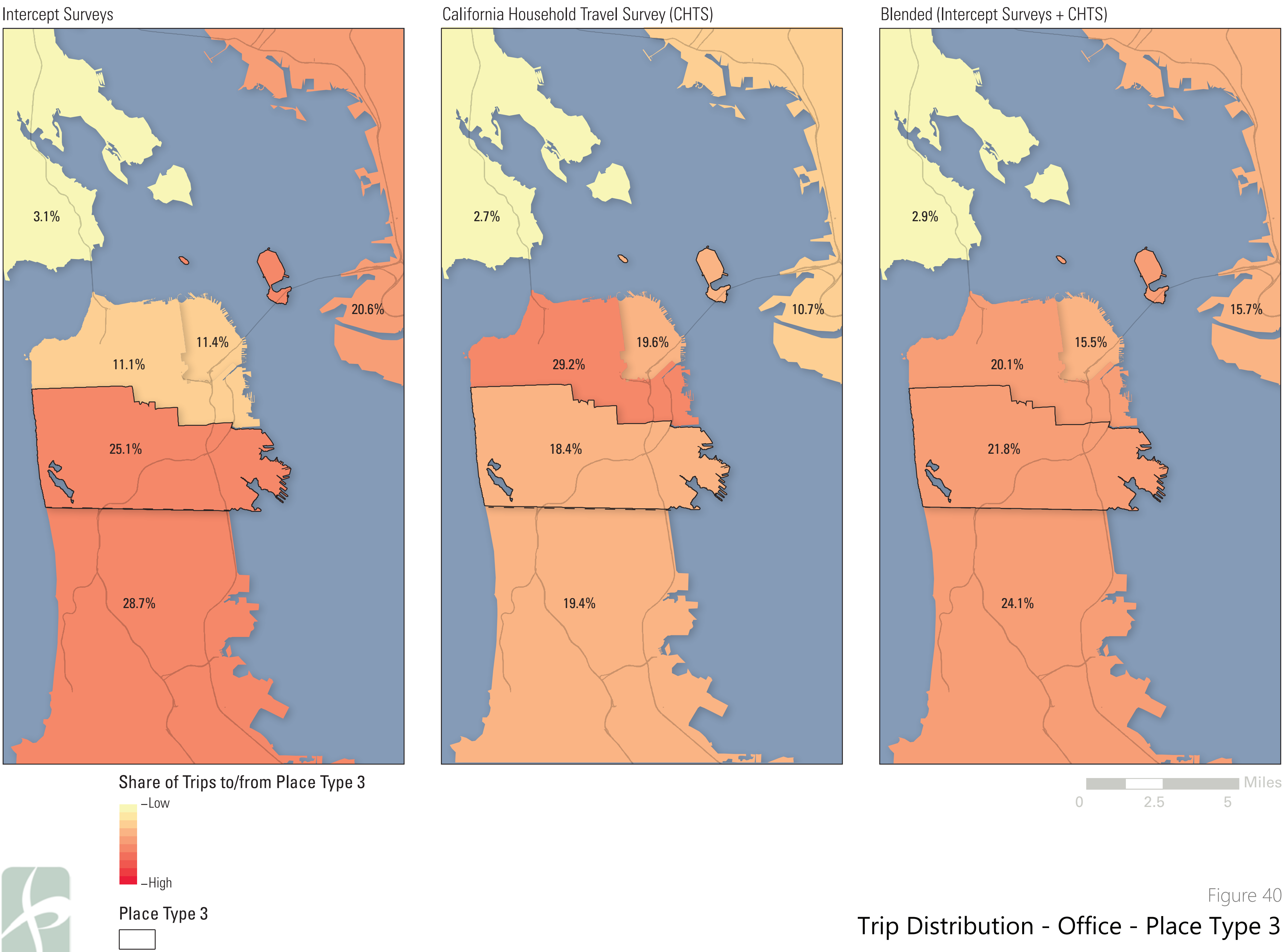
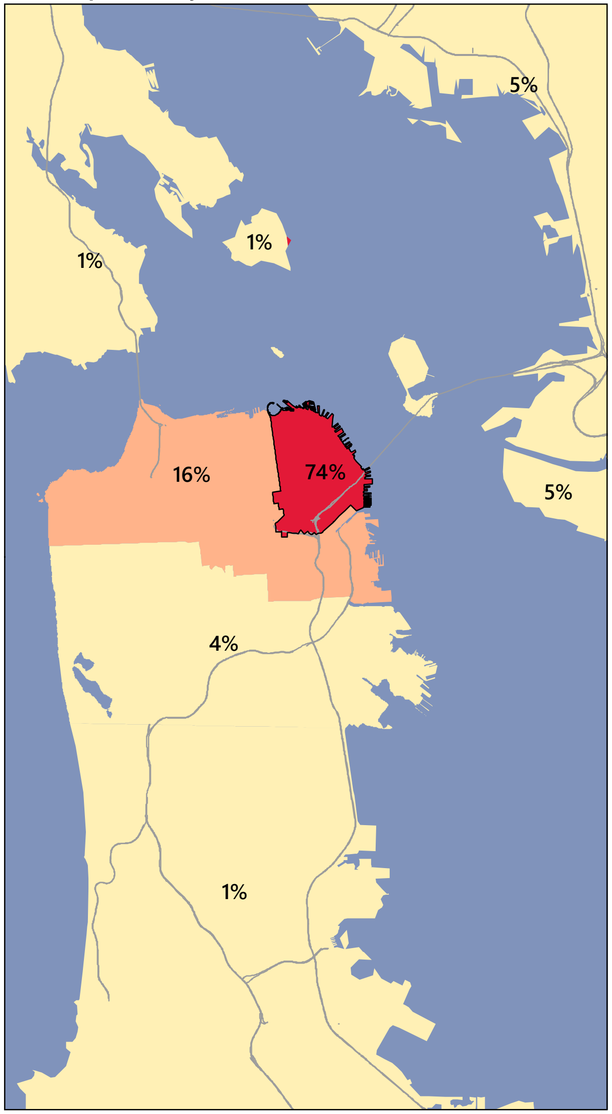


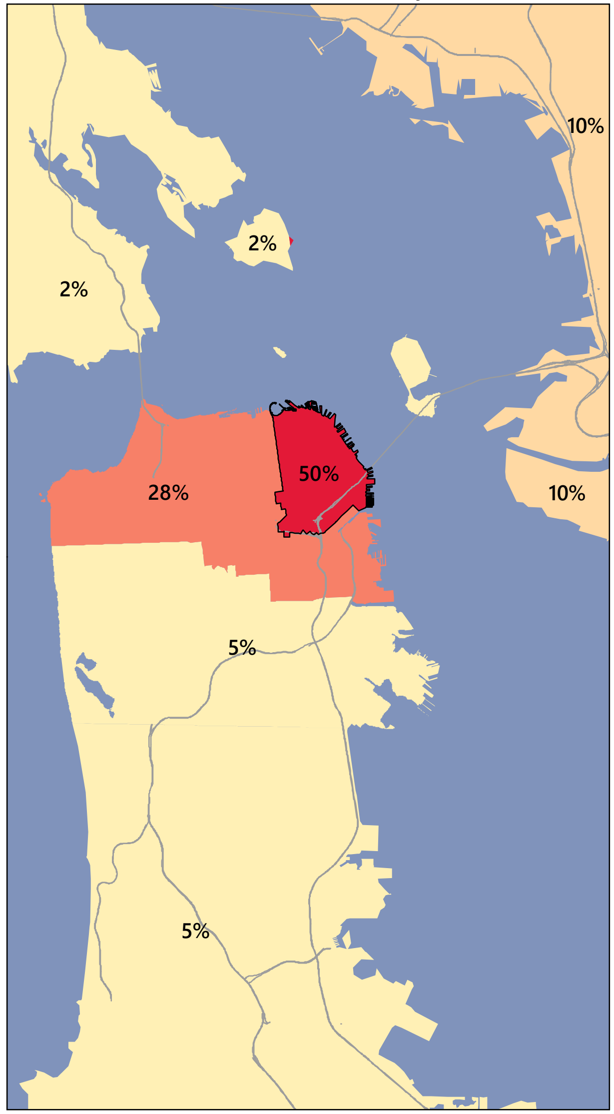
Figure 40

Trip Distribution - Office - Place Type 3

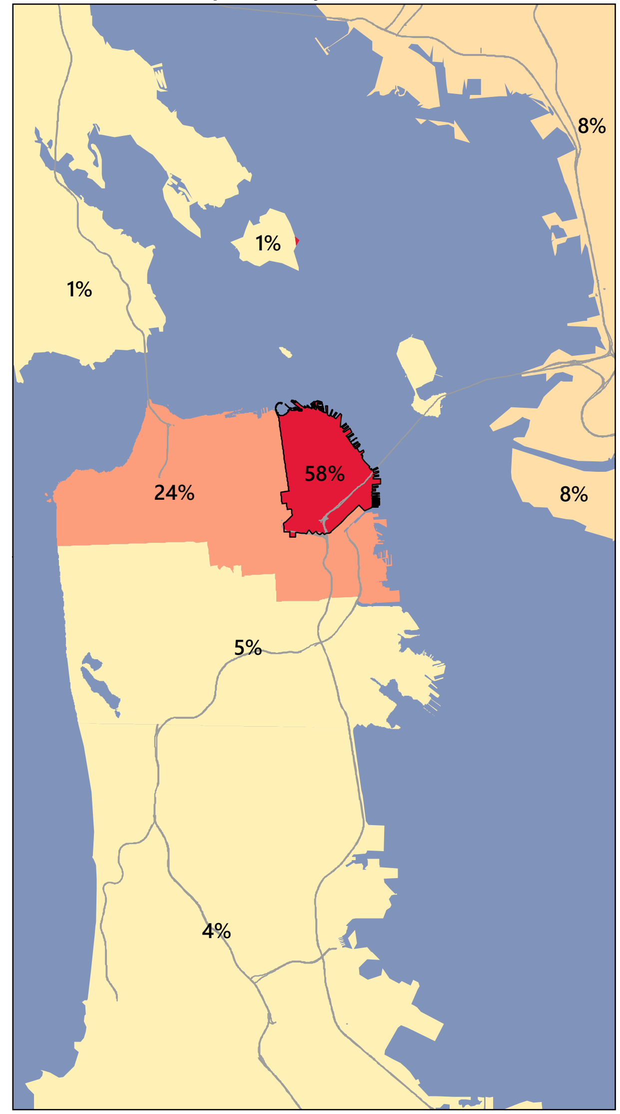
Intercept Surveys



California Household Travel Survey (CHTS)



Blended (Intercept Surveys + CHTS)



Share of Trips to/from Place Type 1

Low

High

Place Type 1

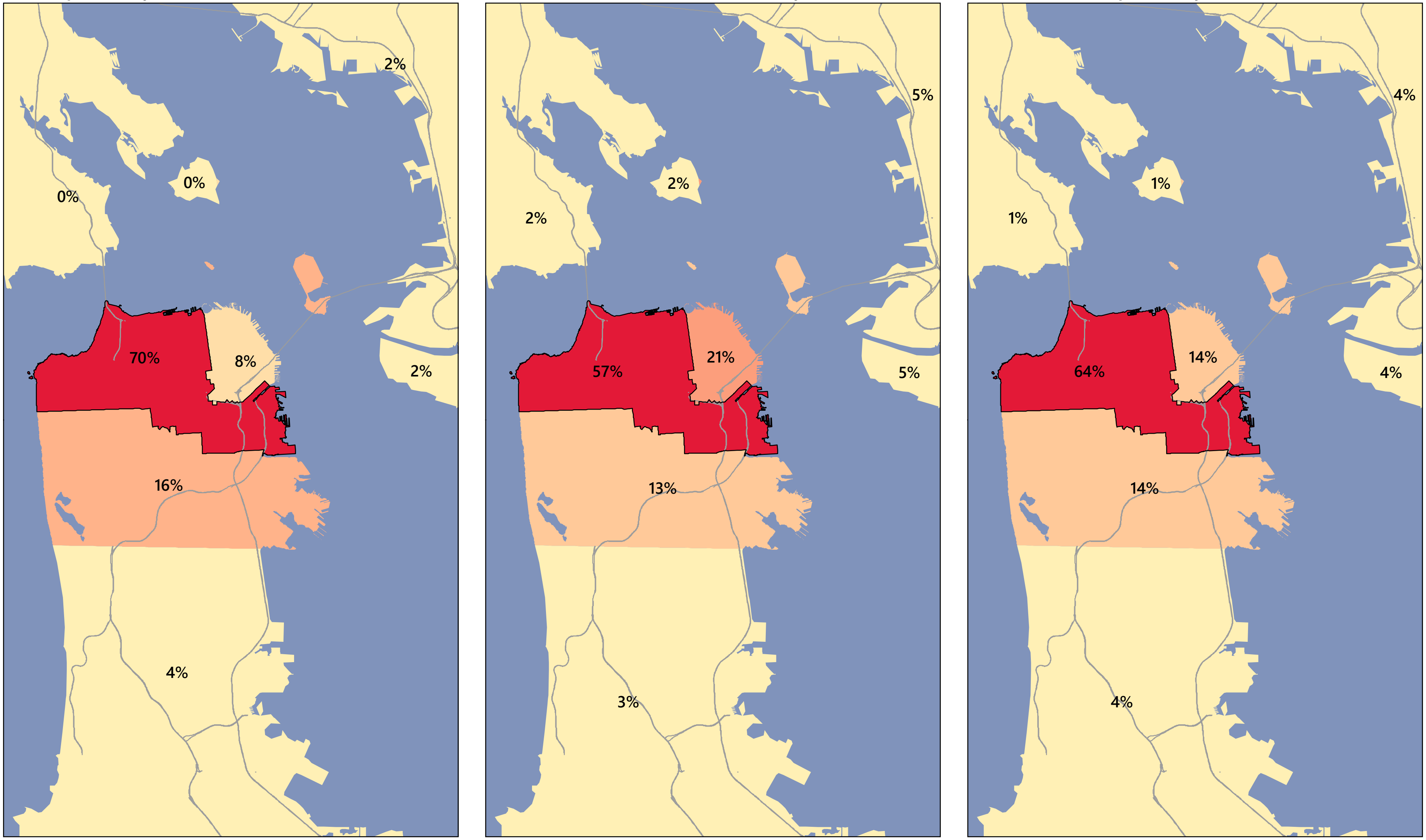
Miles
0 1.25 2.5 5

Figure 41

Trip Distribution - Retail - Place Type 1

N:\Projects\Non_SanJose_Projects\SF Projects\SF15-0864_SF Travel Demand Update\Graphics\GIS\MXD\Fig 44 - Trip Distribution - Retail Place - Type 1.mxd

Intercept Surveys | **California Household Travel Survey (CHTS)** | **Blended (Intercept Surveys + CHTS)**



Share of Trips to/from Place Type 2

Low

High

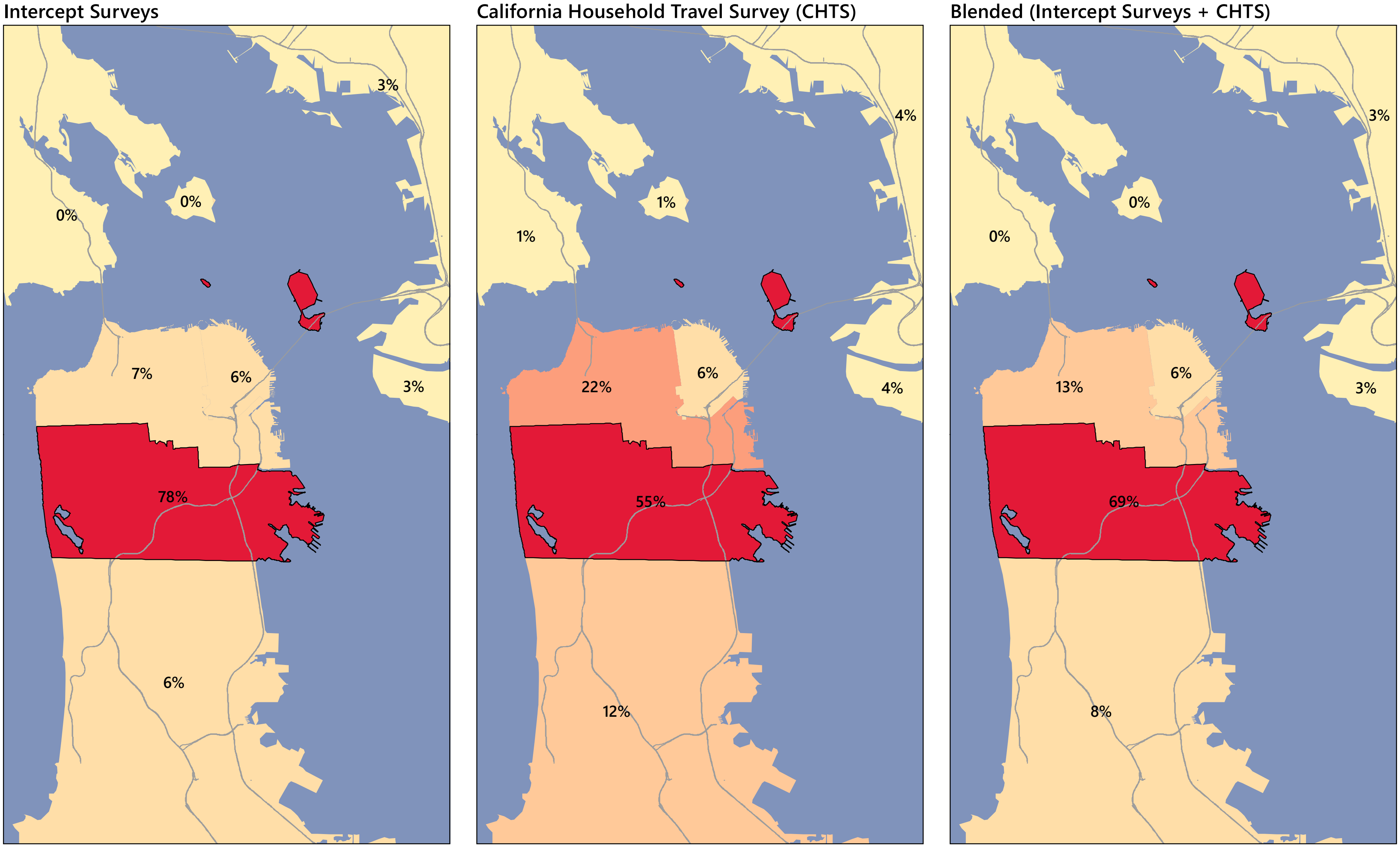
Place Type 2

0 1.25 2.5 5 Miles

Figure 42

Trip Distribution - Retail - Place Type 2

N:\Projects\Non_SanJose_Projects\SF Projects\SF15-0864_SF Travel Demand Update\Graphics\GIS\MXD\Fig 45 - Trip Distribution - Retail Place - Type 2.mxd



Share of Trips to/from Place Type 3

Low

High

Place Type 3

Miles
0 1.25 2.5 5

Figure 43

Trip Distribution - Retail - Place Type 3

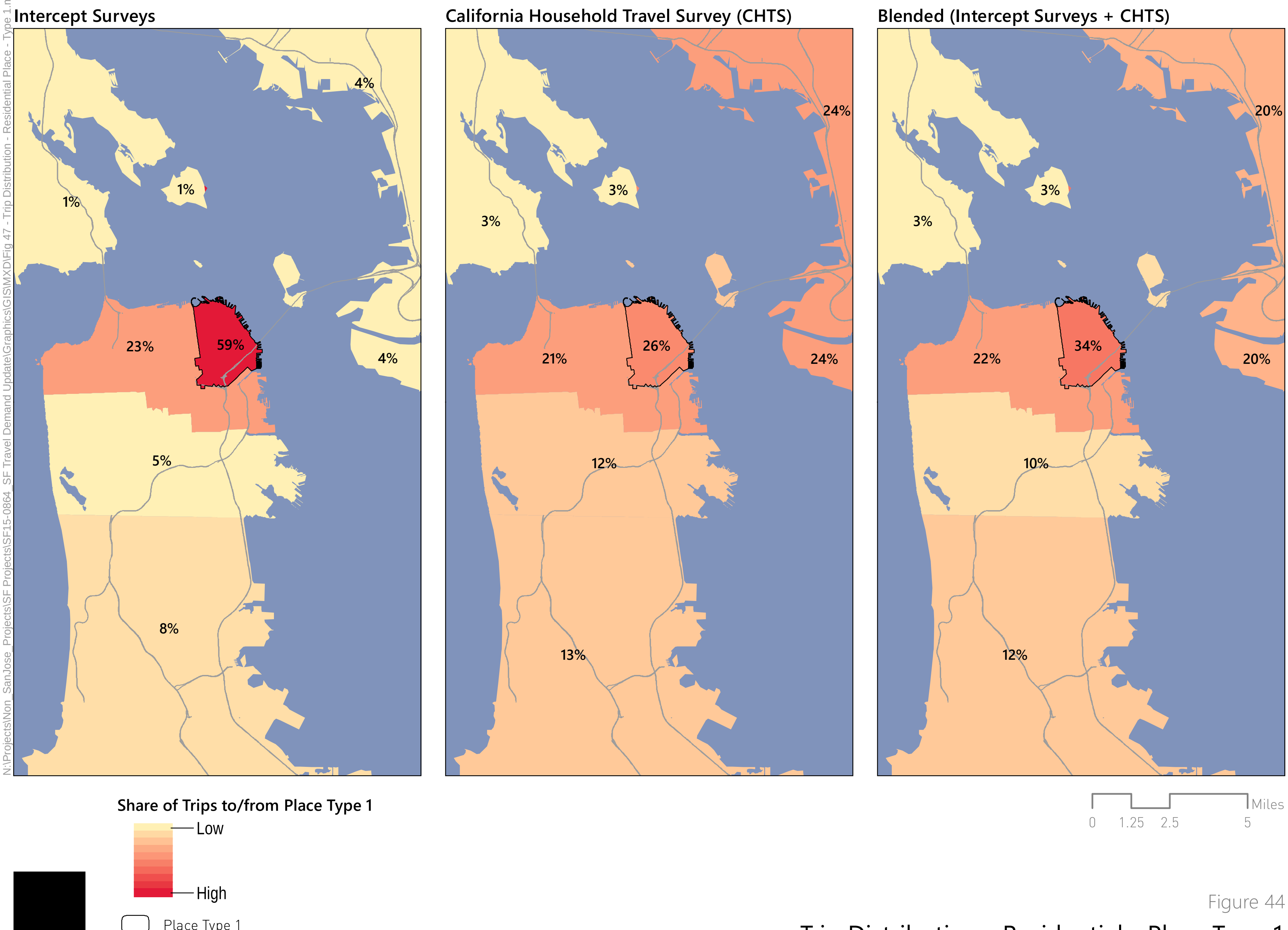
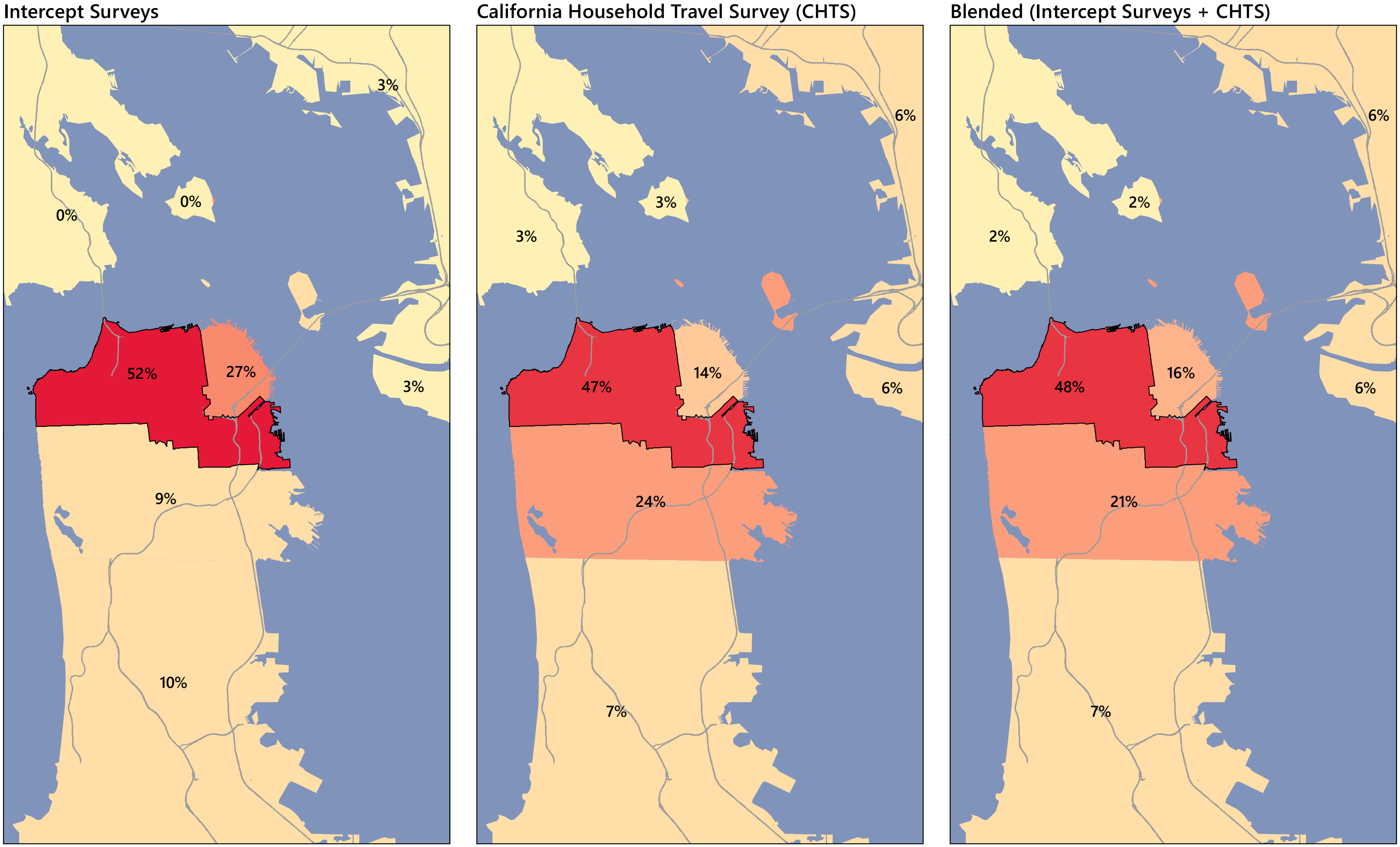


Figure 44

Trip Distribution - Residential - Place Type 1



Share of Trips to/from Place Type 2

Low

High

Place Type 2

Miles 0 1.25 2.5 5

Figure 45

Trip Distribution - Residential - Place Type 2

N:\Projects\Non_SanJose_Projects\SF Projects\SF15-0864_SF Travel Demand Update\Graphics\GIS\MXD\Fig 48 - Trip Distribution - Residential Place - Type 2.mxd

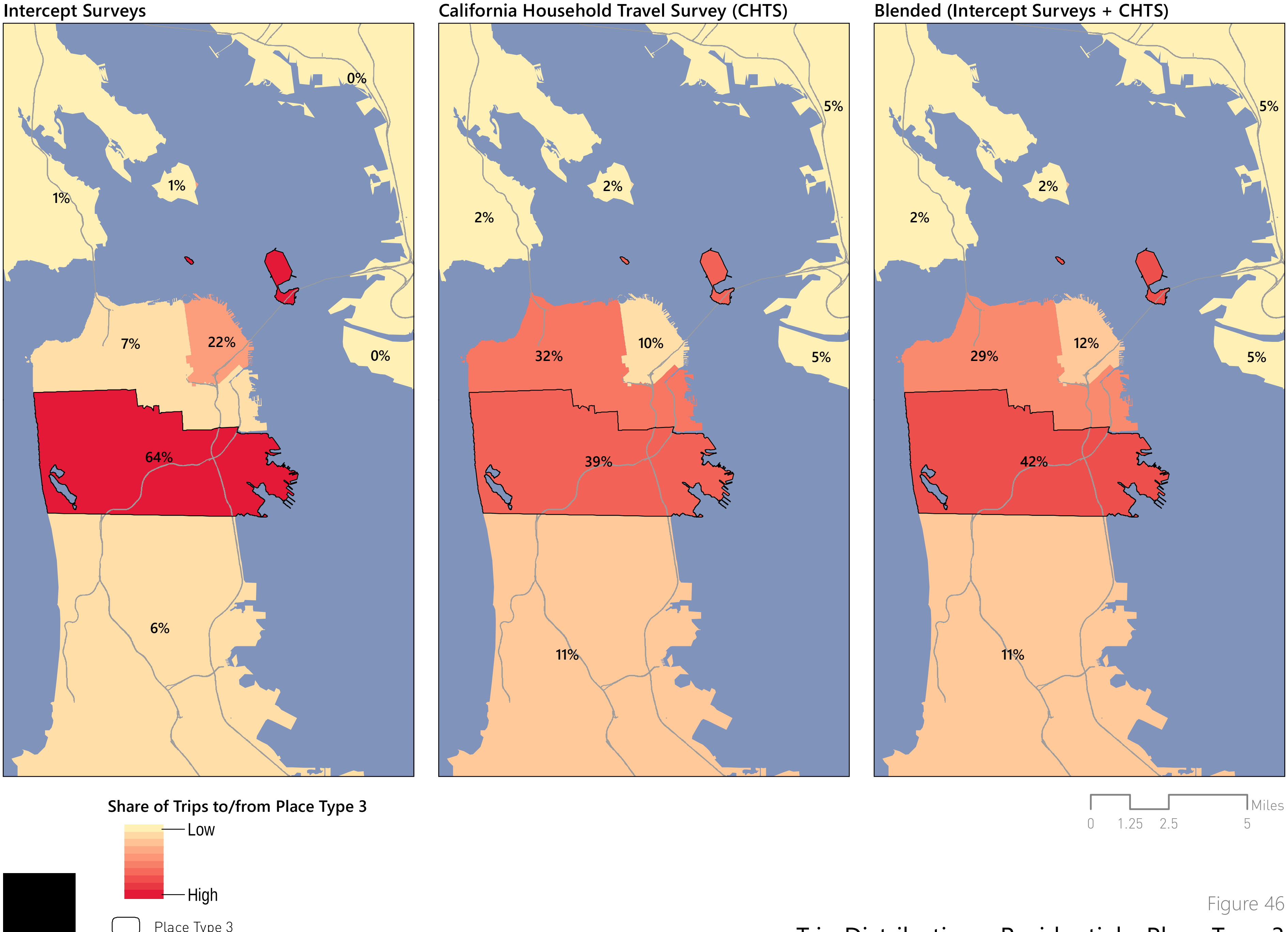


Figure 46

Trip Distribution - Residential - Place Type 3

6.3.4 CHTS Data at Neighborhood Level

In addition to summarizing survey findings at the Place Type level, additional analysis was conducted by SFCTA staff to examine how CHTS data could be used to express trip distribution by mode at the neighborhood level. This additional analysis was intended to help capture the inter-related nature of mode choice, trip origin/destination, and trip purpose, as work trips tend to have differing distributions from non-work trips.

In this method, CHTS records of 5,106 trips with at least one end in San Francisco were classified by trip purpose (work trips vs. all other trips) and mode (drive alone, shared ride (2 people), shared ride (3 or more people), taxi/TNC, or transit). Residential trips were identified as trips that included 'home' as either the origin or destination; office trips were identified as trips that included 'work' as either the origin or destination; and retail trips were identified as trips that were neither home nor work based. Trips were weighted according to the household weighting scheme prepared by CHTS to approximate total trips in each O-D pair on a daily basis. Detailed tables are included as **Appendix K.**

Following calculation of the number of trips represented by the CHTS sample, an Excel spreadsheet was used to provide summary distributions for inbound and outbound trips by mode. These distributions are summarized for each land use and district for vehicle trips, person trips in vehicles, and transit trips. The share of trips associated with work vs. non-work purposes are calculated based on the total CHTS database for each neighborhood according to the land use, as categorized above.

While this methodology allows for some approximation of district-to-district flows for each district, some locations or land use and location combinations have somewhat sparse data recorded. As such, SFCTA also prepared this analysis summarizing origins and destinations by mode for each place-type in total. In cases where the CHTS data set may be sparse, or where there are few instances of a given land use in a neighborhood, using the place type summary can still provide a method for examining trip distributions by mode and by purpose.

Detailed documentation of this approach is included as **Appendix H.**

Chapter 7. Loading Demand

Loading demand analysis represents how the trips generated by a project will affect the use of available loading facilities. As such, it can inform design of both the project and the street, curbs, and sidewalks surrounding the project. Providing adequate loading facilities of the proper type and in the right place can help manage vehicle queuing and limit unsafe loading practices. Generally, if there is adequate loading space provided, vehicles performing both passenger loading as well as deliveries will be able to perform this activity outside of travel lanes.

Loading generally represents demand for a temporary use of space, but that use may negatively affect the surrounding transportation system. If there is not adequate space available for loading, vehicles may double-park and load from a travel lane, which can create hazardous conditions for other people using the transportation system. As such, when loading demand regularly exceeds the amount of loading space provided at a site, there may be secondary impacts to the transportation system due to double-parking, queuing, creation of new hazards for various ways that people travel, or other issues (e.g., local congestion).

Loading spaces may be off-street, such as in a loading dock or driveway, or they may be on-street, in the form of designated curb space ("white curb" passenger loading, "yellow curb" commercial loading, or occasionally "green curb" short-term parking). Off-street loading activity tends to involve deliveries or larger service vehicles, while on-street loading activity may be either deliveries or passenger loading (such as when an individual is dropped off or picked up); however, in practice, many types of vehicles may utilize both off-street loading space as well as on-street loading space. Demand for these spaces is expressed as the number of expected loading instances during a given time period, along with an average expected length of stay. These variables allow for a calculation of how much space is necessary to accommodate loading activity either in an off-street facility or at the curb.

The City currently analyzes loading activity via a methodology that assumes passenger loading occurs at the curb, while all other loading occurs in designated loading spaces either at the curb (in the form of yellow curb commercial loading spaces) or in a loading dock, garage, or other off-street facility. Freight and delivery loading is calculated using loading demand rates established via a 1980 study of goods movement activity in San Francisco. This methodology focuses on use of off-street loading spaces such as loading docks and bays, and passenger loading demand, when requested, is calculated via a methodology based on assumptions used for hotel loading or other cases where loading demand is primarily related to passenger loading.

However, the City has reason to believe that there could be substantial changes in loading activity since the 2002 update to the *San Francisco Transportation Impact Analysis Guidelines*. The rise of for-hire vehicles, such as transportation network companies (TNCs), as well as the increase in deliveries associated with both internet commerce and on-demand app-based services, could generate an overall increase in curb loading activity since the 1980s. Additionally, activities that may have previously occurred in loading docks or driveways (such as unloading deliveries or moving activity) are perceived to have moved to the curb in many instances due to convenience or through policies (e.g., curb cut restrictions) that seek to limit the number of vehicles crossing sidewalks where people are walking. Therefore, Fehr & Peers collected two sets of data to ascertain whether existing curb loading supply is sufficient for typical levels of demand, as well as to assess the total level of passenger loading demand associated with shifts in travel patterns over time.

As discussed in this report, the collected data indicate that loading varies a great deal between different land uses and locations; however, there has been an increase in curb-based loading activity over time. Accommodating this additional demand for curb activity may require additional curb space dedicated to loading activity, or more efficient use of existing loading space, depending on the surrounding land use context. As such, Fehr & Peers recommends slight modifications to the loading demand methodology for new projects that incorporate a model wherein both freight and passenger loading share loading space, and that reflects up-to-date data on the number of loading instances expected for a given land use and the duration of those loading instances. Through estimating potential curb demands of new development, the City can better inform its policy decisions on allocating valuable curb space between parking, loading, and other uses.

7.1 Key Terms and Concepts

Components of loading activities are listed below:

- Vehicle types
- Activity types
- Loading facility types/locations

This section defines these key terms for use throughout the remainder of this chapter.

7.1.1 Vehicle Types

The Federal Highway Administration (FHWA) publishes a vehicle classification list, included as **Appendix L**. These vehicle type descriptions refer to the FHWA vehicle classification in addition to providing a description of each vehicle type's common uses.

Heavy Trucks

Heavy trucks are large trucks (semi trucks or tractor trailers) with wheelbases of 40 feet or more, whose total length may approach 55 feet. Heavy trucks correspond to FHWA vehicle classes 8 through 13, although the largest of these classifications do not generally operate in urban environments. These trucks are approximately 8.5 feet wide. These trucks occupy approximately 60 feet, or three passenger car equivalents (PCEs), assuming each are 20 feet in length, when parked. Heavy trucks are commonly used for large commercial deliveries to businesses such as grocery stores, and for transport of large volumes of goods such as furniture or office records. A typical heavy truck is shown in **Figure 47**.

Figure 47: A typical heavy truck. Source: Google Street View, 2018.

Light Trucks

Light trucks include large panel trucks (e.g. bike share rebalancing vehicles), delivery vans such as UPS, FedEx, or Amazon vehicles, and mid-sized single-unit box trucks, such as U-Haul trucks. Light trucks correspond to FHWA vehicle classifications 5 through 7. Light trucks are commonly used for package delivery, transport of goods, and public and private services, such as garbage pick-up or linen service. The larger end of the light truck vehicle type may occupy approximately 40 linear feet, or two PCEs, when parked. Two typical light trucks are shown in **Figure 48**.

Figure 48: Two typical light trucks. Sources: Google Street View, 2018; Fehr & Peers, 2018.

Taxis

Taxis are passenger cars (FHWA classification 2) dedicated to the hired transport of passengers. Taxis are ubiquitous in large American cities including San Francisco. A typical taxi is shown in **Figure 49**.

Figure 49: A small panel van (Other-type vehicle) at left; a typical taxi at right. Source: Google Street View, 2018.

Other Vehicles

Other vehicles involved in loading include motorcycles, passenger cars, and vans (FHWA classifications 1 through 3).[31] These vehicles may be operating as TNCs, dropping off passengers, delivering light goods, or performing food deliveries. TNCs are included within the "other" category because it is generally infeasible to distinguish whether a passenger car is in operation as a TNC except via costly in-person observations or video analysis. Some vehicles may be in fully private operation yet still be involved in passenger loading, as when a passenger car picks up or drops off a family member at a school or another destination. Additionally, the "other" category includes small panel vans ("cargo vans"), as shown in Figure 49; these vehicles perform a wide variety of loading-type tasks.

7.1.2 Activity Types

Loading activities may involve freight loading, package delivery (a subset of freight loading), or passenger loading. This report refers to the act of accessing a loading zone, stopping the vehicle, and loading or unloading passengers or goods as "loading instances."

Freight Loading

Freight loading involves the delivery or collection of goods, as opposed to passengers. Heavy trucks and light trucks are commonly engaged in freight loading; a typical freight loading instance is depicted in **Figure 50**. Many businesses involve regular freight loading, such as grocery stores and other large retail businesses in order to maintain stocks of goods for use or customer purchase.

[31] Bicycles are involved in a small proportion of deliveries, especially food or fresh flower deliveries, but they are not considered in further detail in this analysis because (1) they represent a small percentage of total deliveries and (2) they can exit the roadway and load/unload off-street, thus generally do not add to on-street curb demand for loading space.

Figure 50: A typical (off-street) freight loading instance. Source: Google Street View, 2018.

Package Delivery and Delivery Service

Package delivery and delivery services are a subset of freight loading. Package delivery is likelier to involve light trucks such as large panel trucks or other-type vehicles such as panel vans, while traditional, larger-scale freight loading primarily involves heavy trucks. Package delivery activities are often dispersed across a large number of destination buildings, as in the case of USPS deliveries to residential uses, UPS and FedEx deliveries to offices, or courier services between offices. A vehicle engaged in package delivery therefore often makes multiple relatively short stops along its route. A typical package delivery instance is shown in **Figure 51**.

Delivery services are similar to package delivery in that they may involve multiple interim stops. These services include door-to-door pick-up or delivery of items such as food (including catering and restaurant orders), dry cleaning, flowers, and groceries or bulk shopping orders. These services may be performed on a more 'ad-hoc' basis; rather than having a regular route or set of customers, delivery service is dispatched each time a customer places an order. These services may include trips to offices, residential units, or hotels, and are often conducted in a standard passenger vehicle or small van, although they may also be conducted by light truck, bicycle, or on foot.

Figure 51: A typical package delivery loading instance. Source: Google Street View, 2018.

Passenger Loading

Passenger loading involves the drop-off and/or pick-up of passengers. A typical passenger loading instance is shown in **Figure 52**. For the purpose of loading analysis, passenger loading is considered to include person trips made by taxi or TNC, and some non-SOV person trips (i.e., those where an individual is dropped off by the driver at their destination). Public and private transit trips involving curbside boarding of the transit vehicle also have a loading component; however, these trips' loading activities take place at a dedicated transit stop or station. Rather than analyzing a development project's effects on transit passenger loading in the consideration of loading space provision, it is typically analyzed as a part of determining a project's effects on transit operations. The present analysis considers person trips whose loading component occurs via private or commercial vehicles at or immediately adjacent to the subject project's land use.

Passenger loading activities include both drop-offs and pick-ups. These two activities have different average durations, as discussed in section 7.3.4 below. In the case of taxi or TNC passenger loading, a single loading instance may sometimes involve a drop-off followed immediately by a pick-up (more so in the case of taxis because they can be visually hailed by passengers from the street). However, most passenger loading instances involve either a drop-off or a pick-up, but not both.

Figure 52: A typical passenger loading instance, in an on-street passenger loading facility (white curb). Source: Fehr & Peers, 2017.

7.1.3 Loading Facility Types

Loading facilities are divided into two categories: off-street and on-street facilities, which further consist of several different types of loading situations. While not an exhaustive list, **Table 23** shows several examples of loading instances categorized by where they typically occur, as well as by activity type.

Table 23: Examples of Loading Activities by Location and Type

	Off-Street	On-Street
Goods Movement	• Grocery store truck loading/unloading • Move-in/ move-out (larger buildings) • Garbage, compost, and recycle pick-up service (e.g., large buildings)	• Move-In/ Move-Out • FedEx, UPS, USPS parcel service • Computer or app-based deliveries • Garbage, compost, and recycle pick-up service (e.g., rolled out to curb) • Commercial loading at yellow curb • Brief stops at green curb for dry-cleaning pick-up; food pick-up; etc.
People Movement	• Hotel guest drop-off and pick-up at a porte-cochère • Use of parking lot for drop-off and pick-up	• Taxi and for-hire vehicle passenger loading • Passenger loading at white curb • School and child care facility pick-up/drop-off • Institutional use (Residential Care Facilities, Community Centers, Museums) pick-up/drop-off • Casual Carpool loading • Event pick-up/drop-off

Source: Fehr & Peers, 2018.

Off-Street

Off-street freight loading facilities accommodate light and heavy trucks engaged in freight loading. These facilities may include loading docks whose heights match the elevated floors of heavy trucks and single-unit light box trucks, or less-specialized off-street bays into which trucks may maneuver in order to load and unload goods within a building. Grocery stores and other large retail, office, and residential buildings typically include at least one off-street freight loading facility to accommodate the loading of merchandise, furniture, maintenance vehicles, move-ins and move-outs, and other similar activities. A typical off-street freight loading facility is shown in **Figure 53**.

Figure 53: A typical off-street freight loading facility. Source: Google Street View, 2018.

Off-street passenger loading facilities are generally associated with hotels and some larger residential developments. Often taking the form of a porte-cochère and sometimes a parking lot, an off-street passenger loading facility enables passenger cars to exit the right of way in order to perform passenger loading and unloading. Such facilities usually protect passengers from exposure to weather, and may permit more leisurely pick-ups and drop-offs, as well as a dedicated space for individuals to maneuver any luggage or large packages they may be carrying. Off-street passenger loading facilities can create conflicts between vehicles and pedestrians if large volumes of loading vehicles are crossing a sidewalk with a substantial number of people walking. A typical off-street passenger loading facility is shown in **Figure 54**.

Figure 54: A typical off-street passenger loading facility. Source: Google Street View, 2018.

On-Street

On-street loading takes place at the curb face adjacent to or near the target building. The facilities for on-street loading are generally segments of curb designated for loading use. In San Francisco, white curbs are used to indicate passenger loading zones (which have a five minute time limit), yellow curbs indicate freight loading zones (which have varying duration and time of day time limits), and green curbs indicate short-term parking. Typical on-street loading facilities are shown in **Figure 55**.

Figure 55: Two typical on-street loading facilities. Left: yellow curb (freight loading); right: white curb (passenger loading). Source: Google Street View, 2018.

Many sites, particularly hotels and schools, have associated white curb zones in front of the site itself. Elsewhere, notably in the Financial District, entire block faces may be designated for freight loading outside of peak travel periods. Many such block faces transition to become travel lanes during peak periods. This is an example of "flex" curb management. Other time-based flex options are possible, such as shifting between freight and passenger loading designations according to time of day, but these configurations are uncommon at present.

When the on-street loading facilities provided for a given land use are insufficient, drivers may conduct loading activities in unoccupied parking spaces or at building driveways; or they may conduct double-parking or loading at a red curb (see **Figure 56**) or in the travel lane. The potential hazards associated with these types of loading activities underscore the importance of providing sufficient on- and off-street loading facilities, and/or actively managing locations of loading instances.

A secondary example of loading that occurs on-street is loading at a traditional taxi stand, where taxis queue while waiting for passengers, who are able to enter the vehicle at the front of the queue. Because these facilities are not affiliated with individual land uses, they are typically not considered as part of a project's on-street loading demand unless the project itself is proposing the facility (e.g., hotel).

Figure 56: Loading activities occurring in bicycle facilities. Source: Google Street View, 2018.

7.1.4 Summary

The present analysis focuses on the following combinations of vehicle type, activity type, and facility type:

- Off-street freight loading by light and heavy trucks: this activity constitutes the traditional "freight loading" approach and is the type of activity currently considered by the existing TIA Guidelines.
- On-street package delivery and delivery service by light trucks and other vehicles: this subset of freight loading is likelier to occur on the street, where its demand for curb space has implications for a project's transportation impacts.
- On-street passenger loading by taxis and other vehicles: passenger loading instances have become far more common in recent years driven by the popularity of TNCs.

7.2 Loading Analysis Methodology

This study of how land use and loading demand are related approaches loading in two ways: by surveying the usage of existing loading spaces and by surveying individuals to ascertain what percentage of person trips are associated with loading activities.

To assess demand for existing loading zones, Fehr & Peers identified the primary loading spaces affiliated with a subset of sites across a variety of land uses. Typically, these loading spaces were sections of "white curb" passenger loading space or "yellow curb" commercial loading space adjacent to the study site, although off-street loading was studied at a smaller subset of sites. Using time-lapse cameras, we obtained utilization rates for each studied loading zone in five minute increments. By examining the use of the physical loading space, we were able to assess whether the primary loading zone was adequate to accommodate the site's loading activity.

We then used results from intercept travel surveys to calculate the share of trips at each survey site that involved either passenger or commercial loading; trip types that were determined to involve loading activity included delivery, TNC/Taxi, and some percentage of HOV passenger. By examining the share of total trips associated with loading activity, we are able to estimate an expected level of curb loading for each land use and place type cross-section. This estimation was compared to camera observations; however, because of limitations to the observation methodology (such as recording passenger loading instances of limited duration), some information was obtained primarily from intercept surveys.

7.2.1 Loading Observations

Loading observations were made at a subset of the data collection sites used for intercept surveys and trip counts, and largely followed similar distributions of geographic location, land use, and urban context. Sites selected for loading observations were required to have a loading zone adjacent to the site (either white curb, yellow curb, or a dedicated driveway / loading zone) that was clearly visible from the public right of way, and capable of being captured on time-lapse camera. The key constraint to sites selected for loading observations was that for most loading zone types, there is no restriction on whether individuals using the zone are affiliated with the use being studied. Several sites were isolated enough that there is little reason to believe that non-affiliated loading behavior was occurring (for example, large office buildings occupying an entire block face); however, for sites in dense neighborhoods, data could reflect total loading demand for an area larger than the use itself.

In addition, three loading zones in the Financial District were subject to peak period travel lane conversion. In these conditions, the loading zone is converted into a travel lane during either the AM peak period or the PM peak period, which affects statistical analysis of overall occupancy in the sense that these affected loading zones are excluded from analysis of occupancy and availability during the periods in which they are not operating as loading zones.

In total, 41 sites were selected for loading time lapse data collection; their locations are shown in **Figure 4** above. Of these, 14 sites included at least one off-street loading space; 15 included at least one white curb passenger loading space; and 17 included at least one yellow curb commercial loading space. Details are included in **Appendix M.**

Loading observations were made via time lapse camera, with images captured every five minutes. The use of time lapse photography allowed for inclusion of a larger number of sites and the ability to collect 24-hour data. Five minute intervals were selected in order to provide a robust number of data points over the 24-hour period while still being economical with the data collection resources available (i.e. higher frequency would be more expensive). If a site had an adjacent loading zone (i.e., white passenger loading curb or yellow commercial loading curb), the camera was positioned to capture whether each space was occupied. For some sites, loading data collection included occupancy of a loading dock or driveway visible from the public right-of-way.

Loading observations consist of data indicating the number of vehicles in the identified loading zone in five-minute increments over a 24-hour period. These data represent "snapshots" of individual loading zones over the course of a typical mid-week weekday (see **Appendix D** for a full list of sites with dates data were collected). These observations were then used to assess occupancy or vacancy of each loading space (and double-parking and multiple vehicles sharing a loading zone, to the extent feasible[32]) during each five-minute period.

Because of the nature of time lapse photography data, there is some level of uncertainty concerning loading data such as length of stay, and the total number of vehicles using a space. In other words, images captured at five-minute intervals may fail to document loading instances (especially passenger loading given the duration is often less than five minutes) that occurred entirely between consecutive images; such instances would be omitted from both length-of-stay calculations and the count of total loading instances. As such, this measure assesses whether the provided length of loading zone is adequate to accommodate demand across the course of a day, rather than the exact number of loading instances accommodated by that same loading zone. Information on loading zone use by instance, including stop duration, was further assembled using video data discussed in section 7.2.3 below.

[32] Generally, the data collection firm was able to provide counts of multiple vehicles utilizing a single loading space, as in instances of double-parking, resulting in a higher than 100% occupancy rate for a given time. However, there may be some instances where double parking occurred but was not registered as such in post-processing.

7.2.2 Intercept Surveys

Intercept surveys were conducted as discussed in section 2. Generally, individuals entering and exiting a study site were asked what mode they used to travel to the site. Three response categories to the mode question were identified as contributing to loading activity at the curb: trips flagged as "delivery" where the mode was "drive alone," trips made via the Taxi/TNC mode, and trips whose mode was identified as "HOV passenger," which includes some individuals being dropped off or picked up by private vehicles.

Because survey data do not differentiate between passengers in private vehicles who were dropped off and those who were in a vehicle that parked, it was necessary to impute a number of loading instances from the total HOV passenger mode share. This study assumes for loading purposes that half of these HOV passenger respondents were dropped off (rather than parking and traveling with a group that includes the vehicle driver); this represents a conservative estimate of how many HOV trips involve loading rather than parking.[33]

7.2.3 Additional Observations

As a supplement to the above observations and survey efforts, Fehr & Peers analyzed data from a parallel effort conducted for SFMTA's TNCs and Street Safety Study. For this study, video data was collected along 20 blocks of San Francisco during daylight hours, providing information concerning street observations.[34] Five street segments/videos were identified with previously existing white curb passenger loading zones, and IDAX Data Solutions processed the data to provide an average dwell time for passenger loading instances at each zone during the PM peak period from 4PM – 6PM. The time of each loading instance was measured from when the vehicle arrived at the loading zone to when it departed the loading zone. Data include instances where vehicles did not fully enter the loading zone (i.e., stopped partially or fully in the travel lane next to the loading zone).

The five data collection sites used for this method were located at:

- Columbus Avenue, between Broadway and Pacific Avenue, in the North Beach neighborhood
- Brannan Street, between Seventh Street and Eighth Street, in the South of Market neighborhood
- Castro Street, between 18th Street and Market Street, in the Castro neighborhood
- Sutter Street, between Grant Street and Stockton Street, in the Union Square neighborhood

[33] Because survey respondents were not asked to specify if they were dropped off or simply part of a group arriving in a single vehicle, we have chosen to select a 50% factor for HOV trips for purposes of loading analysis. This factor is conservative in that it likely slightly overestimates total passenger loading activity, as for most uses carpooling activity is likely among individuals traveling to the end location together.
[34] *TNCs and Street Safety,* San Francisco Municipal Transportation Agency. Forthcoming.

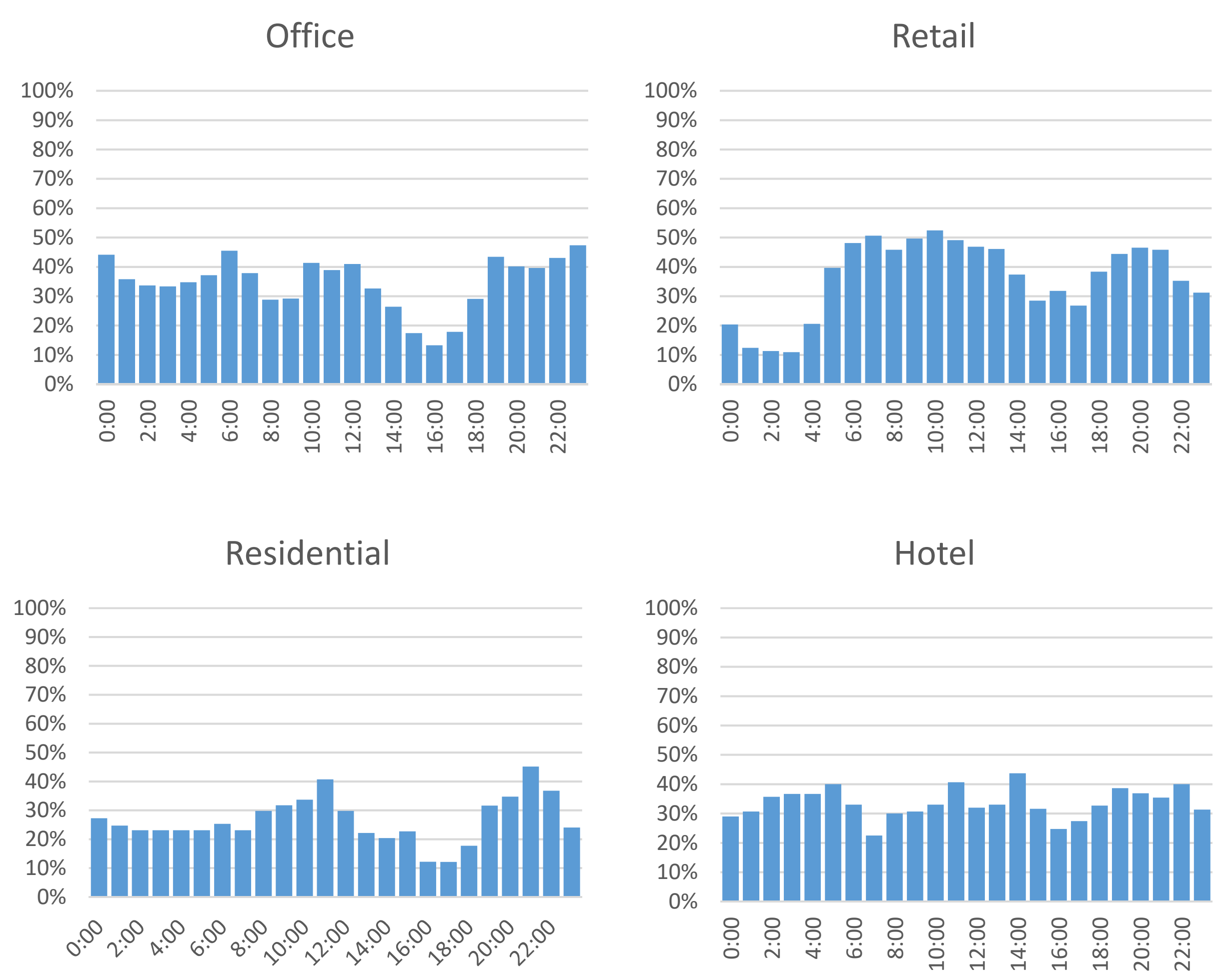
- California Street, between Montgomery Street and Kearny Street, in the Financial District

7.3 Loading Findings

7.3.1 Loading Zone Occupancy

At each of the 41 loading observation sites, 5-minute time lapse footage was taken during a 24-hour period. For each five-minute period, data was processed to indicate whether the loading zone was occupied or vacant, which was used to reach an average occupancy rate by time of day, by land use across the city. This data is presented in Figure 57.

Figure 57: Average Loading Space Occupancy by Time of Day, All Loading Spaces



As shown in the figures, each land use has its own time-of-day profile. For office, retail, and residential sites, a dip in occupancy was observed during the extended PM peak period. This may be partially due to loading spaces in the busiest portion of the city excluded from both the supply and occupancy data when they are in use as travel lanes, assuming that these sites in the busiest portion of the City where loading would have continued to have higher occupancy if loading were permitted. Delivery vehicles and freight vehicles may also attempt to avoid the busiest travel hours in order to reduce time lost in congestion.

Additionally, as shown in Figure 57, across the city, around 20 to 50 percent of loading spaces are occupied at any given time. This occupancy level includes activities such as overnight parking in loading zones that convert to parking overnight (which is why there is generally 10 – 40 percent occupancy in the late night to early morning hours), as well as general loading activities.

Figure 58: shows the average occupancy over time of day for curb loading spaces only (this includes both white curb passenger loading as well as yellow curb commercial loading). Several time-of-day patterns are more pronounced among curbside loading. Compared to the average loading space occupancy across all loading space types (both on and off-street) as shown in Figure 57, Occupancy for curb loading spaces (as shown in Figure 58) is noticeably higher for residential and retail uses throughout the day, which indicates that curb loading is more frequently used than off-street loading at these land use types. In terms of patterns across time of day, residential uses have noted increased activity during the late morning and late evening hours. Retail sees similar increases in activity during the morning to early afternoon hours and the evening hours of the day. Hotel loading remains fairly steady throughout the day, and office loading also remains similar to the combined loading occupancy presented above.

The insights available from the time-lapse loading zone observations are limited by the complexity of loading activity itself and of the loading facilities observed. The 41 sites included in loading observations had a mix of on-street and off-street facilities, some of whose designated uses changed over the course of the day. These changes are complex; for example, many downtown on-street loading zones shift from providing private car parking overnight to acting as travel lanes during the AM peak, then operate as passenger or freight loading (white or yellow curb) at midday, then return to travel lanes, then revert to parking or loading. Loading zones that converted to travel lanes were excluded from supply and demand during the relevant hours; however, conversion into parking outside of peak hours was *not* included as a factor in either loading demand or loading supply. The data collection approach of time-lapse photography, while representing a sensible compromise between level of effort and breadth of data collection, also made it infeasible to say with certainty whether a vehicle present in the loading facility was actually engaged in loading.[35] We can, however, reasonably assume that most “Other” vehicles observed overnight were parked, rather than actively loading

Figure 58: Average Loading Space Occupancy by Time of Day, Curb Spaces Only

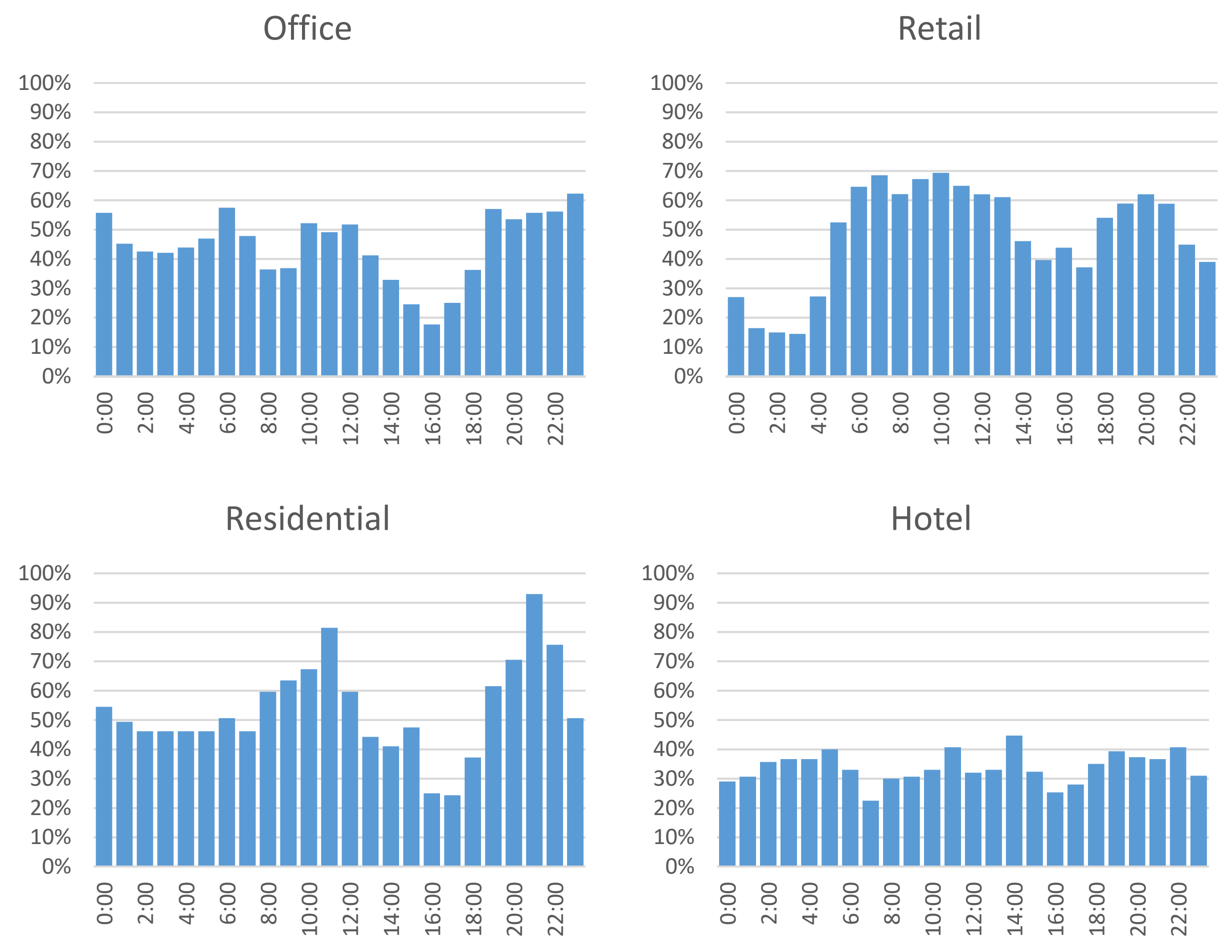
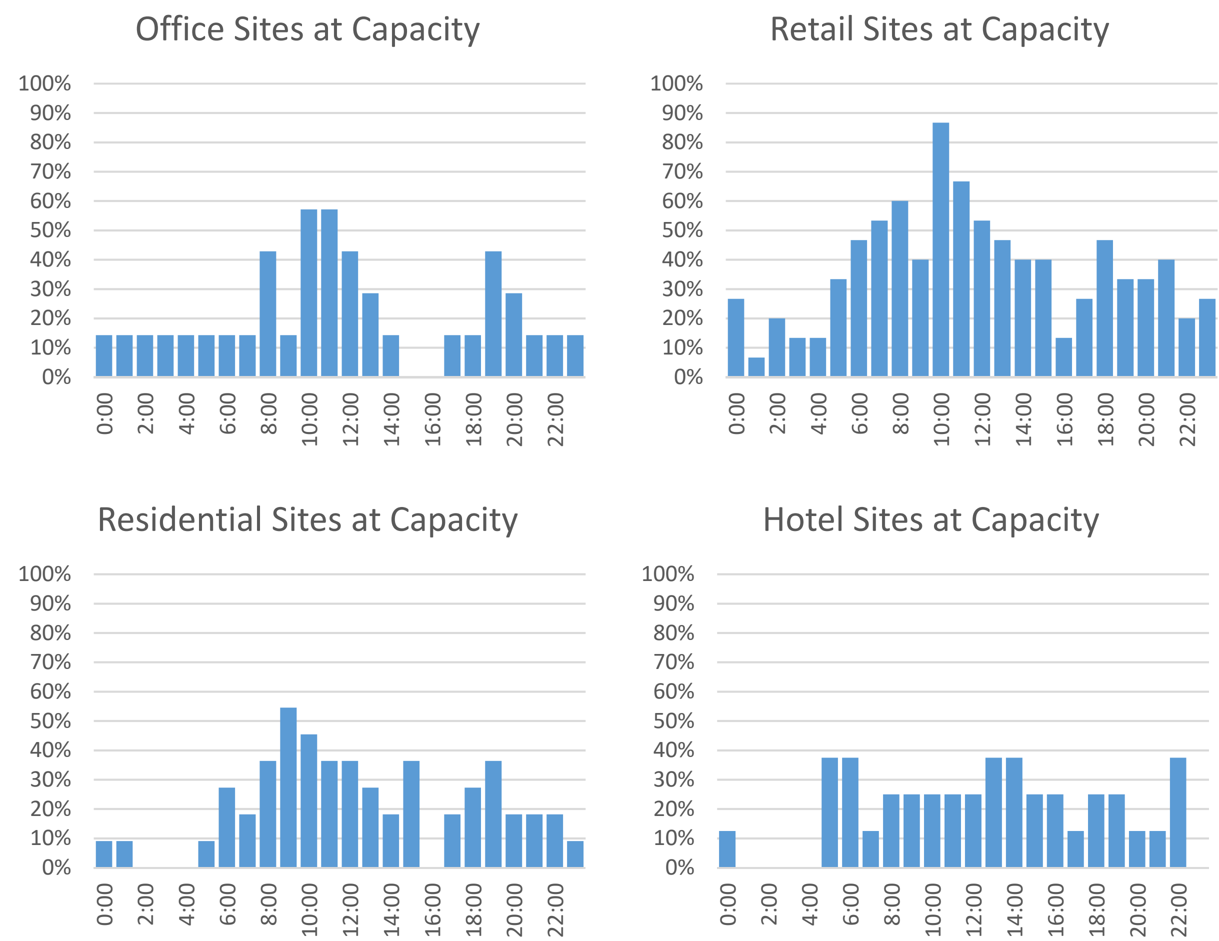


Figure 59 shows the percentage of sites from each land use whose loading areas were at capacity over the course of the day. Sites at capacity are of particular interest, as a fully occupied loading zone is could result in overflow loading demand engaging in loading activities elsewhere (e.g., travel lanes, bicycle lanes) or they could adequately accommodate the loading demand. In particular, we have assessed the share of sites reaching capacity in a given hour in order to reflect at how many individual locations there is a chance of being unable to use a loading zone during each hour of the day. Each hourly bar represents the proportion of sites that were at capacity at any point during that hour, and excludes sites that never reached capacity during the hour in question.

[35] It was not within the scope to collect and reduce full-speed video footage of 41 loading zones for 24 hours each.

Figure 59: Percentage of Loading Zones at Capacity by Time of Day, All Loading Spaces



Overall, loading facilities are most likely to be at capacity during the mid-day period across all land uses. In addition, at non-retail land uses, during the peak hours for loading only around half of the studied loading zones ever reached capacity at any point. To the extent that loading zones are intended to provide dedicated space available for loading without generating any queuing behavior, this finding indicates that for non-retail uses, around half of available loading facilities meet this criteria during even the peak hour of the day. However, to the extent that allocating loading space is intended to provide a well utilized loading zone and serve consistent loading activity, the lack of spaces that reach full occupancy may indicate that loading activity is occurring elsewhere or that less loading activity is taking place. The former may be the case particularly at sites that include both curb-side loading zones and off-street loading areas; as discussed above, curb occupancy is generally higher than off-street occupancy due to restrictions on use of off-street loading zones.

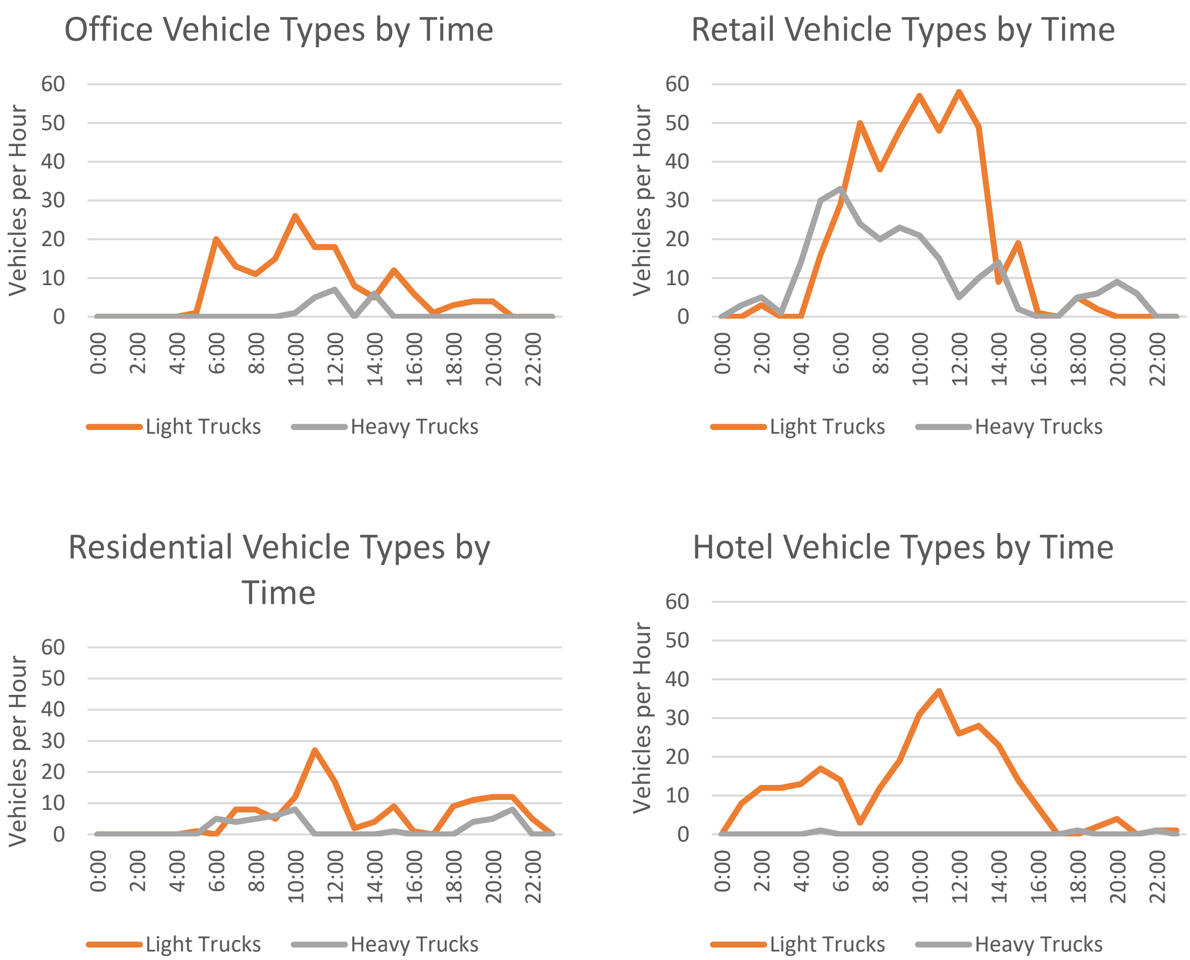
However, for retail land uses, the peak is sharply defined, and has a very high full occupancy rate of around 85 to 90 percent. This peak occurs during the mid-morning, which indicates a time period when retail businesses are typically open for business as well as the hours when commercial deliveries tend to be highest. The 10:00 am peak hour is also when two travel lanes near retail sites in central San Francisco convert to commercial loading zones. Finally, the retail loading zones are most likely to be located along busy retail corridors (sample sites include sites in the Financial District, on Valencia Street in the Mission District, and on Chestnut Street in the Marina District). As such, they may be more likely to experience loading activity associated with neighboring land uses.

7.3.2 Truck Loading Observations

Observations also confirmed common assumptions regarding the distribution of freight loading throughout the day. **Figure 60** shows the total number of vehicle observations across all sites in two freight- specific vehicle classes (light truck and heavy truck) in each hour, classified by land use type. These observations demonstrate that freight loading activity (represented by the presence of light and heavy trucks) is concentrated outside the AM and PM peak travel periods. A midday freight "peak" is visible for all land uses, as is a pronounced dip in freight loading around the extended PM peak period. For all uses except residential, the PM peak period represents less than 20% of loading zone occupancy at the mid-day peak. The increase in occupancy at residential loading zones may indicate that deliveries to residences are more likely to occur during the evening hours as compared to other land uses.

These figures confirm the standard preconceptions about which vehicle types serve which land uses: heavy trucks make up a substantial proportion of retail loading activity and appear only rarely at other land use types, while light trucks (including package delivery panel trucks) serve all land uses in significant numbers.

Figure 60: Total Observed Loading Zone Occupancy by Select Vehicle Classes at Each Land Use by Hour, All Loading Spaces



Finally, it is important to note that these observations indicate the presence of a vehicle in a loading zone at a given moment, and not necessarily an arrival rate of vehicles. Because these charts focus on vehicle types more likely to be involved in loading, the presence of a vehicle likely indicates that loading activity is actively occurring; however, this may not be the case, particularly during the overnight hours when parking may be permitted in the loading area.

While time lapse photography generally is insufficient to ascertain arrival rates, the relative scarcity of light and heavy trucks makes it possible to impute truck arrivals and departures by comparing the presence or absence of a truck across five minute periods. **Figure 61** is derived from observed instances of vehicle arrival in the time lapse data – essentially, cases where an empty space or space occupied by a passenger vehicle was occupied by a light or heavy truck in the next 5-minute data interval. As shown in the figure, arrival activity by larger vehicles is concentrated in the period from early morning to early afternoon, with a steep decline in instances during the PM peak period. **Table 24** shows the relative volume of truck activity during the peak hour of truck loading activity (from 10am to 11am) and during the 2-hour PM peak period (from 4pm to 6pm). Incorporating data from the two-hour peak period (a conservative approach), only around 25 percent of the peak hourly freight loading demand should be expected to occur during the PM peak period.

Figure 61: Observed Truck Loading Arrivals by Hour, All Data Collection Sites, All Loading Spaces

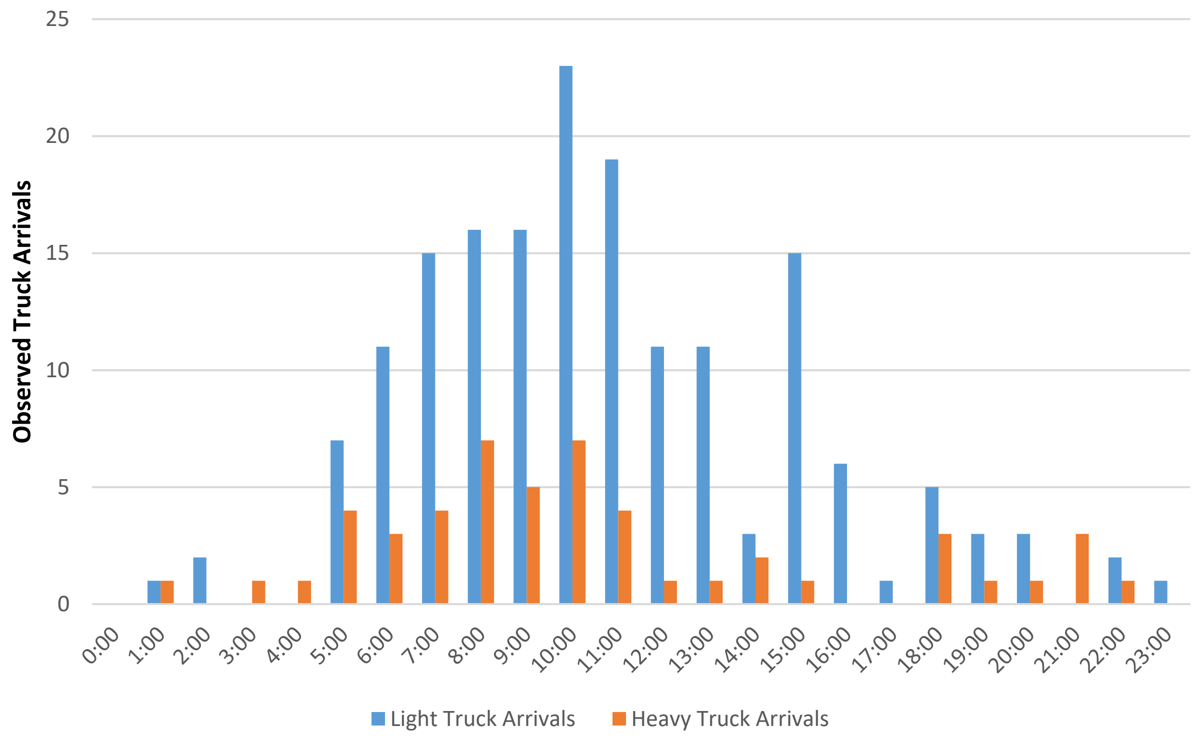


Table 24: Peaking Factors for Freight Activity

Period	Light Truck Arrivals	Heavy Truck Arrivals	Total Truck Activity
10AM – 11AM (Freight Peak)	23	7	**30**
4PM – 5PM (Peak Period, Two Hours)	6	0	**6**
PM Peak Period Demand as % of Freight Peak Period Demand			***20%***

Source: Fehr & Peers, 2018.

7.3.3 Intercept Survey Data

Intercept survey findings are presented in **Table 25**. Mode types presumed to involve a loading instance that occurs at the curb were all delivery trips made via driving, all taxi/TNC trips, and half of HOV passenger trips. This percentage of HOV passenger trips represents a conservative estimate of how many of those trips involved a drop-off/pick-up by a private vehicle, as opposed to groups of individuals including both drivers and passengers.[36] The table separately highlights the percentage of trips identified as delivery and as passenger loading.

Table 25: Curb Loading-type PM Peak Period Mode Splits by Land Use and Geography

Land Use	Geography	Number of Sites	Delivery %	*Taxi / TNC %*	*Private Vehicle Drop-off% (50% of HOV Passenger Mode)*	Passenger Loading %
Office	Place Type 1	8	**3.1%**	6.1%	1.2%	**7.3%**
	Place Type 2	7	**2.3%**	11.0%	2.4%	**13.4%**
	Place Type 3	3	**5.5%**	2.0%	5.1%	**7.1%**
Retail	Place Type 1	4	**5.9%**	4.6%	0.9%	**5.5%**
	Place Type 2	10	**2.3%**	1.4%	1.6%	**3.0%**
	Place Type 3	7	**0.5%**	1.0%	4.2%	**5.2%**
Residential	Place Type 1	4	**5.7%**	6.0%	2.8%	**8.8%**
	Place Type 2	9	**11.3%**	3.5%	3.7%	**7.2%**
	Place Type 3	2	**6.1%**	4.2%	2.7%	**6.9%**
Hotel	Place Type 1	4	**2.6%**	19.6%	2.2%	**21.8%**
	Place Type 2	5	**1.4%**	15.6%	4.1%	**19.7%**
	Place Type 3	2	**7.5%**	7.5%	6.0%	**13.5%**

Source: Fehr & Peers, 2018.
Note: "Delivery" mode acts as a modifier to the primary mode of the trip, and as such is not reported separately in other sections of this document (i.e., deliveries from a truck may appear as "Drive Alone" while those made by bicycle would appear as "bicycle"). "Passenger Loading %" equals the sum of "Taxi / TNC %" and "50% of HOV Passengers (Pax) %."

Overall, the share of person trips involving a loading instance ranges from around five percent for retail uses in Place Type 2 and 24 percent for hotel uses in Place Type 1. For several survey segments, there appears to be a very high rate of person trips involved with deliveries; for instance, at residential buildings in Place Type 2 around 11 percent of all person trips were involved with delivery activity. This is partially explained by the nature of delivery trips in urban environments: a delivery person generates a counted person trip both entering and exiting the building in a relatively short window of time, and may have responded to the surveyor in both directions. As such, the translation from delivery trips as a percentage of

[36] Because survey respondents were not asked to specify if they were dropped off or simply part of a group arriving in a single vehicle, we have chosen to select a 50% factor for HOV trips for purposes of loading analysis. This factor is conservative in that it likely slightly overestimates total passenger loading activity, as for most uses carpooling activity is likely among individuals traveling to the end location together.

total person trips to loading instances requires dividing by a factor of two, as each delivery trip creates one inbound and one outbound person trip across the screenline.

The high levels of variance between similar uses in different place types may represent the number of sites sampled, particularly in the case of deliveries. Because deliveries are presumed to have a longer length of stay in loading zones (see section 4.3), this high level of variance may be more likely to introduce some uncertainty into the total loading demand: due to the longer length of stay, the total loading demand will be more sensitive to delivery events than to passenger loading events when determining peak demand and loading zone length.

7.3.4 Length of Stay

Passenger loading length of stay was calculated from daylight hour video footage of five white-curb passenger loading zones at locations in Place Type 1 and Place Type 2; this data was collected for the SFMTA TNCs and Street Safety report (*forthcoming*) as described in section 7.2.3. The areas selected for calculating length of stay are those with the presence of a dedicated passenger loading zone, as this analysis focuses on the use of loading facilities and planning for the provision of future loading facilities. Data was processed by IDAX Data Solutions, and provided as a list of loading instances and duration of each instance, as well as whether the instance was a drop-off or pick-up, and if the vehicle remained in a loading zone beyond the permitted duration of time or left without loading or unloading passengers.

Length of stay for light and heavy trucks (i.e., delivery and service vehicles) was calculated based on the 5-minute time lapse data discussed in section 3.1 above. Because these light and heavy trucks tend to stay in loading zones for longer durations, use of the five minute loading data was sufficient to obtain an average length of stay. Loading instance duration is summarized in **Table 26**.

Table 26: Dwell Time by Vehicle Type and Activity (hours: minutes: seconds)

	Vehicle Type			
Activity	Passenger Car	Taxi	Light Truck	Heavy Truck
Pick up passenger	0:01:05[1]	0:01:00[2]	-	-
Drop off passenger	0:00:45	-	-	-
Freight loading (on-street)	-	-	0:27:00	0:17:00
Freight loading (off-street)	-	-	0:36:00	0:39:00

Source: Fehr & Peers, 2018.
Notes:
1. The passenger loading durations were rounded to the nearest 5 seconds; because the freight loading durations were based on

less temporally precise data (5 minute snapshots), these durations were rounded to the nearest minute.
2. Taxi data is based on a very small sample size, and is presented for informational purposes only.

Generally, passenger pick-up instances required around one minute to complete. Taxi drop-off instances appear to take longer; however, all available taxi data is from an existing taxi stand, where vehicles waited until a passenger approached to depart. Drop-off instances on average took about 45 seconds to complete; there were no drop-off instances observed by taxis. “Passenger Car” includes vehicles operating as TNCs, as it was not feasible for this study to distinguish between passenger cars operating as TNCs and cars in traditional private operation. Due to the scarcity of data on traditional taxis, we have opted to use the passenger car loading numbers for all passenger loading instances.

These passenger loading durations are shorter than the durations currently in use for hotel loading zones (90 seconds) in the 2002 SF Guidelines, Appendix H. The average length of stay used in the draft methodology is 60 seconds, which assumes that half of activity is pick-up activity (with estimated dwell time of 65 seconds as shown in Table 26) and half of activity is drop-off activity (with estimated dwell time of 45 as shown in Table 26), and rounds upwards to the nearest 10 seconds. In cases where activity is expected to comprise largely one or the other during the peak period (i.e., at event spaces where pre-event traffic is comprised largely of drop-off activity and post-event traffic largely involves pick-up activity), the appropriate directional rate should be used. Additionally, at land uses not included in this study, such as schools and institutions, available data or data from direct field observations should be used instead. It may also be of note that the sites used for length of stay observations are largely located in more urban areas; these were selected in order to increase the number of total loading observations per hour. However, the high level of loading activity at many of these zones may provide a subtle incentive to passengers and drivers to complete loading activity as quickly as possible, thereby reducing observed loading durations.

Average length of stay for light and heavy trucks is calculated based on time lapse footage by observing how long a space remained occupied by a light or heavy truck before becoming vacant; the average “block” of time was as reported in Table 26. Light and heavy trucks’ loading instance durations depended on their location. Light trucks performing on-street freight loading had an average duration of approximately 27 minutes, while light trucks’ off-street freight loading instances lasted about 36 minutes. Heavy trucks stayed slightly longer than light trucks in off-street contexts (39 minutes), but their average on-street length of stay (17 minutes) was shorter than that of light trucks. This length of stay for off-street facilities is longer than the duration already in use for trucks using loading facilities in the 2002 SF Guidelines, Appendix H; however, the observed length of stay may be longer for off-street facilities due to a lack of impetus for the truck to move (i.e., making a delivery to a loading dock for which no other trucks are waiting).

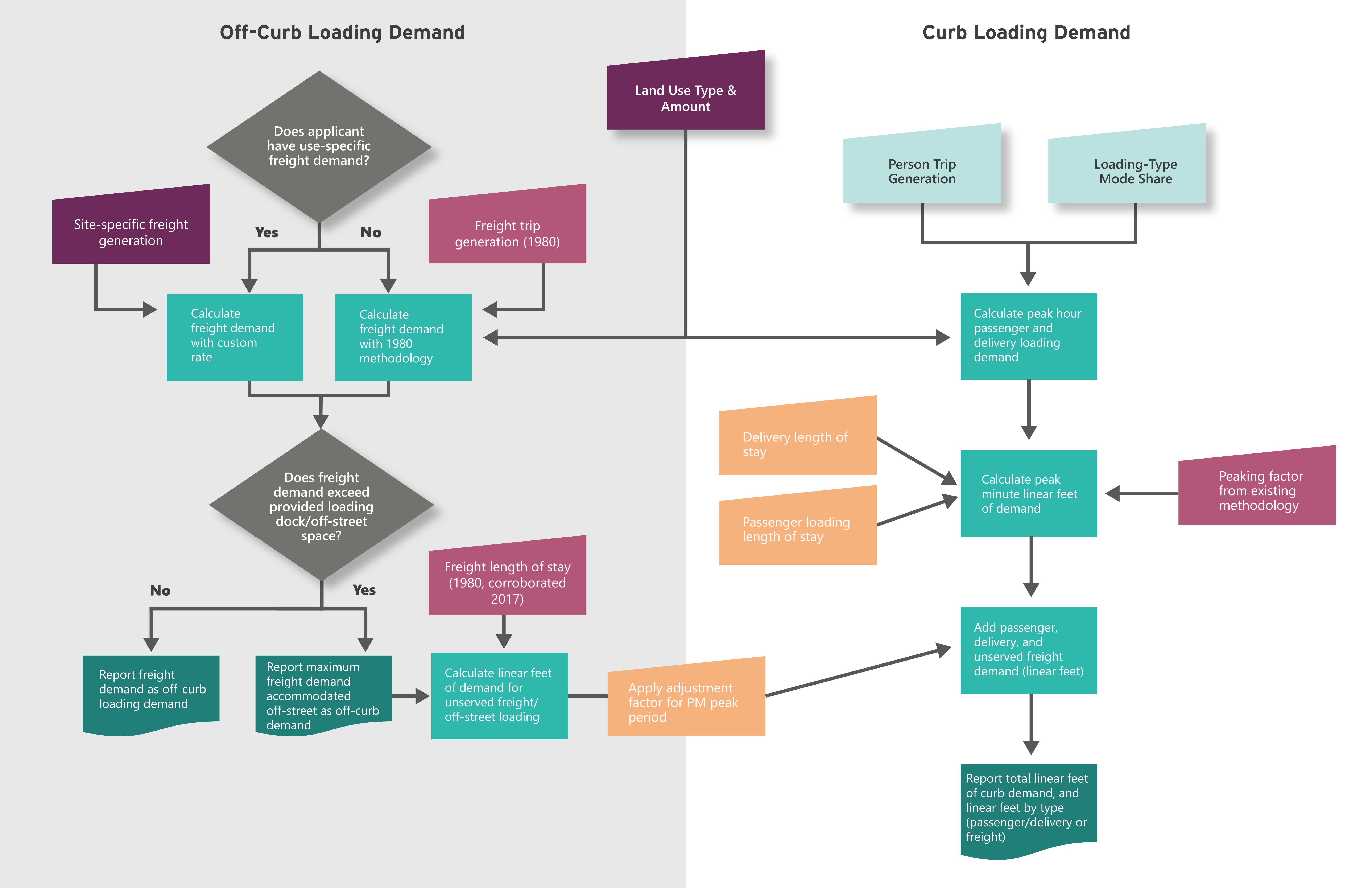
7.4 Recommended Methodology Updates

7.4.1 Recommendations

Based on the findings represented above, Fehr & Peers recommends revising the current methodology to allow for project sponsors and city staff to estimate anticipated loading demand either off-street or on-street as appropriate to a given site and its context. This requires several steps, including identifying which types of loading are likely to occur in each location; determining the expected number of loading instances for each type of loading (freight, passenger, and delivery / delivery service) during the analysis period; estimating the typical vehicle type that may be performing each type of loading activity; the typical duration of each type of loading activity; and, finally, the linear feet of curb space or number of loading bays that would be needed to accommodate demand derived from the cumulative effect of those assumptions.

Figure 62 shows a flow chart detailing how total loading demand can be calculated for both off-street loading and on-street loading. In summary, the draft methodology progresses as follows:

1. Off-Curb Loading Demand
    a. Analyst determines a project's freight demand using rates established in the 1980 goods movement study, or using use-specific rates in the event that the project is formula retail or grocery store. (This step mirrors the methodology in the 2002 SF Guidelines.)
    b. Analyst then determines if the available off-street loading space can accommodate the peak freight loading demand, based on the current loading methodology. (This step mirrors the methodology in the 2002 SF Guidelines.)
    c. If this demand cannot be met through off-street loading spaces, the unaccommodated freight demand (in linear feet) must be added to the total linear feet of peak passenger and delivery loading demand.



Off-Curb Loading Demand
Curb Loading Demand
Land Use Type & Amount
Does applicant have use-specific freight demand?
Site-specific freight generation
Yes
No
Freight trip generation (1980)
Calculate freight demand with custom rate
Calculate freight demand with 1980 methodology
Person Trip Generation
Loading-Type Mode Share
Calculate peak hour passenger and delivery loading demand
Delivery length of stay
Passenger loading length of stay
Calculate peak minute linear feet of demand
Peaking factor from existing methodology
Does freight demand exceed provided loading dock/off-street space?
No
Yes
Freight length of stay (1980, corroborated 2017)
Report freight demand as off-curb loading demand
Report maximum freight demand accommodated off-street as off-curb demand
Calculate linear feet of demand for unserved freight/ off-street loading
Apply adjustment factor for PM peak period
Add passenger, delivery, and unserved freight demand (linear feet)
Report total linear feet of curb demand, and linear feet by type (passenger/delivery or freight)

2. Curb Loading
    a. Analyst determines their curb loading demand by calculating peak hour person trips and applying the "loading-type" mode splits (incorporating both passenger loading and delivery loading) presented in Table 25 above**.** Combined with average vehicle occupancy rates, this provides the number of expected peak hour loading instances.
    b. Peak Minute loading demand is calculated as follows:
        i. Passenger Loading Linear Feet of Demand = [Peaking Factor][37] x [Total Person Trips] x [Taxi/TNC % + ½ x HOV Passenger %] x [1 / Average Vehicle Occupancy] x [Passenger Loading Length of Stay] x [Curb Length to Accommodate Average Vehicle] / [15 minutes]
        ii. Delivery Loading Linear Feet of Demand = [Peaking Factor][38] x [[Total Person Trips] x [Delivery Mode Split %] x [50% Adjustment from Person Trips to Loading Instances] x [Delivery Length of Stay] x [Curb Length needed for Average Delivery Vehicle] / [15 Minutes]
3. The sum of steps 1 and 2 represents the peak hour curb loading demand for the site, and indicates the recommended amount of curb space to be dedicated to loading to accommodate peak demand during the PM peak hour. This number should be rounded to the nearest multiple of an average loading space; i.e., 20 feet.

This methodology incorporates the following changes to the 2002 SF Guidelines based on site observations:

- Differentiating between off-street freight loading, passenger loading, and on-street delivery / delivery services
- Providing peak hour loading instance estimates for passenger loading and delivery / delivery services for a wider variety of land uses based on intercept survey data
- Updated passenger loading length of stay based on data collected for the SFMTA TNCs and Street Safety project, as presented in section 7.3.4.
- Updated delivery loading length of stay based on time lapse data for light trucks in curb loading spaces, as presented in section 7.3.4.
- Updated person trip generation based on person counts at sites throughout the city, as presented in section 6.1.

In development of the draft methodology, we used the average rates from each observed land use without modification. We also made no changes to the hourly peaking factors (i.e., how arrivals are distributed

[37] The 2002 SF Guidelines use a peaking factor of .5, i.e. half of all peak-hour loading instances are anticipated to occur within the peak 15 minutes.
[38] *Ibid*.

across the peak period), nor did we adjust the observed dwell times beyond rounding to the nearest 15 second interval.

Notes and Limitations

This methodology assumes that if there is off-street loading dock space available, small and large trucks will opt to use it rather than the curb. This may not always occur, particularly if drivers, based upon circumstances of the street and the facility design do not want to maneuver (e.g., back into) an off-street loading dock. The methodology also assumes that the peak hour for passenger loading and the peak hour for delivery and freight activity occur simultaneously. In the case of deliveries, the data is based on peak hour intercept surveys; however, other freight activity is still calculated based on the previous methodology in the 2002 SF Guidelines. Project sponsors may be given the opportunity to present alternative peak hours for the two types of deliveries through either data from similar projects, or through mitigation measures or improvement measures stating that deliveries and freight activity will not occur during the peak hour for passenger loading. When the PM peak hour is the primary period of concern, analysts may use a factor of 20 percent to adjust freight loading demand,[39] based on the data presented in Table 24.

The data for delivery mode share and passenger loading mode share are also based on a limited number of sites. As is currently practiced, if a project sponsor has data supporting alternative rates at similar land uses, those rates may be used in the place of the averages presented in Table 25. Similarly, there may be reason to provide an average rate of delivery trips, while maintaining specific rates for passenger loading based on the land use and place type cross-sections discussed above. We also observed that liveried taxis had a higher average dwell time than passenger vehicles; however, due to the scarcity of that data, and potential skew due to observations occurring at taxi stands, we have opted to use the passenger car loading numbers for all passenger loading instances.

This methodology also does not account for specific loading behaviors associated with private shuttles or private transit, as there were insufficient data to assess whether dwell times or loading behavior by these vehicle types differed substantially from existing methodology. In instances where a project proposes providing shuttle service as a mitigation measure or TDM measure, loading demand should be adjusted accordingly in consultation with the Planning Department and SFMTA.

Finally, this methodology is based upon observed conditions in San Francisco in 2016 and 2017. As transportation and mobility continue to evolve, the loading landscape may further adjust. Anticipated changes such as the introduction of automated vehicles to the vehicle fleet, as well as further growth in

[39] The 25% factor reflects observations showing that freight activity during the PM peak period is roughly 25 percent that of activity during the peak hour for freight activity (which occurs in the late morning). When analyzing the PM peak period, analysts may therefore adjust the rates derived from the SF Guidelines by multiplying them by 0.25.

TNCs and potential unmanned delivery via rovers or drones may all affect the use of curb space for loading in the near future.

7.4.2 Example Projects and Methodology Calibration

Following development of the draft loading methodology, Fehr & Peers applied the proposed methods to two example sites taken from the pool of data collection sites with time-lapse data of the loading zones. The intent of this application was to assess whether the draft methodology resulted in findings that roughly correlated to field observations at these sites, and, if they did not, to evaluate methods for addressing the discrepancies.

Two example sites were considered to compare projected loading activity with observed loading activity: TIA15 (the Walgreens at 2141 Chestnut Street) and TIA306 (a residential building at 2200 Sacramento Street). These sites were selected because they represent two different land uses, they have observed loading activities, and their loading facilities are on-street. Validation results are shown in Table 27.

Table 27: Initial Validation Results

	TIA15	TIA306
Name	Walgreens	residential building
Address	2141 Chestnut St	2200 Sacramento St
Geography	Place Type 2	Place Type 2
Land Use Amount	14,421 (sf)	127 (units)
Draft Loading Methodology Results [2]		
Peak Hour Delivery Loading Instances *Total Person Trips x Delivery Mode Share x 50% Factor*	5	4
Peak Hour Passenger Loading Instances [(*Total Person Trips x (TNC Mode Share + 50% HOV Passenger Mode Share)] / (Average Vehicle Occupancy)*[3]	11	5
Delivery Loading Spaces Required [[(*0.5 Peaking Factor) x (n Vehicles/Hour) x (27 minute length of stay) x (30 ft average vehicle length)] / (15 minutes)] / (20 foot standard space)*	7	6
Passenger Loading Spaces Required [(*0.5 Peaking Factor) x (n Instances/Hour) x (1.0 minute length of stay)] / (15 minutes)*	1	1
Combined Loading Spaces Required[4]	8	6
Observed Data		
Combined Loading Spaces Supplied	4	4
Maximum Observed Loading Demand	3	2

Source: Fehr & Peers, 2018.
Notes:
1. Initial validation was performed for TIA15 and TIA306 only. TIA47 was analyzed during the subsequent re-validation. TIA47's calculations are included here for comparison, but were not considered when evaluating the accuracy of the draft methodology.
2. All loading space counts given in terms of passenger car equivalents, i.e. units of 20 linear feet. All estimates of hourly loading instances are rounded up to the nearest integer.
3. Average vehicle occupancy for drop-off trips only was unavailable; as such, the average occupancy is assumed to be one.
4. "Combined Loading Spaces Required" assumes that a single curb designation could accommodate both delivery and passenger loading demand. Due to rounding, "combined loading spaces required" may not equal the sum of "delivery loading spaces required" and "passenger loading spaces required."

TIA15 has 14,421 square feet of retail space. Applying the PM peak hour trip generation rate, the delivery and passenger loading mode splits, and the average vehicle occupancy rate, the revised methodology would predict five delivery instances and eleven passenger loading instances per peak hour. Applying the remainder of the workflow described above would indicate that seven delivery spaces and one passenger loading space would be required to accommodate this delivery activity. In actuality, during the PM peak hour, no more than three vehicles, all passenger vehicles, were observed adjacent to TIA15, and the loading zone was not used to capacity. Thus the proposed methodology overestimates loading needs at this site.

TIA306 has 127 residential dwelling units. Applying the PM peak hour trip generation rate, the delivery and passenger loading mode splits, and the average vehicle occupancy rate, the revised methodology would predict four delivery instances and four passenger loading instances per peak hour. Applying the remainder of the workflow described above would indicate that six delivery spaces and one passenger loading space would be required to accommodate this delivery activity. In actuality, during the PM peak hour, no more than two passenger vehicles were observed adjacent to TIA306. Thus the proposed methodology substantially overestimates delivery and underestimates passenger loading needs at this site.

Across both sites, the unadjusted loading demand formula results in twice the level of demand observed during the data collection period. This is in spite of potential for loading instances unaffiliated with the site to use the loading zone. We hypothesize this is a result of overestimating both the typical vehicle class for curb loading delivery instances, as well as an overestimate of delivery dwell time at the curb. It is probable that there are differences between the kind of light-truck deliveries documented in the time-lapse loading observation dataset and the kinds of deliveries involved in a delivery-type intercept survey response. Many PM peak hour deliveries may be package deliveries from smaller vehicles or food deliveries in passenger-car-sized vehicles, or may be destined to a building other than the project site.

By re-examining the loading data and including only light truck arrivals between 4:00 to 6:00 PM, the average duration of an on-street light truck loading event decreased to approximately 11 minutes (from the 27 minutes for light truck deliveries made at the curb presented in **Table 26**). If this shorter duration, and a smaller vehicle type, were assumed to be the norm for peak-hour delivery instances, the space needs associated with such deliveries would fall by more than a factor of four. Then the sum of passenger loading and delivery spaces would be about three or four spaces, depending on whether the two categories' linear feet are combined prior to separating out into "spaces." This is approximately equal to the actual observed loading at these sites. Additionally, this may still overestimate the time needed for delivery loading, as it does not include any delivery observations occurring in passenger vehicles (such as many food deliveries). As such, to calibrate the model we have reduced the assumed duration of delivery loading events to 11 minutes, which likely still represents a conservative analysis for PM peak hour operations.

7.4.3 Validation via Alternative Methodology

In addition to identifying the overestimation of delivery loading demand, we examined the potential for vehicle arrival rates to affect the maximum observed loading demand, and applied a standard Poisson distribution to expected arrival rates to validate the use of the 0.5 peaking factor in the proposed loading demand formula.

In the real world, loading vehicles do not arrive at a constant rate, so chance also plays a role in determining how many loading spaces are needed to accommodate peak loading demand. The 2002 SF Guidelines use a high peaking factor of 0.5, i.e., half of the peak hour loading instances would take place within the peak 15 minutes. This factor is chosen to be intentionally conservative to attempt to reflect the variability of loading arrivals within a deterministic formula. A more robust statistical approach, borrowing from standard traffic engineering practice, would be to apply a more moderate peaking factor (such as .28, in accordance with Highway Capacity Manual (HCM) guidance on typical urban peak hour factors).[40] Then we can conservatively assume that a "busy" loading period would be a 15-minute period in which the number of instances was at the 95th percentile of the Poisson distribution whose mean is the peaked 15 minute number of loading instances. The table below shows the number of peak-15-minute loading instance for a range of hourly loading demands, according to the existing peaking factor, the existing peaking factor plus extraction of the 95th percentile of the corresponding Poisson distribution, and a .28 peaking factor plus extraction of the 95th percentile of the corresponding Poisson distribution.

The space needs associated with freight loading rapidly increase along with the number of freight loading instances per peak hour, due to the long duration of each freight loading instance. In practice, project sponsors might demonstrate how Transportation Demand Management (TDM) measures such as delivery-supportive amenities might reduce either the number of separate freight loading instances or the duration of each instance.

Table 28 summarizes the results of this process, showing the number of estimated loading instances and necessary loading spaces (in passenger car equivalents; i.e., 20-foot lengths) for a number of potential hourly loading demand levels. Generally, when examined at similar peaking factors, the Poisson distribution will result in a slightly higher level of demand; however, at a more realistic peak hour factor, using a Poisson distribution to estimate a true maximum demand level results in a slightly lower level of recommended loading space provision.

[40] HCM 2000 recommends a peak hour factor of 0.92 for urban areas; this equates to approximately .28 in the TIA Guidelines formulation.
https://www.researchgate.net/publication/245561343_Variability_of_Peak_Hour_Factor_at_Intersections

Table 28: Simple Peaking Factor vs. Poisson Distribution (Passenger Loading Case)

Loading Instances per Hour	Loading Instances per Peak 15 Minutes			Number of Loading Spaces (PCEs) Required		
	0.5 Peaking Factor	95th Percentile Poisson Distribution (with 2.0 Peaking Factor)	95th Percentile Poisson Distribution (with 1.1 Peaking Factor)	0.5 Peaking Factor	95th Percentile Poisson Distribution (with 2.0 Peaking Factor)	95th Percentile Poisson Distribution (with 1.1 Peaking Factor)
10	5	9	6	1	1	1
20	10	15	10	1	1	1
30	15	22	14	1	2	1
40	20	28	17	2	2	2
50	25	33	20	2	3	2
60	30	39	24	2	3	2
70	35	45	28	3	3	2
80	40	51	30	3	4	2
90	45	56	33	3	4	3
100	50	62	37	4	5	3
110	55	67	40	4	5	3
120	60	73	43	4	5	3
130	65	79	46	5	6	4
140	70	84	50	5	6	4
150	75	90	53	5	6	4
160	80	95	55	6	7	4
170	85	100	59	6	7	4
180	90	106	62	6	8	5
190	95	111	65	7	8	5
200	100	117	67	7	8	5

Source: Fehr & Peers, 2018.

This lower level of demand largely exerts a marginal effect, but generally demand estimates are within one space of the current formula. This indicates that while the existing formula may overestimate the amount of peaking occurring in loading zones, its results are roughly in line with estimates based on a more reasoned statistical distribution. Additionally, a deterministic formula may be simpler for analysts to apply than a method requiring use of extended tables to determine the 95th percentile of expected peak period arrivals. As such, Fehr & Peers conducted the second step of validation using the deterministic formula rather than the 95th percentile Poisson distribution method.

7.4.4 Validation Based on Additional Study Site

To validate the changes to the demand formula reflecting a reduction (from 27 to 11 minutes) in loading dwell time for deliveries, Fehr & Peers evaluated one additional site: the Hotel Carlton at 1075 Sutter Street. Additionally, updated results are presented for the previous two sites using the adjustments to delivery loading durations.

Table 29: Revised Curb Loading Demand Estimates Based on Reduced Delivery Loading Duration

	TIA15	TIA306	TIA47
Business Name	Walgreens	Residential Building	Hotel Carlton
Address	2141 Chestnut St	2200 Sacramento St	1075 Sutter St
Geography	Place Type 2	Place Type 2	Place Type 1
Land Use Amount	14.421 (sf)	127(units)	177 (rooms)
***Loading Formula Outputs*[1]**			
Delivery Loading Instances	5	4	2
Passenger Loading Instances	11	5	23
Delivery Loading Spaces Required	3	3	2
Passenger Loading Spaces Required	1	1	1
Combined Loading Spaces Required[2]	4	3	2
Observed Data			
Combined Loading Spaces Supplied	4	4	3
Maximum Observed Loading Demand	3	2	2

Source: Fehr & Peers, 2018.
Notes:
1. All loading space counts given in terms of passenger car equivalents, i.e. units of 20 linear feet.
2. "Combined Loading Spaces Required" assumes that a single curb designation could accommodate both delivery and passenger loading demand. Due to rounding, "combined loading spaces required" may not equal the sum of "delivery loading spaces required" and "passenger loading spaces required."

As shown in **Table 29**, the revised methodology results in a more reasonable estimation of loading demand at TIA15 and TIA306, and accurately estimates the level of loading demand at TIA47. Delivery loading still accounts for the majority of loading demand due to its extended estimated duration; however, the resulting occupancy levels are in-line with field observations.

Limitations outlined from the previous analysis persist; there is no restriction on individuals accessing surrounding land uses from using a loading zone in front of one of the study sites. This may result in an increased level of passenger and delivery loading compared to the calculated demand at a single site. Given the urban, mixed-use nature of much of San Francisco, there are limitations on collecting data on loading instances tied to a single land use. Additionally, due to a lack of data surrounding loading times for deliveries occurring by passenger vehicle likely results in an overly conservative loading time for delivery instances, even following the adjustment based on peak hour observations of light trucks.

7.4.5 Summary of Validation

In summary, the validation exercise illustrates the following:

- Delivery loading demand was previously under-estimated in the 2002 SF Guidelines for many land uses, and much of existing delivery loading demand occurs at the curb.
- Use of the deterministic formula with a 0.5 peaking factor during the peak 15 minutes of demand likely does not reflect the true distribution of loading demand; however, it may serve as a reasonable proxy for assessing loading demand given the inherent uncertainty of vehicle arrival distributions. The formula using a 0.5 peaking factor found a loading demand within one space of a more refined method using the 95th-percentile Poisson variable for peak 15 minute arrivals at a more reasonable peaking level of 0.28.
- There may be little reason to assess demand from unaccommodated off-street freight loading during the same time period as peak passenger and delivery loading, as data show little to no heavy truck activity (a proxy for off-street freight activity) during the peak hours for passenger and delivery loading at the curb, with the exception of the late morning period for retail uses. A two-pronged approach may suffice depending on land use and location.

Overall, based on the flowchart presented as Figure 62, we recommend adjusting the anticipated loading times for delivery instances, and providing an option for analysts to assess unaccommodated off-street loading demand during a different time period from passenger loading demand, based on the distributions of person trips (for adjusting passenger and delivery loading demand) and freight loading instances (for adjusting off-street freight loading demand). If the analyst is presenting loading demand during the PM peak period, when it is most likely to affect the surrounding transportation network, unaccommodated off-street freight loading may be factored down using a multiplier of 25 percent, to reflect the relative volume of PM peak hour heavy vehicle and light truck activity relative to peak activity at 10 am.

Chapter 8. Conclusions and Next Steps

Travel behavior is complicated, on both an individual level and on a citywide level. There are many factors that influence how we choose to travel from place to place, and where we choose to travel to. This report details the methods and findings of a single concerted data collection effort, along with integration of some supplemental data from the CHTS. However, it does not directly compare mode share or trip distribution observed at land uses with the rates currently in use in the SF Guidelines. Rather, it notes where individual buildings or sites may be outliers when compared to other similar buildings and sites, as well as noting the wide range of trip generation rates and mode share percentages among the sites surveyed. Each individual site tells its own story of travel behavior based on its location, urban context, and other factors. In total, these sites provide insight into overall travel patterns associated with land use in San Francisco.

8.1 Limitations of this Study

As summarized in Chapter 6, this analysis found a wide range in trip generation, trip distribution, and mode choice across the study sites. These variations are both expected and normal due to the complexity of travel behavior and the focus on a small subset of all available development in San Francisco. By using the average rates, trip distributions and mode shares revealed through data collection, analysis will tend to treat each new site as a "typical" site, which helps to provide a reasonable check of its effects on the above considerations.

Nonetheless, several elements of this analysis merit the use of caution in applying its findings.

Potential Bias Due to Site Selection Process

The sites studied were selected based on a number of factors, including availability of detailed land use information, applicability to expected future development patterns, and suitability for the data collection methods used in this study. There is potential bias in that the sites meeting these criteria may not be representative of sites throughout San Francisco due to age of development, demographics or socioeconomic status of residents, or other unforeseeable characteristics. This may be particularly true for sites of a certain land use in some neighborhoods; for instance, Parkmerced was selected for study in Place Type 3 due to a general lack of large, multi-unit buildings in that Place Type; however, it may not be representative of typical household travel in that geographical zone.

Sample Size

While the total number of survey responses and person trips recorded was substantial, due to budget and logistical limitations the total number of sites studied was relatively modest compared to the total amount of developed property in San Francisco. As such, we see large levels of variability between sites, even sites that appear similar on their face. This also leads to some level of variability when applying rates from different sources during analysis (for instance, average vehicle occupancy as calculated through CHTS data when compared to person trips by HOV at individual sites).

Building Occupancy

Efforts were made to survey only buildings that had reached at least 80 percent occupancy, as assessed through site visits and initial outreach. However, there is potential for error in these occupancy assessments, particularly for residential condominium buildings, where occupancy was calculated based on the share of units sold. There is potential for individual units to be sold, but not occupied at the time that counts and intercept surveys were conducted.

Differing Use Types

For non-residential uses, many different types of land use are categorized in a single category for environmental analysis purposes. For instance, retail includes both drug stores and specialty retail, and does not differentiate between formula and non-formula retail; office uses include potential for a variety of business types with varying levels of visitors or even security; and hotels include facilities at a wide range of price points and purposes (i.e. business v. leisure travel). Assessing a single, average rate for each of these uses necessarily requires underestimating trips for some types of land use, and overestimating trips for others. Related to the above discussion of sample size, a small change in the share of sites in each category could potentially lead to differing average rates.

Reported Mode Share

While surveys were conducted by professional surveyors, there is potential for misunderstanding between the surveyor and the intercepted survey respondent. These misunderstandings can occur for a variety of reasons, but include language barriers or omission of elements of a trip. For instance, a person who traveled by BART but then walked to the intercepted location might respond that they walked, and omit the transit trip entirely.

Pass-By Trips and Non-Trips

Surveys provided a chance to collect data on if a trip was a pass-by trip occurring while the respondent was en route to another location, or if the trip was a “non-trip,” such as an individual taking a fresh air break. However, there may be some potential misunderstanding on this question, and individuals may under-report the extent to which their trips are pass-by trips, or not report a non-trip. Additionally, camera counts at all buildings cannot distinguish between these two trips, and could potentially lead to a slight level of over-counting of trips generated by each use.

Trip Purpose

Because the survey did not ask respondents the purpose of their trip, we are unable to disaggregate work trips from non-work trips. Particularly in the case of trip distribution, work trips may differ substantially from non-work trips, as people are more likely to commute from outside of San Francisco compared to shopping or recreational trips. This issue has been partially addressed through presentation of CHTS trip distribution data.; however, the best data concerning the share of trips related to work and non-work purposes by land use remains survey data from the prior travel demand guidelines.[41]

Loading Duration

The use of time-lapse camera technology prevents extracting dwell time in loading zones at intervals smaller than five minutes. While this provides a fairly comprehensive look at average occupancy, the dwell time data have been supplemented with observations of passenger loading from other studies, and have been summarized for light and heavy trucks only for delivery loading. As such, loading durations may need to be adjusted based on individual land uses, particularly if there are anticipated to be a large number of deliveries with shorter than average durations.

Shared Loading Zones

The on-street loading zones studied were largely available for use by neighboring land uses or for unaffiliated loading activities. As such, the total loading demand for curb spaces may be somewhat overestimated due to use of the spaces by individuals accessing neighboring land uses.

[41] There is very little available data that examines trip purpose by land use. While the CHTS data can be used to assess a rough share of work and non-work trips for residential and office uses, it is less useful at estimating these numbers for retail and hotel uses. The most recent San Francisco-specific data on work and non-work trip purposes dates to 1990, and is the information used in the 2002 *Guidelines*.

8.2 Potential Uses of These Findings

The data collected here are intended for use in future updates of the city Travel Demand Guidelines, as used in environmental analysis and for other planning purposes. In particular, 24-hour person trip generation rates and updated mode split information for a variety of land uses and urban contexts can be used to update the existing travel demand rates.

Trip distribution data collected via this effort may be used as a comparison point to district- or neighborhood-based trip distribution data prepared by SFCTA. This data, based on the most recent CHTS, provides valuable information about distributions of trips by mode.

Finally, loading demand may be useful for estimating curb allocations at new development sites, particularly when balancing parking demand, loading demand, and other potential uses of the space (such as for pedestrian zones or transit stops). Mode splits for deliveries and loading instances may also be useful in assessing loading demand for larger projects and area plans, as they provide a generalized method of assessing the number of loading instances for a variety of land uses. The presented data may be supplemented with site-specific or use-specific data as appropriate to reach loading demands for individual sites.

Additionally, site-specific data will be provided to the San Francisco Planning Department for potential use in assessing similar buildings, and providing up-to-date trip generation and mode split data for similar buildings submitting environmental applications to the City.

ATTACHMENT C

San Francisco Trips Travel Demand Web Tool

How to Use This Tool

This tool estimates the number, type and common destinations of new trips that people would take to and from a new development project. The estimates are for daily and for weekday PM peak hour.

Step 1 – Please enter the project address in the entry bar. Note that Place Type of the address below the entry bar will self-update.

Step 2 – Enter project attributes by selecting the project's appropriate land use types and filling in the amount of land use (e.g., number of units, gross square footage, etc.).

Step 3 – Select travel attributes that you wish to query and display:

- 3.a: Mode: (e.g., All Auto Trips, Transit Trips, or TNC/Taxi Trips).
- 3.b: Purpose (e.g., Work Trips, Non-Work Trips, or All Trips).
- 3.c: Direction (e.g., Inbound or Outbound Trips to the Project Site).
- 3.d: Time period (e.g., Daily or PM Peak)
- 3.e.: Level of Trip Distribution (e.g., District, Place Type, City).

Based on your toggled attributes, the map interface displays the number of person trips between the project site and the neighborhood districts. The thresholds used by the interface to display the continuum of color scheme (light blue for the lowest group of person trips to dark blue for the highest group of person trips) self-updates based on the highest number of person trips using the toggled attributes.

Step 4 – Click on the "Download Data" button to retrieve the outputs in a spreadsheet form to save for your records.

Step 5 – Click on "Reset All" to start over.

Note: The results of your selections are displayed on the upper right corner of the map interface. The 'Total (Person Trips)' column displays all daily person trips by mode, regardless of trip purpose and direction and vehicle trips. The 'Filtered (Person Trips)' column displays the number of person trips filtered by the selected toggle buttons for mode, purpose, direction, and time period.

Note: Move your mouse cursor over the various neighborhoods on the map interface to see the results of your selections (filtered person trips, vehicle trips, and average vehicle occupancy) displayed per district (or selected level of distribution) located in the right corner of the map interface.

Disclaimer: For more information regarding guidance for how to use this tool and the data that went into this tool, please visit the San Francisco Planning Department's Transportation Impact Analysis guidelines webpage: http://sf-planning.org/transportation-impact-analysis-guidelines-environmental-review-update.

ATTACHMENT D

Trip Internalization Rate Best Practices Memo

Overview

Trip internalization: Refers to a subset of person trips where both the trip origin and trip destination are expected to be contained within the same area, or remain inside a development. A trip internalization rate applied during the travel demand modeling process would therefore prevent the double counting of a literal application of the SF Guidelines methodology for trip generation.

- Trip internalization is highly relevant to large, mixed-use developments that include various land uses that would be expected to produce a significant amount of trips that remain within the development. Some examples of these developments in San Francisco are: Mission Rock, Pier 70, 5M, Treasure Island/Yerba Buena Island redevelopment projects.

The Adavant Consulting Model Summary

There are a variety of methodologies that consultants use to calculate trip internalization rates. One method, the Adavant Consulting model summary is outlined below:

1. Determine the total number of person trips generated during the daily and peak hour time periods for each of the individual land uses proposed by the site using the trip generation rates presented in the SF Guidelines (or other substantiated sources, such as ITE for the AM peak period);
2. Estimate the number of project person trips by place of origin and destination and calculate their respective modal splits for each land use during each time period;
3. Identify the number of person-trips generated during each time period with an origin or destination in the district to represent the universe of project-related internal trips that will be calculated and shifted to transit, taxi/TNC, and other non-motorized modes;
4. Group these auto and transit person-trips during each time period by each individual land use into two categories: trip productions (e.g., residential uses) and trip attractions (e.g., office, retail uses);
5. Apply an initial linked trip factor and internal trip factor rates to each individual land use categorized within the production and attraction categories based on ITE, San Diego Association of Governments (SANDAG), or other similar substantiated sources and engineering judgement. See Table below for an example of Internal Trip Capture Rates within a mixed-use project. The most appropriate source should be substantiated with the department;
6. Iteratively adjust the linked trip factors and internal capture rates applied to each individual land uses until the number of production trips equals the number of attraction trips for each time period;
7. Shift the resulting number of attraction and production trips calculated for each land use from the original auto and transit modes to all other modes as they represent the additional person-trips that would be considered internal to the project; and
8. Perform a reasonableness check of the resulting internal person trip capture rates by comparing the data obtained at the completion of Step 7. Against similar results available from ITE, the Transportation Research Board (TRB), and other sources such as pervious EIR analysis).

Source: Adavant consulting memorandum re: Pier 70 Special Use District Project Case No. 2014-001272 Estimation of Project Travel Demand – Revised Project with Open Space, Pier 70 Transportation Impact Street - Technical

Maximum Internal Trip Capture Rates within a Mixed-Use Project from Various Sources

Land Use Type	Daily			AM Peak Hour			PM Peak Hour			
	NCHRP [a] & ITE [b]	Selected for Analysis [c]		ITE [d]	Selected for Analysis [c]		NCHRP [a] & ITE [b]	ITE [d]	Selected for Analysis [c]	
		Scenario A	Scenario B		Scenario A	Scenario B			Scenario A	Scenario B
Residential (all unit types)	38%	35%	38%	20%	18%	20%	53%	57%	30%	45%
General Office[e]	22%	15%	5%	32%	10%	5%	31%	20%	20%	15%
General Retail	30%	14%	8%	50%	24%	9%	20%	46%	20%	12%
Restaurant	30%[f]	14%	7%	31%[g]	18%	9%	20%[f]	50%[g]	20%	12%

Notes:

[a] *Enhancing Internal Trip Capture Estimation for Mixed-Use Development,* NCHRP Report 684, Table 3, p.11*;* transportation Research Board, Washington DC, 2011.

[b] *Trip Generation Manual, 9th Edition, Volume 1: User's Guide and Handbook,* Tables 7.1 and 7.2 (pp. 93-94); Institute of Transportation Engineers, Washington DC, 2012 (based on a limited sample size of mixed-use projects)

[c] The internal capture rates selected for the transportation analysis of the Pier 70 SUD Project are constrained by the need or each scenario to match trip origins with trip destinations (productions/attractions) within the project site. The differences in the selected trip capture rates reflect the mix of uses within each scenario and match potential residential trips with office trips, office trips with retail trips, etc.

[d] *Improved Estimation of Internal Trip Capture for Mixed-Use Development,* Tables 2 and 3 (pp. 26-27), ITE Journal, August 2010.

[e] PDR uses in San Francisco are typically assumed to have travel characteristics similar to those of General Office uses.

[f] Analyzed within the retail land use category by NCHRP and ITE.

[g] There is no distinction in the ITE analysis between sit-down and quick service restaurant uses.

Source: Adavant Consulting from various sources, as noted – July 2015

TRANSPORTATION IMPACT ANALYSIS GUIDELINES

APPENDIX G
WALKING/ACCESSIBILITY

SEAL OF THE CITY AND COUNTY OF SAN FRANCISCO

San Francisco Planning

SAN FRANCISCO
PLANNING DEPARTMENT

MEMO

Appendix G
Walking/Accessibility Memorandum

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Date:	February 14, 2019
To:	Record No. 2015-012094GEN
Prepared by:	Jenny Delumo, Christopher Espiritu, and Lana Wong
Reviewed by:	Wade Wietgrefe
RE:	**Transportation Impact Analysis Guidelines Update, Walking/Accessibility**

INTRODUCTION

This memorandum updates the prior guidance provided in the Transportation Impact Analysis Guidelines for the walking/accessibility[1] topic (known as pedestrians in the prior guidelines). The department prepared this memorandum in consultation with stakeholders (e.g., city and county agencies, consultants). The department will issue memoranda that provide updates to other topics (e.g., transit, loading) within the guidelines. When the department issues a memorandum about a topic, it will supersede existing guidance regarding that topic.

This memorandum provides specific guidance on the methodology and impact analysis required for walking/accessibility transportation topic. Overall guidance on conducting transportation analysis for environmental review, including developing the project description, how to address the significance criteria, methodology, and impact analysis, is in the Transportation Impact Analysis Guidelines.

The guidance provided herein assumes a land use development project located outside of an area plan that requires a transportation study. Guidance on other types of projects, such as projects located in an area plan or infrastructure projects, is discussed below under the "Other" subsection. The department may use this guidance for multiple projects, but the department has discretion on how to apply the guidance on a project-by-project basis.

The organization of the memorandum is as follows:

1) Project Description
2) Significance Criteria
3) Existing and Existing plus Project
    a) Methodology
    b) Existing Baseline
    c) Impact Analysis
4) Cumulative
    a) Methodology
    b) Impact Analysis
5) Other (covers different types of projects)

[1] This memorandum addresses impacts to people walking, including people with disabilities that may or may not require personal assistive mobility devices. In addition, people walking may refer to people participating in recreational or social activities in the public right-of-way.

Attachments to this memorandum are under separate cover and are attached to the end of this memorandum. The department may update the attachments to the memoranda more frequently than the body of the memoranda.

PROJECT DESCRIPTION

Refer to the Transportation Impact Analysis Guidelines Appendix A, Tables 1-3, for a list of the typical physical, additional physical, and programmatic features for existing and existing plus project conditions, as applicable. The geographic extent of these features must, at a minimum, include the project's frontage and may include the entirety of the project's block. Appendix A, Table 4 of the guidelines provides a non-exhaustive list of approvals from agencies other than the planning department that a project sponsor may need to obtain for the project description features described in the guidelines. Attachment A of this memorandum includes examples of figures that illustrate how to graphically represent walking conditions.

SIGNIFICANCE CRITERIA

San Francisco Administrative Code chapter 31 directs the department to identify environmental effects of a project using as its base the environmental checklist form set forth in Appendix G of the California Environmental Quality Act (CEQA) Guidelines. As it relates to people walking, Appendix G states: "would the project conflict with a program plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?" The department uses the following significance criteria to evaluate that question: A project would have a significant impact if it:

1) Creates potentially hazardous conditions[2] for people walking; or
2) Interferes with accessibility of people walking to and from the project site, and adjoining areas.

EXISTING AND EXISTING PLUS PROJECT

Methodology

This section describes the typical methodology required to address the significance criteria. The methodology section identifies the collection, generation, and approach to analyze data. The department will determine whether to adjust the methodology as necessary to inform the analysis.

The guidelines provide direction on the geographical area and period required for analysis. Further guidance on the typical methodology for evaluating existing and existing plus project conditions for this topic, including data collection, is provided below. This section also indicates in bracketed text [ ] whether the presentation of typical methodological elements in other sections of a transportation study (e.g., baseline, impact analysis) could occur in text, a figure, and/or a table (see Appendix A of the

[2] For the purposes of this memorandum, "hazard" refers to a project generated vehicle potentially colliding with people walking that could cause serious or fatal physical injury, accounting for the aspects described below. Human error or non-compliance with laws, weather conditions, time-of-day, and other factors can affect whether a collision could occur. However, for purposes of CEQA, hazards refer to engineering aspects of a project (e.g., speed, turning movements, complex designs, substantial distance between street crossings, sight lines) that may cause a greater risk of collisions that result in serious or fatal physical injury than a typical project. This significance criterion focuses on hazards that could reasonably stem from the project itself, beyond collisions that may result from aforementioned non-engineering aspects or the transportation system as a whole.

guidelines for examples of typical tables and Attachment A of this memorandum for examples of walking-related figures).

Existing Conditions

The following identifies the typical methodology for assessing existing conditions.

Counts

The methodology may include prior counts collected from other studies or sources combined with (e.g., an average of three different dates with counts at the same intersection, global positioning system user data) or in isolation from the counts collected for the project. The use of prior counts must be justified, in consultation with the department. Typically, the use of prior counts may occur if these counts have not changed substantially under existing conditions (e.g., due to lack of new development, circulation changes, or travel patterns). [text, table]

Visual Analysis with Recorded Observations

Data collection for the project should include a site visit for a visual analysis, with recorded observations of the absence, discontinuity, or presence of the features listed in the project description, other relevant features (e.g., ADA accessible curb ramps), and a description of the weather conditions. In addition, the site visit must record any existing potential or observed hazards at locations in the study area where people walk, especially along routes of travel for people walking between the project site and nearby transit stations/stops (e.g., crosswalks, sidewalks), major destinations (e.g., schools, event centers, recreational facilities, tourist activities, shopping districts, high-density residential or office areas, transit stations, and airports), or land uses with particularly vulnerable people (e.g., children, seniors, people with disabilities). [text, figure]

Street Design Characteristics

Obtain the following general characteristics of streets within the study area:

- Location and type of traffic control devices (e.g., stop signs, signals, crosswalk, countdown signals, audible warning devices) [text, figure]
- Number of travel lanes by type (e.g., mixed flow, parking, bicycle, transit-only, etc.) [text, figure]
- Posted speed limit and recorded speed observations or inferences about observed speeds [text]
- Presence of High-Injury Corridor [text, figure]
- Better Streets Plan designation and Key Walking Street designation, if applicable [text, figure]

Obtain the following additional characteristics of streets within the study area to the extent applicable:

- Signal timing and phasing of traffic control devices [text]
- Width of travel lanes [text, figure]
- Number of travel lanes by type at intersections (if different from midblock) [text, figure]
- Size of blocks [text, figure]
- Data regarding the location and causes of collisions (e.g., particular turning movements) [text, figure]
- Nearby transit stations/stops amenities (e.g., shelters) and service information (e.g., frequency) [text, figure, table]

Existing plus Project Conditions

The following identifies the typical methodology for assessing existing plus project conditions.

<u>Travel Demand Analysis</u>

Estimate the number of people walking and driving from the project. [text, table] In addition, the methodology will distribute and assign the project's vehicle trips to roadways, intersections, loading zones, and driveways to the extent applicable. Describe walking trips to and from the project site, particularly between the project's entrance and exit locations and nearby transit stations/stops and major destinations. [text, figure]

<u>Potentially Hazardous Conditions</u>

Use the travel demand analysis and project elements to determine if the project would cause potentially hazardous conditions. The methodology should assess to the extent applicable:

- The number, movement type, sightlines, and speed of project vehicle trips in and out of project facilities based upon the design of such facilities (e.g., curb-cut dimensions, roadway speeds) in relation to the number of people walking at those locations [text, figure]
- The location of the project in relation to sidewalks
- The ability of facilities (e.g., crosswalks, sidewalks) to accommodate the number of people walking[3] [text, figure]
- The number, type (e.g., left turn, right turn), sightlines, and speed of project vehicle turning movements at intersections, including any changes to the public right-of-way that facilitate vehicular movement (e.g., channelized turns), in relation to the number of people walking at those movement locations [text, figure]

<u>Accessibility</u>

Use the travel demand analysis and project elements to determine if the project would interfere with accessibility of people walking to and from the site and adjoining areas. The methodology should assess to the extent applicable:

- The number of people walking between the project's entrance and exit locations and adjacent passenger loading zones, nearby transit stations/stops, and major destinations and the presence of ADA accessible sidewalks and facilities (e.g., curb ramps) along these routes, taking into account the presence of physical obstructions on sidewalks [text, figure]
- The number of project vehicle trips, including freight and delivery service vehicle trips, travelling in and out of project facilities and the ability for such facilities to accommodate those vehicle trips in relation to the number of people walking at those locations and nearby streets [text, figure]
- The distance between entrances/exits to crosswalks, transit stations/stops, and major destinations [text, figure]

[3] The Better Streets Plan includes streetscape guidelines, including minimum and recommended sidewalk widths for different street types, to provide sufficient through-width for people traveling along sidewalks and meet Americans with Disabilities Act accessibility requirements. In most circumstances, projects that meet the minimum sidewalk width identified for their applicable street type would provide adequate sidewalk capacity for people who walk. In rare instances, the department may require a project to meet a minimum sidewalk width for a street type different than the one identified under the Better Streets Plan to avoid a hazard, if the applicable street type does not match the intensity of a proposed development (e.g., a special use district of increased intensity in an industrial street type location).

Existing Baseline

Refer to the guidelines for direction on including existing baseline in transportation studies.

Impact Analysis

This section ties the project description, methodology, and existing baseline together to address the significance criteria for existing plus project conditions. This section addresses the typical approach for the impact analysis and provides more details related to hazards and accessibility impacts for people walking. The impact analysis section should present a format (text, figure, or table) consistent with earlier sections of this memorandum for easy comparison.

The impact analysis must address whether the project would create potentially hazardous conditions for people walking and whether the project interferes with accessibility of people walking to the site and adjoining areas. Too many factors mentioned in the methodology affect the potential for hazardous conditions and for interference with accessibility. Instead, the department will determine significance on a project-by-project basis.

Refer to the guidelines for direction on what to consider when conducting the existing plus project impact analysis and how to present the findings. The subsections below provide specific examples of the types of circumstances that could result in a potentially hazardous condition impact or accessibility impact under existing plus project conditions.

Potentially Hazardous Conditions

The following examples are some of the circumstances that may result in potentially hazardous conditions, paying particular attention as to whether particularly vulnerable people exist or would exist in the study area. This is not an exhaustive list of circumstances, under which, potentially hazardous impacts would occur:

- A project would add a substantial number of moving vehicle trips (e.g., curb-cut width, turning movement) across a sidewalk used by a substantial number of people walking (e.g., based on counts or projections or a Key Walking Street)
- A project would construct or be located on a lot with physical obstructions (e.g., trees, utilities, and on-street parking directly adjacent to the curb-cut or transit stop) or slopes that would obstruct sightlines between a substantial number of people walking and people driving or biking at high speeds
- A project would be located in an area without any facilities for a substantial number of people walking to and from the project site and adjacent passenger loading zones, nearby transit stations/stops, and major destinations
- A project would generate a substantial number of people walking to and from the project site across an uncontrolled mid-block crosswalk (or intersection) with a substantial number of vehicles
- A project would add a substantial number of people walking along routes with inadequate throughway zone widths or crosswalks thereby creating overcrowding on sidewalks or crosswalks and the potential hazard of people walking into a mixed-flow travel lane
- A project would reduce sidewalk widths or add elements to the sidewalk such that the throughway zone is inadequate thereby creating overcrowding on sidewalks and the potential hazard of people walking into a mixed-flow travel lane
- A project would add a substantial number of vehicle trips (i.e., exacerbate) to a turning movement (e.g., left vehicular turn without a protected phase) that is an existing hazard (e.g., High Injury Corridor) for a substantial number of people walking

- A project would facilitate a substantial number of moving vehicle trips by removing facilities designed to protect a substantial number of people walking (e.g., increased intersection crossing distance, channelized turns)
- A project would be unable to accommodate[4] vehicle trips, including freight and delivery service vehicle trips, into its off-street facilities thereby blocking access to sidewalks or nearby crosswalks for a substantial number of people walking resulting in people walking into a mixed-flow travel lane or regularly used parking lane
- A project would add a substantial number of people walking along routes where there are multiple vehicular turn lanes or at an uncontrolled intersection where people walking would have inadequate time to cross the street prior to a vehicle approaching the crossing area

Accessibility

The following examples are some of the circumstances that may result in interference with accessibility. This is not an exhaustive list of circumstances, under which, potential accessibility impacts would occur:

- A project would be located in an area without adequate ADA facilities (e.g., curb ramps) for a substantial number of people walking to and from the project site and adjacent passenger loading zones, nearby transit stations/stops, and major destinations
- A project would be unable to accommodate[5] vehicle trips, including freight loading and delivery service vehicle trips, into its off-street facilities thereby blocking access to sidewalks or nearby crosswalks for a substantial number of people walking
- A project places a structure (e.g., large building, right-of-way encroachments) that closes off or renders existing facilities for people walking challenging to use or non-ADA accessible, without providing replacement facilities, and substantially increases distances for people walking to safely cross streets or access neighborhoods, nearby transit stations/stops, and major destinations
- A project would generate a substantial number of people walking to and from a project site in the middle of the block to a major destination across the street at an uncontrolled mid-block location or intersection

CUMULATIVE

Methodology

The guidelines detail the typical methodology for cumulative analysis, including the geographical area, period, cumulative projects, and adjustments (refer to Appendix B) under cumulative conditions. The cumulative section in transportation impact studies must present (text, figure, or table) the applicable elements included in the methodology.

Impact analysis

This section ties the methodology and description of cumulative conditions together to address the significance criteria for cumulative conditions. Refer to the guidelines for direction on what to consider when conducting the cumulative impact analysis and how to present the findings. The same examples of the types of circumstances that could result in a potential hazardous condition impact or accessibility

[4] Accommodate refers to design of the facility (e.g., whether vehicles can be accommodated without queuing based upon throat length, gate location, etc.) and not the capacity (e.g., whether the number of spaces would accommodate the demand) of the facility as many variables affect the demand to and from a facility.

[5] *Ibid.*

impact that were provided for existing plus project conditions apply here, except for cumulative conditions.

OTHER

The guidance provided in this memorandum assumes a land use development project located outside of an area plan that requires a transportation study. This section describes the type of additional or different information that may be necessary to address walking/accessibility impacts for the following circumstances: land use development project located within an area plan, an area plan, or infrastructure project (which may be located in a different county than San Francisco).

Land Use Development Project Located within an Area Plan

For projects that are consistent with an area plan for which an environmental impact report (EIR) was certified, pursuant to CEQA guidelines section 15183, the assessment must limit its analysis to such conditions specified in that section. The guidelines provide direction on how to analyze a land use development project in an area plan and a list of area plan EIRs that have been certified as of February 2019.

Attachment B of this memorandum identifies mitigation and improvement measures from area plan EIRs related to people walking. The department will list walking-related mitigation and improvement measures from future area plan EIRs in Attachment B after the Planning Commission or Board of Supervisors certifies those EIRs.

Area Plans

For area plans, the assessment will typically use the significance criteria identified herein. The following sub-sections describe the type of additional or different information that may be necessary to address walking/accessibility impacts for project description, methodology, and impact analysis. For area plans that also include infrastructure changes (e.g., street redesigns), please see the Infrastructure Project subsection for additional or different information that may be necessary.

Project Description

Typically, the department conducts an analysis to estimate the amount of future development that could occur in the plan area as a result of its implementation. The department typically does not have all the project description details described herein. However, the project description may include policies that may relate to the methodology and impact analysis (e.g., curb-cut restrictions).

Methodology

The assessment will typically use the same methodology identified herein, except the methodology will use a larger geographical study area and require less site-specific information (e.g., driveway locations at each site) except to document circumstances where vehicles may not be allowed (e.g., curb-cut restrictions). While an individual project may not require some elements listed in the Existing and Existing plus Project Methodology subsection, area plans typically will include all of these elements. The department should select sidewalks, streets, and intersections most impacted by the area plan to represent the impacts that may occur at other locations.

Impact Analysis

For analysis of area plans, assess the projected amount of growth and infrastructure changes associated with the rezoning within the area plan boundaries. The analysis of potentially hazardous conditions and accessibility impacts should be similar to that described under the Existing plus Project and Cumulative Impact Analysis subsections. If the area plan includes infrastructure changes (e.g., street redesigns), given the potential time gap between land use development and completion of infrastructure changes, the analysis should discuss the potential short-term effects of that potential time gap in a lesser level of detail than that provided for overall effects. However, the analysis should assume individual land use development projects within the area plan would be subject to requirements related to property specific infrastructure changes (e.g., Better Streets Plan).

Examples of circumstances that would result in significant impacts are described under the Existing plus Project Impact Analysis subsection.

Infrastructure Project

For infrastructure projects (e.g., new roads, bridge repair, sewer line, rail service, roadway modifications, etc.), the assessment of the project description, significance criteria, and impact analysis should be similar to private development projects. The analysis typically does not require trip generation analysis as infrastructure projects usually do not generate trips.[6] However, some infrastructure projects may induce trips, such as the addition of through lanes on existing or new highways or streets.[7] In addition, infrastructure projects may generate short-term trips due to construction workers and vehicles accessing the project site.

Project Description

The project description must describe the typical physical, additional physical, and programmatic features for existing and project conditions, as applicable. The project description must provide the geographic boundaries of the project and street cross sections.

Methodology

The assessment will typically use the same methodology identified herein, except the methodology will pay particular attention to proposed closures and rerouting.

Impact Analysis

The analysis of potentially hazardous conditions and accessibility impacts should be similar to that described under the Existing plus Project and Cumulative Impact Analysis subsections.

Potentially Hazardous Conditions

Examples of circumstances that would result in significant impacts are described under the Existing plus Project Impact Analysis subsection. The following examples are some of the additional circumstances relevant to infrastructure projects, which may result in potentially hazardous conditions, paying particular attention as to whether particularly vulnerable people exist or would exist in the study area. This is not an exhaustive list of circumstances under which, potentially hazardous impacts would occur:

- A project would include a geometric design feature (e.g., roadway or ramp widening, wide mixed-flow travel lanes, large curb radii) such that a substantial number of moving vehicle trips would occur along routes used by a substantial number of people walking

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[6] Governor's Office of Planning and Research, *Revised Proposal on Updates to the CEQA Guidelines on Evaluating Transportation Impacts in CEQA*, January 20, 2016.

[7] Generally, minor transportation projects would not result in additional trips. Examples include, but are not limited to, rehabilitation, maintenance, and repair of transportation infrastructure; installation, removal or reconfiguration of non-through traffic lanes and traffic control devices; removal of through lanes; installation of traffic calming measures and wayfinding; removal of on- or off-street parking. Governor's Office of Planning and Research, *Technical Advisory on Evaluating Transportation Impacts in CEQA*, November 2017.

Accessibility

Examples of circumstances that would result in significant impacts are described under Existing plus Project Impact Analysis subsection. The following examples are some of the additional circumstances relevant to infrastructure projects, which may result in interference with accessibility. This is not an exhaustive list of circumstances, under which, potentially hazardous impacts would occur:

- A project would establish a new physical structure (e.g., at-grade rail service or roadway) which would result in inadequate access for substantial number of people walking to and from nearby transit stations/stops and major destinations (e.g., diverting people to walk more than a few hundred feet to cross a street, or having people wait extensively at crossings)
- A project would widen the travel lanes within a street (e.g., installation of multiple vehicular dedicated turn lanes or turn pockets), which would substantially increase the distance for a substantial number of people walking to cross a street and access nearby transit stations/stops and major destinations

ATTACHMENT A

Existing and Proposed Project Figure and Table Examples

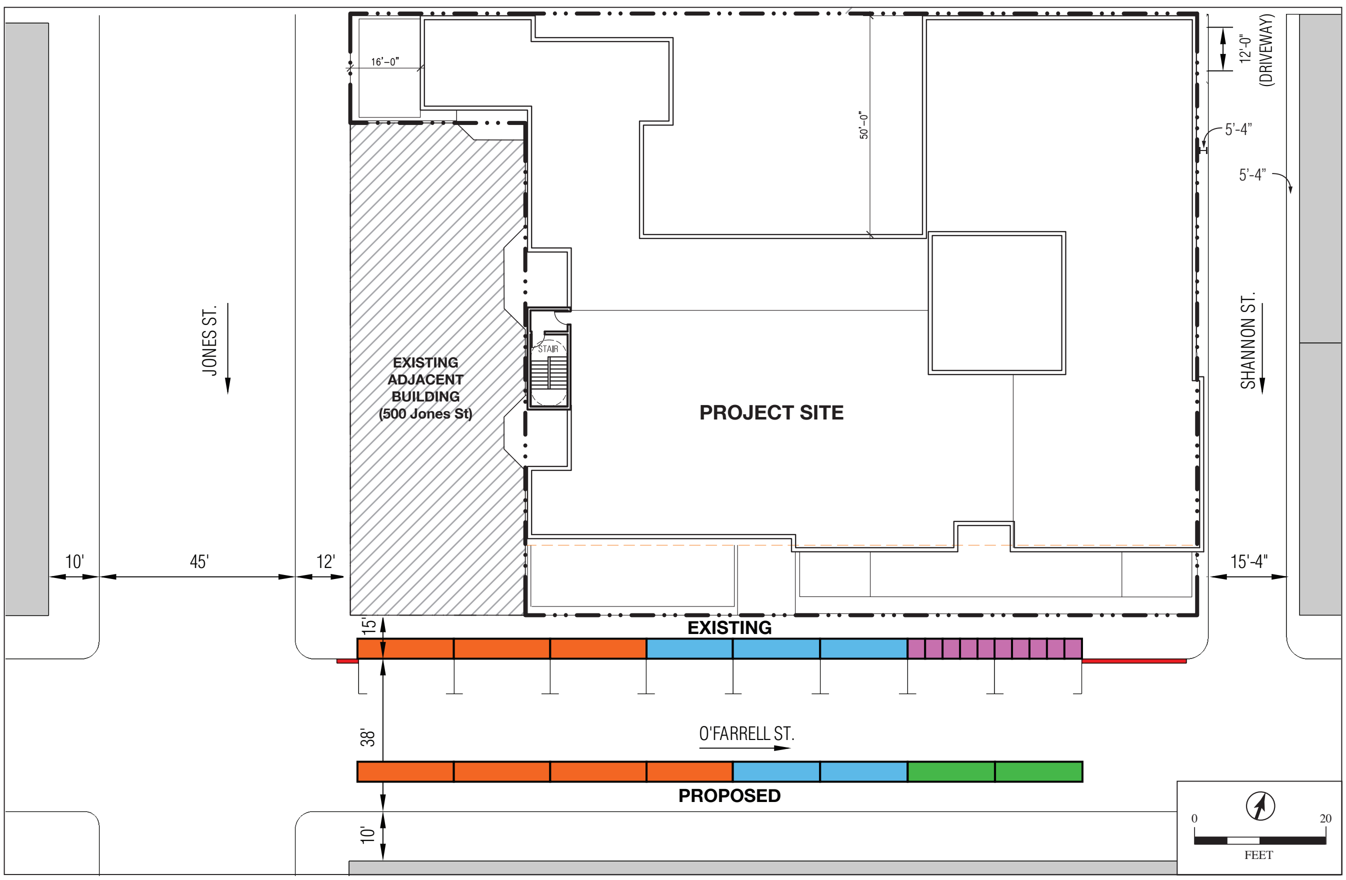
Introduction

Attachment A represents typical figures necessary to illustrate walking conditions included in a transportation study. All figures should include basic elements (e.g., north arrow, title, legend, references, acronyms, etc.). Symbology should reflect that documents may be printed in black and white. All figures and tables should include all the information the reader would need to understand the information presented. The figures presented below were from previous transportation studies and are illustrative only and may not include all the basic elements.

FIGURE 1

Site Plan/Ground Floor Plan

Figure 1 is an example of a site plan that includes a detailed description of existing and proposed on-street loading. When developing a map similar to the one shown, include the linear dimensions of the existing and proposed loading zones, match the color of the zones to those used in the SFMTA Color Curb Program, and make existing and proposed changes explicit.



PARKING SPACE KEY

- YELLOW ZONE - COMMERCIAL LOADING SPACE (METERED M-F 9AM-4PM)
- GENERAL PARKING SPACE (METERED)
- GENERAL PARKING METERED/PASSENGER LOADING/UNLOADING ZONE DURING CHURCH SERVICES
- PASSENGER LOADING/UNLOADING AT ALL TIMES

FIGURE 2

Walking/Accessibility Circulation

Figure 2 shows a walking and accessibility circulation map, including circulation from surrounding streets and internal circulation. The dotted lines represent primary street access for people walking and the straight lines represent secondary access.

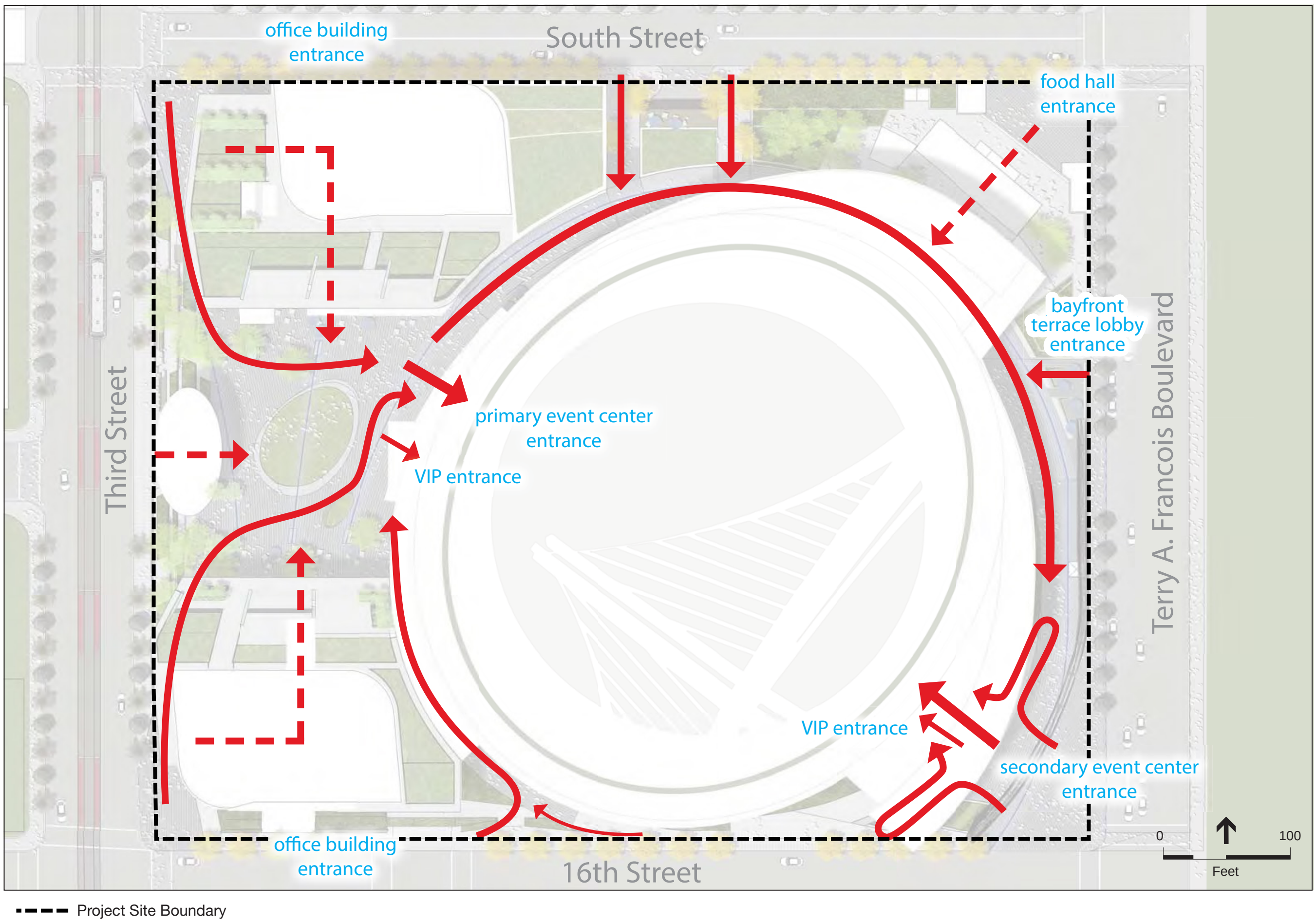


TABLE 2

Peak Hour Counts for People Walking at Study Intersections

Table 2 below shows the typical format to present counts of people walking at all identified project intersections/ street segments. 'X' represents the volume of people walking that were observed during counts.

Intersection	Intersection Leg Counts at Peak Period (INSERT TIME)				TOTAL
	North	South	East	West	
Intersection 1	x	x	x	x	x
Intersection 2	x	x	x	x	x
Intersection 3	x	x	x	x	x
Intersection 4	x	x	x	x	x

FIGURE 3

Walking Network

Figure 3 is an example of mapping the existing network as it relates to people walking within a project study area, with a focus on missing features for the network. Inclusion of this figure would be appropriate in the Existing Baseline section.

ATTACHMENT B

Mitigation and Improvement Measures

MITIGATION MEASURES FOR LAND USE DEVELOPMENT PROJECTS LOCATED WITHIN AN AREA PLAN

Eastern Neighborhoods Rezoning and Area Plan

Improvement Measure E-1:* *Pedestrian Circulation

E.1.a. As an improvement measure to improve pedestrian conditions in the Eastern Neighborhoods, community-supported planning efforts as part of MTA's Livable Streets program should be conducted to identify specific improvements to enhance pedestrian travel and safety in each neighborhood.

E.1.b. As an improvement measure to facilitate completion of the sidewalk network in areas where substantial new development is projected to occur, property owners should be encouraged to develop improvement or assessment districts to fund improvements to the sidewalk network adjacent to parcels where new development is not anticipated to occur.

Balboa Park Station Area Plan

Improvement Measure: Provide signals with countdown indicators at all major intersections and at crosswalks that connect to the MUNI light rail stops and Balboa Park BART Station.

Transit Center District Plan and Transit Tower

M-TR-4a: Widen Crosswalks. To ensure satisfactory pedestrian level of service at affected crosswalks, the Municipal Transportation Agency, Sustainable Streets Division, could conduct periodic counts of pedestrian conditions (annually, for example) and could widen existing crosswalk widths, generally by 1 to 3 feet, at such times as pedestrian LOS is degraded to unacceptable levels.

M-TR-5: Garage/Loading Dock Attendant. If warranted by project-specific conditions, the project sponsor of a development project in the Plan area shall ensure that building management employs attendant(s) for the project's parking garage and/or loading dock, as applicable. The attendant would be stationed as determined by the project specific analysis, typically at the project's driveway to direct vehicles entering and exiting the building and avoid any safety-related conflicts with people walking on the sidewalk during the a.m. and p.m. peak periods of traffic and pedestrian activity, with extended hours as dictated by traffic and pedestrian conditions and by activity in the project garage and loading dock. (See also Mitigation Measure M-TR-4b, above.) Each project shall also install audible and/or visible warning devices, or comparably effective warning devices as approved by the Planning Department and/or the Sustainable Streets Division of the Municipal Transportation Agency, to alert people walking of the outbound vehicles from the parking garage and/or loading dock, as applicable.

Rincon Hill Plan

No applicable mitigation and improvement measures were identified.

Market and Octavia Neighborhood Plan

No applicable mitigation and improvement measures were identified.

Visitacion Valley Redevelopment Plan

No applicable mitigation and improvement measures were identified.

Treasure Island and Yerba Buena Island Redevelopment Plan

No applicable mitigation and improvement measures were identified.

Glen Park Community Plan

No applicable mitigation and improvement measures were identified.

Western SoMa Community Plan

No applicable mitigation and improvement measures were identified.

Central SoMa Plan

No applicable mitigation and improvement measures were identified.

MITIGATION AND IMPROVEMENT MEASURE EXAMPLES

The following lists the typical types of measures that can mitigate or lessen impacts to people walking for each significance criterion:

EXAMPLE 1 Potentially Hazardous Conditions

- Establish safe site distances (e.g., daylighting, relocation of curb cuts or new structures);
- Widen existing sidewalks or install sidewalks where none exist;
- Relocate entrances/exits for people walking away from off-street garage/loading docks;
- Manage freight and service deliveries (e.g., active loading managment plan)
- Employ queue abatement measures or pursue deisgn modifications to off-street vehicular entrances/exits to accommodate queing vehicles (see queue abatement language below)
- Install visible and/or audible warning devices at off-street vehicular driveways to alert both people walking and driving of activity at the driveway;
- Provide on-site signage promoting safety for people walking (e.g., signage at the garage exit reminding motorists to slow down and yield to people walking in the sidewalk);
- Facilitate safe crossings (e.g., stop-controlled intersections, installation of signal heads with countdown timers; installation of audible warning devices, refuge islands);
- Provide roadway designs that slow vehicle speeds such as traffic calming measures (e.g., bulb-outs, chicanes, speed humps, tighter turning radii)
- Remove turn pockets
- Signalize vehicle turning movements and restrict vehicle movements on red
- Signal changes such as reducing signal cycle lengths or leading intervals for people walking; and
- Provide network improvements such as crosswalks, shorter blocks, mid-block crossings, or mid-block alleys between the project site and intersections, adjacent transit stations/stops, and other major destinations

EXAMPLE 2 Accessibility

- Construct, upgrade, or redesign curb ramps and sidewalks to be ADA compliant;
- Provide adequate sidewalks (e.g., effective widths, paths of travel)
- Widen existing sidewalks or install sidewalks where none exist);
- Employ queue abatement measures or pursue design modifications to off-street vehicular entrances/exits to accommodate queuing vehicles (see queue abatement language below)
- Povide network improvements such as crosswalks, shorter blocks, mid-block crossings, or mid-block alleys between the project site and intersections, adjacent transit stations/stops, and major destinations
- Place physical structure underground or in another location to maintain access for people walking
- Place wayfinding signs to direct people walking towards entrances/exits

TRANSPORTATION IMPACT ANALYSIS GUIDELINES

APPENDIX H
BICYCLING

San Francisco Planning

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Appendix H
Bicycling Memorandum

Date:	February 14, 2019
To:	Record No. 2015-012094GEN
Prepared by:	Elizabeth White
Reviewed by	Manoj Madhavan and Wade Wietgrefe
RE:	**Transportation Impact Analysis Guidelines Update, Bicycling**

INTRODUCTION

This memorandum updates the prior guidance provided in the Transportation Impact Analysis Guidelines for the bicycling[1] topic. The department prepared this memorandum in consultation with stakeholders (e.g., city and county agencies, consultants). The department will issue memoranda that provide updates to other topics (e.g., transit, loading) within the guidelines. When the department issues a memorandum about a topic, it will supersede existing guidance regarding that topic.

This memorandum provides specific guidance on the methodology and impact analysis required for the bicycling transportation topic. Overall guidance on conducting transportation analysis for environmental review, including developing the project description, how to address the significance criteria, methodology, and impact analysis, is in the Transportation Impact Analysis Guidelines.

The guidance provided herein assumes a land use development project located outside of an area plan that requires a transportation impact study. Guidance on other types of projects, such as projects located in an area plan or infrastructure projects, is discussed below under the "Other" subsection. The department may use this guidance for multiple projects, but the department has discretion on how to apply the guidance on a project-by-project basis.

The organization of the memorandum is as follows:

1) Project Description
2) Significance Criteria
3) Existing and Existing plus Project
    a) Methodology
    b) Existing Baseline
    c) Impact Analysis
4) Cumulative
    a) Methodology
    b) Impact Analysis
5) Other (covers different types of projects)

[1] This memorandum addresses impacts to people bicycling for the purpose of transport, recreation, or exercise.

Attachments to this memorandum are under separate cover and are attached to the end of this memorandum. The department may update the attachments to the memoranda more frequently than the body of the memoranda.

PROJECT DESCRIPTION

Refer to the Transportation Impact Analysis Guidelines Appendix A, Tables 1-3, for a list of the typical physical, additional physical, and programmatic features for existing and existing plus project conditions, as applicable. The geographic extent of these features must, at a minimum, include the project's frontage and may include the entirety of the project's block. Appendix A, Table 4 of the guidelines provides a non-exhaustive list of approvals from agencies other than the planning department that a project sponsor may need to obtain for the project description features described in the guidelines. Attachment A of this memorandum includes examples of figures that illustrate how to graphically represent bicycling conditions.

SIGNIFICANCE CRITERIA

San Francisco Administrative Code section 31 directs the department to identify environmental effects of a project using as its base the environmental checklist form set forth in Appendix G of the California Environmental Quality Act (CEQA) Guidelines. As it relates to people bicycling, Appendix G states: "would the project conflict with a program plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?" The department generally uses the following significance criteria to evaluate that question: A project would have a significant impact if it:

1) Creates potentially hazardous conditions[2] for people bicycling; or
2) Interferes with accessibility of people bicycling to and from the project site, and adjoining areas.

EXISTING AND EXISTING PLUS PROJECT

Methodology

This section describes the typical methodology required to address the significance criteria. The methodology section identifies the collection, generation, and approach to analyze data. The department will determine whether to adjust the methodology as necessary to inform the transportation analysis.

The guidelines provide direction on the geographical area and period required for analysis. Further guidance on the typical methodology for evaluating existing and existing plus project conditions for this topic, including data collection, is provided below. This section also indicates in bracketed text [ ] whether the presentation of typical methodological elements in other sections of a transportation study (e.g., baseline, impact analysis) could occur in text, a figure, and/or a table (see Appendix A of the guidelines for examples of typical tables and Attachment A of this memorandum for examples of bicycling-related figures).

---

[2] For the purposes of this memorandum, "hazard" refers to a project generated vehicle potentially colliding with people walking that could cause serious or fatal physical injury, accounting for the aspects described below. Human error or non-compliance with laws, weather conditions, time-of-day, and other factors can affect whether a collision could occur. However, for purposes of CEQA, hazards refer to engineering aspects of a project (e.g., speed, turning movements, complex designs, substantial distance between street crossings, sight lines) that may cause a greater risk of collisions that result in serious or fatal physical injury than a typical project. This significance criterion focuses on hazards that could reasonably stem from the project itself, beyond collisions that may result from aforementioned non-engineering aspects or the transportation system as a whole.

Existing Conditions

The following identifies the typical methodology for assessing existing conditions.

<u>Counts</u>

The methodology may include prior counts collected from other studies or sources combined with (e.g., an average of three different dates with counts at the same intersection, global positioning system user data)[3] or in isolation from the counts collected for the project. The use of prior counts must be justified, in consultation with the department. Typically, the use of prior counts may occur if these counts have not changed substantially under existing conditions (e.g., due to lack of new development, circulation changes, or travel patterns). [text, table]

<u>Visual Analysis with Recorded Observations</u>

Data collection for the project should include a site visit for a visual analysis, with recorded observations of the absence, discontinuity, or presence of the features listed in the project description as well as a description of the weather conditions at the time of the site visit. In addition, the site visit must record any existing potential or observed hazards at locations in the study area where people are bicycling, especially if the project site is on or adjacent to bicycle facilities (e.g. routes identified as part of the San Francisco Bikeway Network or a bike share station), or major destinations (e.g., schools, event centers, recreational facilities, tourist activities, shopping districts). [text, figure]

<u>Street Design Characteristics</u>

Obtain the following general characteristics of streets within the study area:

- Location and type of traffic control devices (e.g., stop signs, signals, bicycle-only control traffic devices) [text, figure]
- Number of travel lanes by type (e.g., mixed flow, parking, bicycle, transit-only, etc.) [text, figure]
- Posted speed limit and recorded speed observations or inferences about observed speeds [text]
- Presence of High-Injury Corridor [text, figure]
- San Francisco Bikeway Network designation [text, figure]

Obtain the following additional characteristics of streets within the study area to the extent applicable:

- Signal timing and phasing of traffic control devices [text]
- Width of travel lanes [text, figure]
- Number of travel lanes by type at intersections (if different from midblock) [text, figure]
- Length of blocks [text, figure]
- Data regarding the location and causes of collisions (e.g., particular turning movements) [text, figure]

Existing plus Project Conditions

The following identifies the typical methodology for assessing existing plus project conditions.

[3] Due to steady growth in people bicycling throughout San Francisco, unless conditions change, the use of prior counts should typically not exceed three years.

Travel Demand Analysis

Estimate the number of people bicycling and driving from the project. [text, table] In addition, the methodology will distribute and assign the project's vehicle trips to roadways, intersections, loading zones, and driveways to the extent applicable. Describe bicycling trips to and from the project site, particularly between the project site and major destinations and routes identified in the San Francisco Bikeway Network. [text, figure]

Potentially Hazardous Conditions

Use the travel demand analysis and project elements to determine if the project would cause potentially hazardous conditions. The methodology should assess to the extent applicable:

- The number, movement type, sight lines, and speed of project vehicle trips in and out of project facilities based upon the design of such facilities (e.g., curb cut dimensions, roadway speeds) in relation to the number of people bicycling at those locations [text, figure]
- The location of the project in relation to bicycle facilities (e.g., bike share stations or San Francisco's Bikeway Network)
- The number and movement type of project-generated vehicle trips into or out of a loading zone across an area frequently used by people bicycling (i.e., supported by counts or observations) or a bicycle facility (e.g., part of San Francisco's Bikeway Network)
- The number, type (e.g., left turn, right turn), sight lines, and speed of project vehicle turning movements at intersections, including any changes to the public right-of-way that facilitate vehicular movement (e.g., channelized turns), in relation to the number of people bicycling at those movement locations [text, figure]

Accessibility

Use the travel demand analysis and project elements to determine if the project would interfere with the accessibility of people bicycling to and from the site and adjoining areas. The methodology should assess to the extent applicable:

- The presence of nearby bicycle facilities (e.g., proximity to San Francisco's Bikeway Network), taking into account the presence of any physical features that obstruct bicycle facilities
- The number of project vehicle trips, including freight and service vehicle trips, travelling in and out of project facilities and the ability for such facilities to accommodate those vehicle trips in relation to the number of people bicycling at those locations and nearby streets [text, figure]

Existing Baseline

Refer to the guidelines for direction on including existing baseline in transportation studies.

Impact Analysis

This section ties the project description, methodology, and existing baseline together to address the significance criteria for existing plus project conditions. This section addresses the typical approach for the impact analysis and provides more details related to hazards and accessibility impacts for people bicycling. The impact analysis section should present a format (text, figure, or table) consistent with earlier sections of this memorandum for easy comparison.

The impact analysis must address whether the project would create potentially hazardous conditions for people bicycling and whether the project interferes with accessibility of people bicycling to the site and adjoining areas. Too many factors mentioned in the methodology affect the potential for hazardous conditions and for interference with accessibility. Instead, the department will determine significance on a project-by-project basis.

Refer to the guidelines for direction on what to consider when conducting the existing plus project impact analysis and how to present the findings. The subsections below provide specific examples of the types of circumstances that could result in a potentially hazardous condition impact or accessibility impact under existing plus project conditions.

Potentially Hazardous Conditions

The following examples are some of the circumstances that may result in potentially hazardous conditions to people bicycling. This is not an exhaustive list of circumstances under which potentially hazardous impacts would occur:

- A project would add a substantial number of moving vehicle trips (e.g., curb cut width, turning movement) across a bicycle facility (e.g. part of San Francisco's Bikeway Network) used by a substantial number of people bicycling (e.g., based on counts, or projections)
- A project would construct or be located on a lot with physical obstructions (e.g., trees, utilities, and on-street parking directly adjacent to the curb cut or transit stop) or slopes that would obstruct sightlines between a substantial number of people bicycling and people driving at high speeds
- A project would add a substantial number of vehicle trips (i.e., exacerbate) to a turning movement (e.g., left vehicular turn without a protected phase) that is an existing hazard (e.g., High Injury Corridor) for a substantial number of people bicycling
- A project would facilitate a substantial number of vehicle trips by removing facilities designed to protect a substantial number of people bicycling (e.g., plastic safe-hit posts, channelized turns)
- A project would be unable to accommodate[4] vehicle trips, including freight and service vehicle trips, into its off-street facilities thereby blocking access to bicycle facilities for a substantial number of people bicycling resulting in people bicycling into a mixed-flow travel lane with vehicles travelling at high speed differentials than people in the bicycle facility
- A project would modify a physical feature in the roadway that may create a hazardous condition for a substantial number of people bicycling (e.g., modification of a curb in which people bicycling may strike)
- The number and movement type of project-generated vehicle trips into or out of a loading zone across an area frequently used by people bicycling (i.e. supported by counts or observations) or a bicycle facility (e.g., part of San Francisco's Bikeway Network)

Accessibility

The following examples are some of the circumstances that may interfere with accessibility. This is not an exhaustive list of circumstances under which potential accessibility impacts would occur:

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[4] Accommodate refers to design of the facility (e.g., can vehicles be accommodated without queuing based upon throat length, gate location, etc.) and not the capacity (e.g., does the number of spaces accommodate the demand) of the facility as many variables affect the demand to and from a facility.

- A project would be unable to accommodate[5] vehicle trips, including freight loading and service vehicle trips, into its off-street facilities thereby blocking access to bicycle facilities used by a substantial number of people bicycling
- A project places a structure (e.g., large building, right-of-way encroachments) that closes off or renders existing facilities for people bicycling challenging to use, without providing replacement facilities or alternative routes of compatible nature[6], and substantially increases distances for people bicycling to safely connect to San Francisco's Bikeway Network or access neighborhoods and major destinations

CUMULATIVE

Methodology

The guidelines detail the typical methodology for cumulative analysis, including the geographical area, period, cumulative projects, and adjustments (refer to Appendix B) under cumulative conditions. The cumulative section in transportation studies must present (text, figure, or table) the applicable elements included in the methodology.

Impact Analysis

This section ties the methodology and description of cumulative conditions together to address the significance criteria for cumulative conditions. Refer to the guidelines for direction on what to consider when conducting the cumulative impact analysis and how to present the findings. The same examples of the types of circumstances that could result in a potential hazardous condition impact or accessibility impact that were provided for existing plus project conditions apply here, except for cumulative conditions.

OTHER

The guidance provided in this memorandum assumes a land use development project located outside of an area plan that requires a transportation impact study. This section describes the type of additional or different information that may be necessary to address bicycling impacts for the following circumstances: land use development project located within an area plan, an area plan, or infrastructure project (which may be located in a different county than San Francisco).

Land Use Development Project Located within an Area Plan

For projects that are consistent with an area plan for which an environmental impact report (EIR) was certified, pursuant to CEQA guidelines section 15183, the assessment must limit its analysis to such conditions specified in that section. The guidelines provide direction on how to analyze a land use development project in an area plan and a list of area plan EIRs that have been certified as of February 2019.

Attachment B of this memorandum identifies mitigation and improvement measures from area plan EIRs related to people bicycling. The department will list bicycling-related mitigation and improvement measures from future area plan EIRs in Attachment B after the Planning Commission or Board of Supervisors certifies those EIRs.

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[5] *Ibid.*

[6] Factors such as incline, volume of vehicles, vehicle speed, and street lighting should be used to assess compatibility of alternative bicycling routes.

Area Plans

For area plans, the assessment will typically use the significance criteria identified herein. The following subsections describe the type of additional or different information that may be necessary to address bicycling impacts for area plan projects, methodology, and impact analysis. For area plans that also include infrastructure changes (e.g., street redesigns), please see the Infrastructure Project subsection for additional or different information that may be necessary.

Project Description

Typically, the department conducts an analysis to project the amount of future development that could occur in the plan area as a result of its implementation. The department typically does not have all the project description details described herein. However, the project description may include policies that may relate to the methodology and impact analysis (e.g., curb cut restrictions).

Methodology

The assessment will typically use the same methodology identified herein, except the methodology will use a larger geographical study area and require less site-specific information (e.g., driveway locations at each site) except to document circumstances where vehicles may not be allowed (e.g., curb cut restrictions). While an individual project may not require some elements listed in the Existing and Existing plus Project Methodology subsection, area plans typically will include all of these elements. The department should select sidewalks, streets, and intersections most impacted by the area plan to represent the impacts that may occur at other locations.

Impact Analysis

For analysis of area plans, assess the projected amount of growth and infrastructure changes associated with the rezoning within the area plan boundaries. The analysis of potentially hazardous conditions and accessibility impacts should be similar to that described under the Existing plus Project and Cumulative Impact Analysis subsections. If the area plan includes infrastructure changes (e.g., street redesigns), given the potential time gap between land use development and completion of infrastructure changes, the analysis should discuss the potential short-term effects of that potential time gap in a lesser level of detail than that provided for overall effects. However, the analysis should assume individual land use development projects within the area plan would be subject to requirements related to property specific infrastructure changes (e.g., Better Streets Plan).

Examples of circumstances that would result in significant impacts are described under the Existing Plus Project Impact Analysis subsection.

Infrastructure Project

For infrastructure projects (e.g., trails, new roads, bridge repair, sewer line, rail service, roadway modifications, etc.), the assessment of the project description, significance criteria, and impact analysis should be similar to private development projects. The analysis typically does not require trip generation analysis as infrastructure projects usually do not generate trips.[7] However, some infrastructure projects may induce trips, such as the addition of through lanes on existing or new highways or streets.[8] In

[7] Governor's Office of Planning and Research, *Revised Proposal on Updates to the CEQA Guidelines on Evaluating Transportation Impacts in CEQA,* January 20, 2016.

[8] Generally, minor transportation projects would not result in additional trips. Examples include, but are not limited to, rehabilitation, maintenance, and repair of transportation infrastructure; installation, removal or reconfiguration of non-through

addition, infrastructure projects may generate short-term trips due to construction workers and vehicles accessing the project site.

Project Description

The project description must describe the typical physical, additional physical, and programmatic features for existing and project conditions, as applicable. The project description must provide the geographic boundaries of the project and street cross sections.

Methodology

The assessment will typically use the same methodology identified herein, except the methodology will pay particular attention to proposed closures and rerouting.

Impact Analysis

The analysis of potentially hazardous conditions and accessibility impacts should be similar to that described under the Existing plus Project and Cumulative Impact Analysis subsections.

<u>Potentially Hazardous Conditions</u>

Examples of circumstances that would result in significant impacts are described under Existing plus Project Impact Analysis subsection. The following examples are some of the additional circumstances relevant to infrastructure projects, which may result in potentially hazardous conditions. This is not an exhaustive list of circumstances under which potentially hazardous impacts would occur:

- A project would install an obstruction (e.g., utility covers, streetcar tracks, drain grates, Bay Area Rapid Transit /Muni grates) within or across a bicycle facility used by a substantial number of people bicycling without adequate space to navigate around or notification measures to alert the people to the obstruction
- A project would modify or introduce a design feature in the public right-of-way that would either directly or indirectly inhibit the ability of people bicycling to safely navigate between various sections of the public right-of-way (i.e., roadway to shoulder)
- A project would include a geometric design feature (e.g., roadway or ramp widening, wide mixed-flow travel lanes, large curb radii) such that a substantial number of moving vehicle trips would occur adjacent to or across bicycle routes without protection (e.g., buffer, physical feature, speed reductions) between the vehicle trips and a substantial number of people bicycling

<u>Accessibility</u>

Examples of circumstances that would result in significant impacts are described under Existing Plus Project Impact Analysis subsection. The following example is an additional circumstance relevant to infrastructure projects, which may interfere with accessibility. Accessibility impacts not listed below could occur under other circumstances:

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traffic lanes and traffic control devices; removal of through lanes; installation of traffic calming measures and wayfinding; removal of on- or off-street parking. Governor's Office of Planning and Research, *Technical Advisory on Evaluating Transportation Impacts in CEQA*, November 2017.

- a project would establish a new physical structure (e.g., at-grade rail service or roadway) which would result in inadequate access for substantial number of people bicycling to and from nearby routes identified as part of San Francisco's Bikeway Network and major destinations (e.g., diverting people bicycling to an incompatible route that would result in an unreasonable increase in incline or distance, or having people wait extensively at crossings)

ATTACHMENT A

Existing and Proposed Project Figure and Table Examples

Introduction

Attachment A represents typical figures necessary to illustrate bicycling conditions included in a transportation study. All figures should include basic elements (e.g., north arrow, title, legend, references, acronyms, etc.). Symbology should reflect that documents may be printed in black and white. All figures and tables should include all the information the reader would need to understand the information presented. The figures presented below were from previous transportation studies and are illustrative only and may not include all the basic elements

FIGURE 1

Site Plan/Ground Floor Plan

Figure 1 is an example of a site plan that includes a detailed description of existing and proposed on-street loading. When developing a map similar to the one shown, include the linear dimensions of the existing and proposed loading zones, match the color of the zones to those used in the SFMTA Color Curb Program, and make existing and proposed changes explicit.

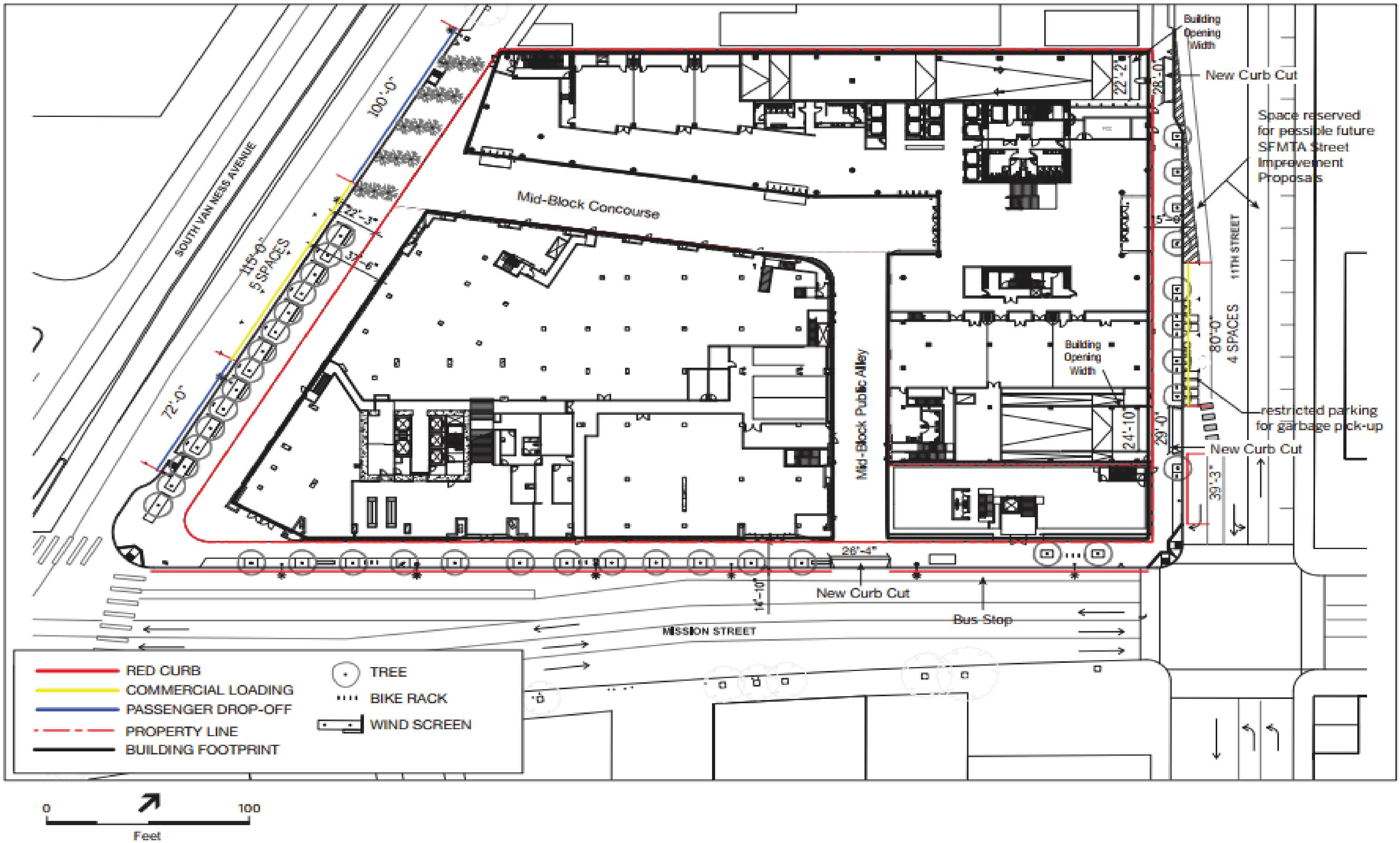


FIGURE 2

Bicycling Circulation

Figure 2 shows a bicycling circulation map, including circulation from surrounding streets and internal circulation.

TABLE 1

Peak Hour Counts for People Bicycling at Study Intersections

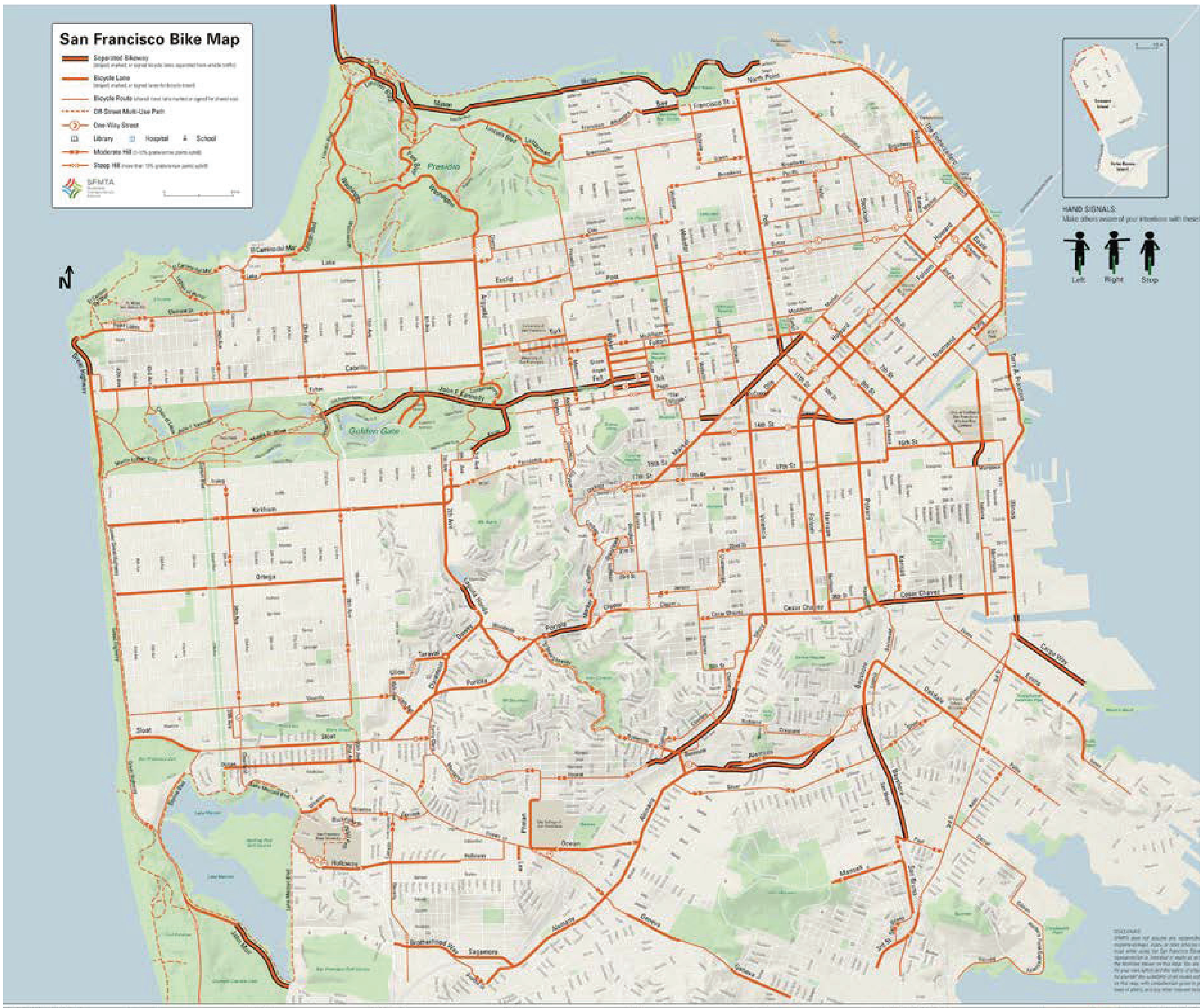
Table 1 below shows the typical format to present counts of people bicycling at all identified project intersections/ street segments. 'X' represents the volume of people bicycling that were observed during counts.

Intersection	Intersection Leg Counts at Peak Period (INSERT TIME)				TOTAL
	North	South	East	West	
Intersection 1	x	x	x	x	x
Intersection 2	x	x	x	x	x
Intersection 3	x	x	x	x	x
Intersection 4	x	x	x	x	x

FIGURE 3

Walking Network

Figure 3 is an example of mapping the existing network as it relates to people bicycling within a project study area. Inclusion of the bicycle facilities identified in this map near a specific project site would be appropriate in the Existing Baseline section.



ATTACHMENT B

Mitigation and Improvement Measures

MITIGATION MEASURES FOR LAND USE DEVELOPMENT PROJECTS LOCATED WITHIN AN AREA PLAN

Eastern Neighborhoods Rezoning and Area Plan

Mitigation Measure E-3: ***Enhanced Funding***
As a mitigation measure to adequately address the growth in automobile traffic generated by the Eastern Neighborhoods rezoning, ensure that sufficient operating and capital funding is secured for congestion management programs to make more efficient uses of ramps, streets, and parking, as well as funding to sustain alternative transportation (transit, bicycle, pedestrian) network and programs that provide incentives for drivers to use these modes.

Rincon Hill Plan

No applicable mitigation or improvement measures were identified.

Market and Octavia Neighborhood Plan

No applicable mitigation or improvement measures were identified.

Visitacion Valley Redevelopment Plan

No applicable mitigation or improvement measures were identified.

Balboa Park Station Area Plan

No applicable mitigation or improvement measures were identified.

Treasure Island and Yerba Buena Island Redevelopment Plan

No applicable mitigation or improvement measures were identified.

Glen Park Community Plan

No applicable mitigation or improvement measures were identified.

Transit Center District Plan and Transit Tower

No applicable mitigation or improvement measures were identified.

Western SoMa Community Plan

No applicable mitigation or improvement measures were identified.

Central SoMa Plan

No applicable mitigation or improvement measures were identified.

MITIGATION AND IMPROVEMENT MEASURE EXAMPLES

The following lists the typical types of measures that can mitigate or lessen impacts to people bicycling for each significance criterion:

EXAMPLE 1 Potentially Hazardous Conditions

» Facilitate safe crossings (e.g., stop-controlled intersections, installation of signal heads with countdown timers; installation of audible warning devices, pedestrian safety islands, bicycle-only traffic control devices);

» Establish safe sight distances (e.g., daylighting);

» Widen existing bicycle facilities (or install bicycle facilities where none exist);

» Roadway design changes intended to slow vehicle speeds such as traffic calming measures (e.g., bulb-outs, chicanes, speed humps, tighter turning radii);

» Relocate bicycle facilities away from off-street garage/loading docks;

» Install visible and/or audible warning devices at garage entrances/exits to alert people bicycling and people driving of activity at the garage driveway;

» Provide on-site signage promoting safety for people bicycling (e.g., signage at the garage exit reminding motorists to slow down and yield to people bicycling);

» Coordinate freight and service deliveries to reduce conflicts with people bicycling adjacent to on-site and off-site loading zones; and

» Prevent, monitor, and abate project-generated vehicle queues (see sample language below).

» Signal changes such as reducing signal cycle lengths to less than 90 seconds or leading pedestrian/bicycle intervals.

EXAMPLE 2 Accessibility

» Employ Queue Abatement Measures or pursue design modifications to proposed garage entrances/exits to accommodate queuing vehicles (see next page for Queue Abatement Sample Language)

» Provide adequate (e.g., effective widths, paths of travel) bicycle facilities adjacent to the project site, and/or network improvements such as crosswalks, shorter blocks, mid-block crossings, mid-block alleys, or a pedestrian/bicycle bridge or underpass, between the project site and intersections, adjacent transit stations/stops, and other major destinations.

TRANSPORTATION IMPACT ANALYSIS GUIDELINES

APPENDIX I
PUBLIC TRANSIT

SEAL OF THE CITY AND COUNTY OF SAN FRANCISCO

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Appendix I
Public Transit Memorandum

Date:	February 14, 2019
To:	Record No. 2015-012094GEN
Prepared by:	Debra Dwyer, Sherie George, and Daniel Wu
Reviewed by:	Wade Wietgrefe
RE:	**Transportation Impact Analysis Guidelines Update, Public Transit**

INTRODUCTION

This memorandum updates the prior guidance provided in the Transportation Impact Analysis Guidelines for the public transit topic. For the purpose of environmental review, the department defines transit as public transit system operations in the public right-of-way.[1] This consists of public transit services owned and/or operated by local and regional governmental agencies. The department prepared this memorandum in consultation with stakeholders (e.g., city and county agencies, consultants). The department will issue memoranda that provide updates to other topics (e.g., traffic hazards, loading) within the guidelines. When the department issues a memorandum about a topic, it will supersede existing guidance regarding that topic.

This memorandum provides specific guidance on the methodology and impact analysis required for the public transit transportation topic. Overall guidance on conducting transportation analysis for environmental review, including developing the project description, how to address the significance criteria, methodology, and impact analysis, is in the guidelines.

The guidance provided herein assumes a land use development project located outside of an area plan that requires a transportation study. Guidance on other types of projects, such as projects located in an area plan, projects requiring rezoning, and infrastructure projects, is discussed below under the "Other" subsection. The department has discretion on applying the guidance for multiple projects, but the department has discretion on applying the guidance on a project by project basis.

The organization of the memorandum is as follows:

1) Project Description
2) Significance Criteria
3) Existing and Existing plus Project
    a) Methodology
    b) Existing Baseline
    c) Impact Analysis
4) Cumulative
    a) Methodology
    b) Impact Analysis
5) Other (covers different types of projects)

[1] Transit does not include private transit carriers, on-demand services, and/or shuttle services. These private transit carriers are considered private vehicles on the public right-of-way during evaluation of a project's potential transportation-related impacts.

Attachments are under separate cover. The department may update the attachments to the memoranda more frequently than the body of the memoranda.

PROJECT DESCRIPTION

Refer to the Transportation Impact Analysis Guidelines Appendix A, Tables 1-3, for a list of the typical physical, additional physical, and programmatic features for existing and existing plus project conditions, as applicable. The geographic extent of these features must, at a minimum, include the project's frontage and may include the entirety of the project's block. Appendix A, Table 4 of the guidelines provides a non-exhaustive list of approvals from agencies other than the planning department that a project sponsor may need to obtain for the project description features described in the guidelines. Attachment A of this memorandum includes examples of figures that illustrate how to graphically represent public transit conditions.

SIGNIFICANCE CRITERIA

San Francisco Administrative Code Chapter 31 directs the department to identify environmental effects of a project using as its base the environmental checklist form set forth in Appendix G of the California Environmental Quality Act (CEQA) Guidelines. As it relates to people taking public transit and public transit operations, Appendix G states: "would the project conflict with a program plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?" The department uses the following significance criteria to evaluate that question: A project would have a significant impact if it would:

1) Substantially delay public transit; or
2) Creates potentially hazardous conditions[2] for public transit operations

EXISTING AND EXISTING PLUS PROJECT

Methodology

This section describes the typical methodology required to address the significance criteria. The methodology section identifies the collection, generation, and approach to analyze data. The department will determine whether to adjust the methodology as necessary to inform the analysis. For most projects, the department may only require transit impact analysis if the project site fronts or is within one block of a street with transit service.

[2] For the purposes of this memorandum, "hazard" refers to a project generated vehicle potentially colliding with a transit vehicle that could cause serious or fatal physical injury, accounting for the aspects described below. Human error or non-compliance with laws, weather conditions, time-of-day, and other factors can affect whether a collision could occur. However, for purposes of CEQA, hazards refer to engineering aspects of a project (e.g., speed, turning movements, complex designs, substantial distance between street crossings, sight lines) that may cause a greater risk of collisions that result in serious or fatal physical injury than a typical project. This significance criterion focuses on hazards that could reasonably stem from the project itself, beyond collisions that may result from aforementioned non-engineering aspects or the transportation system as a whole.

Period

In San Francisco, the weekday extended p.m. peak period (Tuesday, Wednesday, or Thursday, 3 p.m. to 7 p.m.) is typically the period when the most overall travel happens.[3] Although a substantial amount[4] of travel occurs throughout the day and impacts from projects would typically be less during other periods, the methodology should typically focus on this period (including limiting the hours within the extended p.m. peak period) as changes in travel demand or public right-of-way would be acute compared to other times of the day and days of the week. In some instances, the most overall travel may occur at different periods (a.m., midday, post-p.m. peak, and/or weekend) for smaller geographic areas (e.g., a segment of a street) or certain transit route (e.g. Muni Metro surface service) in existing conditions or as a result of the project, or the project may result in substantial disparity in travel demand at different periods (e.g., special events). In these instances, the methodology may substantiate the use of periods in addition to or other than the weekday p.m. peak period. Attachment B shows ridership by Muni route over different time periods and can substantiate the use of periods in addition to or other than the weekday p.m. peak period. The use of an alternative time period to p.m. peak should be discussed with the planning department during the scoping period.

Existing Conditions

The following identifies the typical methodology for projects. The department will determine the appropriate methodology as necessary to inform the impact determination:

<u>Visual Analysis with Recorded Observations</u>

Data collection for the project should include a site visit for a visual analysis, with recorded observations of the absence, discontinuity, or presence of the features listed in the project description and other relevant features (e.g., the location of a transit-only lane or other transit facilities), and a description of the weather conditions. In addition, the site visit must record any existing hazards to transit operations at locations in the study area, especially along travel lanes where transit vehicles operate and transit stop/station locations. [text, figure]

<u>Transit Travel Time, Delay, and Reliability</u>

Include the travel time of transit vehicles or indicators of transit delay and reliability such as the following to the extent applicable:

- Auto to transit travel time comparison
- Transit Travel time (and variability) between stops and/or time points

Transit travel time, delay, and reliability data may be obtained from in-public transit vehicle automatic vehicle location system, countywide congestion management program, or other San Francisco or regional public transit agency reports.

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[3] Examples that illustrate this statement: within the San Francisco County Congestion Management Program network transit and vehicular travel speeds are lower during the p.m. peak period (4:30-6:30 p.m.) than during the a.m. peak period (7-9a.m.) as documented in San Francisco County Transportation Authority, *Congestion Management Program*, December 2015; demand at transit stations is consistent and generally higher throughout the p.m. peak period relative to demand at transit stations during the a.m. peak period, as documented in the Metropolitan Transportation Commission, *Core Capacity Transit Study Briefing Book*, July 2016; the weekday peak period for for-hire vehicles occurs from 6:30 p.m. to 7p.m., as documented in San Francisco County Transportation Authority, *TNCs Today: a Profile of San Francisco Transportation Network Company Activity*, June 2017.

[4] Throughout this memo, the term "substantial amount" is used but not defined. This is because what constitutes a substantial amount of people, vehicles, etc., depends on the context in which the project is being evaluated (e.g., existing conditions, proposed land uses, and other variables).

Street Design Characteristics

Include the following general characteristics of streets within the study area:

- Location and type of traffic control devices (e.g., stop signs, signals, crosswalk) [text, figure]
- Number of travel lanes by type (e.g., mixed flow, parking, bicycle, transit-only, etc.) [text, figure]
- Posted speed limit and recorded or inferences about observed speeds [text]
- Presence of High-Injury Corridor [text, figure]
- Transit Preferential Streets Program designation,[5] if applicable [text, figure]

Include the following additional characteristics of streets within the study area to the extent applicable:

- Signal timing and phasing of traffic control devices, including presence of transit signal priority [text]
- Width of travel lanes [text, figure]
- Number of travel lanes by type at intersections (if different from the number of travel lanes along midblock) [text, figure]
- Nearby transit stations/stops amenities (e.g., shelters, boarding islands) and service information [i.e., frequency, time of day service, ridership, origins and destinations, and service type (See Attachment C for a description of service type and routes)] [text, figure, table]

Existing plus Project Conditions

The following identifies the typical methodology:

Travel Demand Analysis

Estimate the number of people driving and taking transit to and from the project site. [text, table] In addition, distribute and assign the project's vehicle trips to roadways, intersections, loading zones, and driveways and transit trips to transit stops and routes to the extent applicable. [text, figure]

Transit Delay

Use the travel demand analysis and project elements to determine if the project would result in transit service delay. The department transit delay screening criteria is 300 inbound project vehicle trips during the peak hour. Attachment D provides additional notes on this screening criteria. If a project exceeds the screening criteria, then the methodology should conduct a quantitative transit delay analysis. Example quantitative approaches to assess transit delay include:

- Transit delay analysis based on three components – traffic congestion delay (calculated by summing the average vehicle delay along the transit routes), transit reentry delay (calculated as the sum at each transit stop using empirical data), and passenger boarding delay (calculated by using a second per passenger boarding/alighting and based on transit assignment[6]).
- Transit Cooperative Research Program 165 methodology.[7] The methodology assesses, among other things, bus stop operations, segment travel speeds, transit roadway facilities, bus facility

[5] Transit Preferential Streets Program designations are as follows: Primary Transit Streets (Transit Oriented or Transit Important) and Others (Secondary Transit Street or Transit center).

[6] Transit assignments refers to assignment of project person trips on transit routes

[7] Transit Cooperative Research Program 165 is a reference document that provides research-based guidance and quantitative techniques for calculating transit delays and other operational characteristics.

capacity, and intersection approach to determine transit travel time based on public transit route schedule time points.

Attachment E provides more detail regarding these approaches. The methodology should report delay from each applicable category: traffic congestion delay, passenger boarding/alighting delay, re-entry delay, and/or other delay types.

Potentially Hazardous Conditions

Use the travel demand analysis and project elements to determine if the project would result in potentially hazardous conditions for transit operations. The methodology should qualitatively and/or quantitatively assess:

- The number, movement type, sightlines, and speed of project vehicle trips in and out of project facilities based upon the design of such facilities (e.g., curb-cut dimensions, roadway speeds) in relation to the travel lanes where transit vehicles operate and transit stop/station locations [text, figure]
- The number, type (e.g., left turn, right turn), sightlines, and speed of project vehicle movements at intersections and roadways in relation to the travel lanes where transit vehicles operate and transit stop/station locations [text, figure]

Existing Baseline

Refer to the guidelines for direction on including existing baseline in transportation studies.

Impact Analysis

This section ties the project description, methodology, and existing baseline together to address the significance criteria for existing plus project conditions. This section addresses the typical approach for the impact analysis and provides more details related to hazards and substantial transit delay impacts for transit operations and people taking transit. The impact analysis section should present a format (text, figure, or table) consistent with earlier sections of this memorandum for easy comparison.

The impact analysis must address whether the project would create potentially hazardous conditions for public transit operations and whether the project would create potential delays to public transit.

Refer to the guidelines for direction on what to typically consider when conducting the existing plus project impact analysis and how to present the findings. The subsections below provide specific examples of the types of circumstances that could result in a potentially hazardous condition impact or public transit delay impact under existing plus project conditions.

Potentially Hazardous Conditions

This is not an exhaustive list of circumstances, under which potentially hazardous conditions could occur:

- A project would add a substantial number of moving vehicle trips (e.g., turning movement into the project driveway, curb cut) crossing a transit lane or transit facility (e.g., transit stop) used by a substantial number of people taking transit (e.g., based on Muni service type category or designation)
- A project would construct or be located on a lot with physical obstructions (e.g., trees, utilities, an adjacent curb cut used by a substantial number of people driving, or on-street parking directly adjacent to the curb cut or transit stop) or slopes that would obstruct sightlines between a substantial number of people driving exiting or reversing into an off-street facility and a transit vehicle operating in travel lane next to the off-street facility
- A project would be unable to accommodate vehicle trips, including freight and delivery service vehicle trips, into its off-street facilities thereby resulting in queues on the transit only lane or

near a transit facility (e.g., bus stop) used by a substantial number of people taking transit (e.g., based on Muni service type category or designation)

Transit Delay

For projects that meet the screening criteria as shown in Attachment D, the transit impact analysis must use a quantitative threshold of significance and qualitative criteria to determine whether the project would substantially delay public transit. For individual Muni routes, if the project would result in transit delay greater than or equal to four minutes, then it might result in a significant impact. For individual Muni routes with headways less than eight minutes, the department may use a threshold of significance less than four minutes. For individual surface lines operated by regional agencies, if the project would result in transit delay greater than one-half headway, then it might result in a significant impact. The department considers the following qualitative criteria for determining whether that delay would result in significant impacts due to a substantial number of people riding transit switching to riding in private or for-hire vehicles:

- Transit service routes headways and ridership,
- Origins and destinations of trips,
- Availability of other transit and modes, and
- Competitiveness with private vehicles including for-hire vehicles.

Based on the qualitative criteria, the department will determine the significance. The following examples are some of the circumstances that may result in substantial transit delay. This is not an exhaustive list of circumstances, under which substantial transit delay could occur:

- A project would add a substantial number of moving vehicle trips (e.g., turning movement into the project driveway, curb cut) crossing a transit lane or transit facility (e.g., transit stop) used by a substantial number of people taking transit, resulting in transit delay greater than four minutes, and the qualitative analysis shows that existing automobile travel time is substantially lower than transit travel time on study area roadways where transit operates that could result in people switching from transit to ride in private vehicles and/or for-hire vehicles.
- A project would add a substantial number of moving vehicle trips (e.g., turning movement,) that would require potential traffic signal retiming to the detriment of a substantial number of people taking transit, resulting in transit delay greater than four minutes, and the qualitative analysis shows that the potentially impacted transit routes have high ridership, and serve the same origins and destinations as other travel modes, thereby could result in people switching from transit to these other modes.

CUMULATIVE

Methodology

The guidelines detail the typical methodology for cumulative analysis, including the geographical area, period, cumulative projects, and adjustments (refer to Appendix B) under cumulative conditions. The cumulative section in transportation studies must present (text, figure, or table) the applicable elements included in the methodology.

Impact Analysis

This section ties the methodology and description of cumulative conditions together to address the significance criteria for cumulative conditions. Refer to the guidelines for direction on what to consider when conducting the cumulative impact analysis and how to present the findings. The same examples of the types of circumstances that could result in potentially hazardous conditions to transit operations that were provided for existing plus project conditions apply here, except for cumulative conditions.

If cumulative projects combine to delay individual Muni routes by greater than or equal to four minutes, then it might result in a significant cumulative impact. For individual Muni routes with headways less than eight minutes, the department may use a threshold of significance less than four minutes to determine a significant cumulative impact. For individual surface lines operated by regional agencies, if cumulative projects would result in transit delay greater than one-half headway, then it might result in a significant impact. The department considers the same qualitative criteria as described in existing plus project conditions for determining whether that delay would result in significant impacts due to a substantial number of people riding transit switching to riding in private or for-hire vehicles. The department will determine significance regarding cumulative contribution, as a percentage of overall delay, on a project-by-project basis.

OTHER

The guidance provided in this memorandum assumes a land use development project located outside of an area plan that requires a transportation study. This section describes the type of additional or different information that may be necessary to address transit impacts for the following circumstances: land use development project located within an area plan, an area plan or certain rezoning outside of area plans, unique land use or events, or infrastructure project (which may be located in a different county than San Francisco).

Land Use Development Project Located within an Area Plan

For projects that are consistent with an area plan for which an environmental impact report (EIR) was certified, pursuant to CEQA guidelines section 15183, the assessment must limit its analysis to such conditions specified in that section. The guidelines provide direction on how to analyze a land use development project in an area plan and a list of area plan EIRs that have been certified as of February 2019.

Attachment F of this memorandum identifies mitigation and improvement measures from area plan EIRs related to emergency access. The department will list emergency access-related mitigation and improvement measures from future area plan EIRs in Attachment F after the Planning Commission or Board of Supervisors certifies those EIRs.

Area Plans or Other Substantial Rezoning Outside of Area Plans

For area plans or projects that would require rezoning outside of area plans, such that the development density allowed at a site would substantially increase, the assessment will typically use the significance criteria identified herein.[8] The following subsections describe the type of additional or different information that may be necessary to address transit operations and impacts to people taking transit for project description, methodology, and impact analysis. For area plans that also include infrastructure

[8] Sometimes project sponsors propose redevelopment of large areas consisting of multi-structure, multi-phased development outside a formal plan area. These proposals often require rezoning in the form of special use districts or changes to zoning similar to the rezoning under an area plan. In terms of the project description, a project may have a well-defined aspects or phases, while other projects in the proposal may rely on consistency/conformance with associated design guidelines or performance standards.

changes (e.g., street redesigns), please see the Infrastructure Project subsection for additional or different information that may be necessary.

Project Description

Typically, the department conducts an analysis to estimate the amount of future development that could occur in the area plan or rezoning as a result of its implementation. The department typically does not have all the project description outlines herein for an area plan or rezoning. However, for area plans, the project description may include policies that may relate to the methodology and impact analysis (e.g., curb-cut restrictions) or design guidelines or performance standards.

Methodology

The assessment will typically use the same methodology identified herein, except the methodology will use a larger geographical study area given the typical larger size of these types of projects (e.g., select streets and intersections along transit corridors most impacted by the area plan or rezoning). As described above, the assessment requires less site-specific information (e.g., driveway locations at each building may not be available) except to document circumstances where vehicles may not be allowed (e.g., curb-cut restrictions). Area plan rezoning typically may not require some of the project elements listed in the Existing and Existing plus Project Methodology subsection.

The assessment will evaluate potential changes to travel patterns and assign project transit trips to different transit routes. Based on these changes and transit trip assignment, the methodology may include qualitative and/or quantitative transit analysis as described under the Existing plus Project and Cumulative Impact Analysis subsections.

Impact Analysis

For analysis of area plans or rezoning, assess the projected amount of growth and infrastructure changes associated with the rezoning within the area plan boundaries or project site. The analysis of potentially hazardous conditions for people taking transit or analysis of transit travel delay should be similar to that described under the Existing plus Project Cumulative Impact Analysis subsections. If the area plan or rezoning includes infrastructure changes (e.g., street redesigns), given the potential time gap between land use development and completion of infrastructure changes, the analysis should discuss the potential short-term effects of that time gap in a lesser level of detail than that provided for overall effects. However, the analysis should assume individual land use development projects within the area plan or the proposed project would be subject to property specific infrastructure changes (e.g., Better Streets Plan).

Infrastructure Project

For infrastructure projects (e.g., new roads, bridge repair, sewer line, rail service, roadway modifications, etc.), the assessment of the project description, significance criteria, and impact analysis should be similar to private development projects. The analysis typically does not require trip generation, as infrastructure projects usually do not generate trips.[9] However, some infrastructure project may induce trips, such as

[9] Governor's Office of Planning and Research, *Revised Proposal on Updates to the CEQA Guidelines on Evaluating Transportation Impacts in CEQA*, January 20, 2016.

the addition of through lanes on existing or new highways or streets.[10] In addition, infrastructure projects may generate short-term trips due to construction workers and vehicles accessing the project site.

Project Description

The project description must describe the typical physical, additional physical, and programmatic features for existing and project conditions, as applicable. The project description must provide the geographic boundaries of the project and street cross sections.

Methodology

The assessment will typically use the same methodology identified herein, except the methodology will pay particular attention to proposed closures and rerouting.

Impact Analysis

The analysis of potentially hazardous conditions for public transit operations and substantial transit delay impacts should be similar to that described under the Existing plus Project Cumulative Impact Analysis subsections. Examples of circumstances that would result in significant impacts are described under Existing plus Project Impact Analysis subsection. The following examples are some of the additional circumstances relevant to infrastructure projects, which may result in potentially hazardous conditions for people taking transit and substantial transit delay.

- The project proposes changes that divert vehicles from a roadway without transit service or facilities to a roadway used by a substantial number of people taking transit (e.g., based on Muni service type category or designation)
- A project would remove a travel lane(s) (e.g., for an on-street bicycle facility), thereby limiting to fewer mixed-flow lane(s) used by a substantial number of vehicle trips and a substantial number of people taking transit (e.g., based on Muni service type category or designation)

[10] Generally, minor transportation projects would not result in additional trips. Examples include, but are not limited to, rehabilitation, maintenance, and repair of transportation infrastructure; installation, removal or reconfiguration of non-through traffic lanes and traffic control devices; removal of through lanes; installation of traffic calming measures and wayfinding; removal of on- or off-street parking. Governor's Office of Planning and Research, *Technical Advisory on Evaluating Transportation Impacts in CEQA*, November 2017.

ATTACHMENT A

Existing and Proposed Project Figure and Table Examples

Introduction

Attachment A represents typical figures necessary to illustrate transit conditions included in a transportation study. All figures should include basic elements (e.g., north arrow, title, legend, references, acronyms, etc.). Symbology should reflect that documents may be printed in black and white. All figures and tables should include all the information the reader would need to understand the information presented. The figures presented below were from previous transportation studies and are illustrative only and may not include all the basic elements.

FIGURE 1

Site Plan

Figure 1 is an example of a site plan that includes a detailed description of existing and proposed streetscape elements that could affect existing transit services. When developing a map similar to the one shown, include the linear dimensions of the existing and proposed alternations to publicly-accessible rights-of-way (e.g., parking, loading zones, bicycle facilities, or transit facilities). The presence of infrastructure or streetscape elements that assist with the operation of transit (e.g., Muni overhead wire poles, transit shelters) should be identified. Any loading zones should match the color of the zones to those used in the SFMTA Color Curb Program. Existing and proposed changes should be explicit.

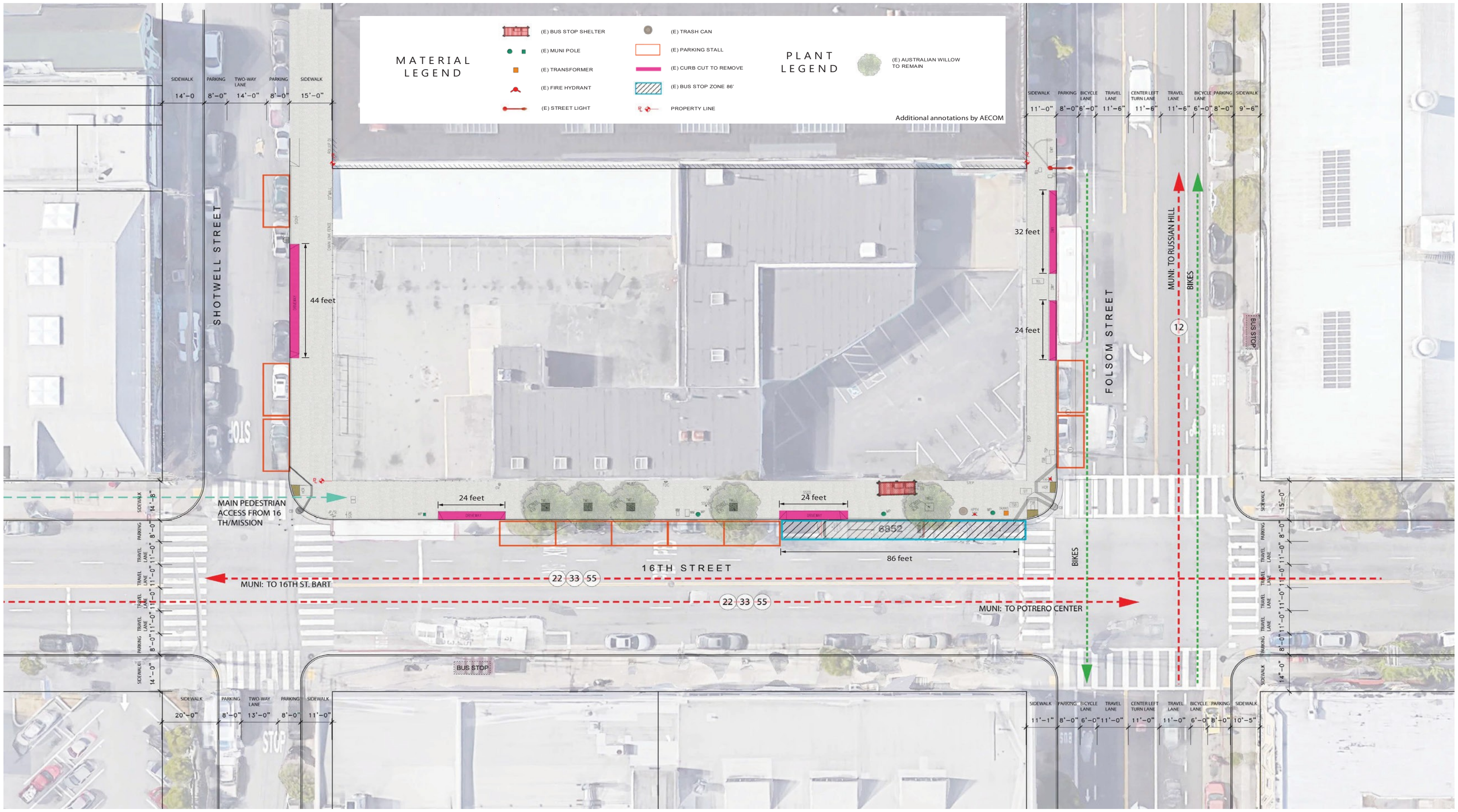


FIGURE 2

Transit Network

Figure 2 shows a transit network map, identifying public transit service that serves the project area and surrounding streets. The dotted lines represent the project study area. Local and regional public transit services are represented through different line colors with labeled route numbers. Service type (i.e., Rail, Rapid Bus, Frequent, Grid, Connector, Specialized, Owl) may also be identified. Additional symbols are included to identify transit stops, stations, and other important transit facilities.

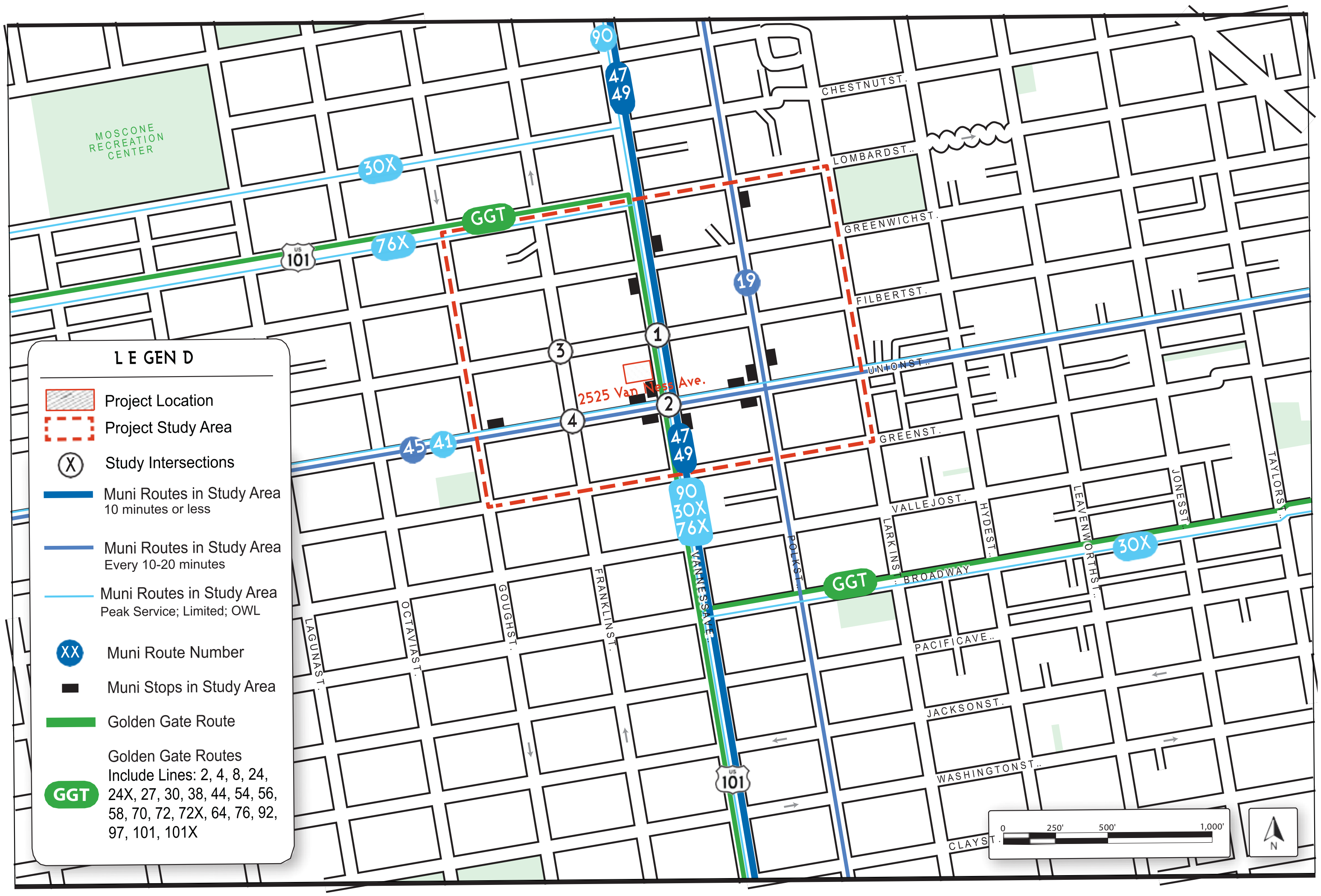


TABLE 1

Existing Public Transit Network Characteristics

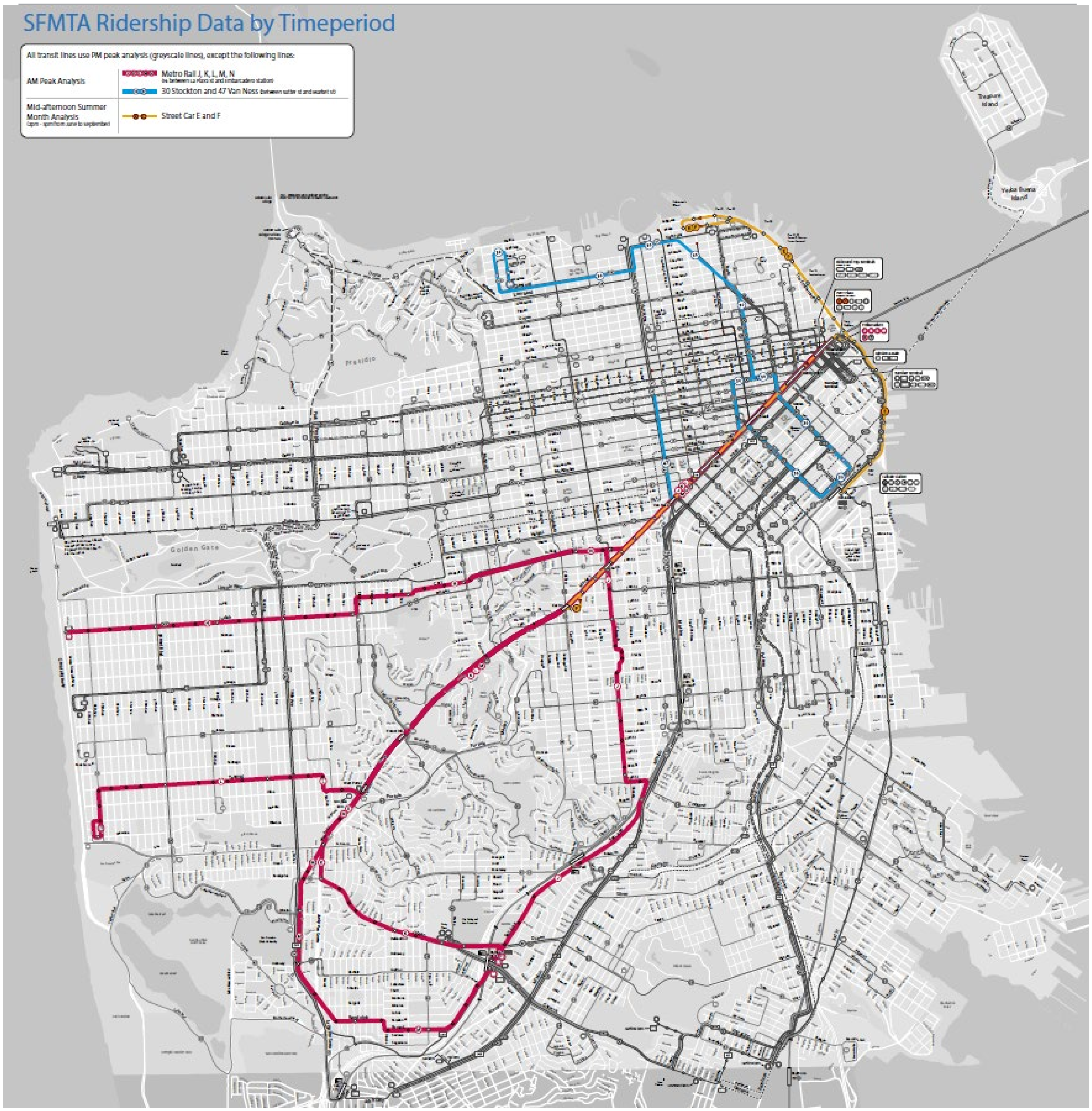
Table 1 below presents the existing public transit routes within an approximate quarter-mile of the project site. The table should include all necessary information to describe the existing transit network conditions (e.g., route numbers, service type, and distance to project site). As shown in Table 1, ‘x’ represents numerical values that would need to be provided and be consistent with project plans.

Route	Direction	Weekday Headways (AM / PM)[1]		Hours of Operation	Nearest Stop Location	Distance to Project Site (feet)[2]	Neighborhoods Served by Route
47-Van Ness	IB	8	8	6:00AM - 1:14AM	Van Ness Ave & Union St	325	Fisherman's Wharf, Fort Mason, Marina, Russian Hill, Polk Gulch, Union Street, Cathedral Hill, Lower Nob Hill, Tenderloin, Civic Center, South of Market, Showplace Square
	OB	8	12	5:43AM - 1:16AM	Van Ness Ave & Union St	110	
49-Van Ness /Mission	IB	8	8	5:13AM - 1AM	Van Ness Ave & Union St	325	Fort Mason, Marina, Russian Hill, Polk Gulch, Union Street, Cathedral Hill, Lower Nob Hill, Tenderloin, Civic Center, South of Market, Mission, Bernal Heights, Holly Park, St. Mary’s Park, Mission Terrace, Excelsior, Cayuga, Sunnyside, Oceanview
	OB	8	13	5:40AM - 1AM	Van Ness Ave & Union St	110	
76X-Marin Headlands Express	IB	NA	NA	Weekends 10:30AM - 7:25PM	Van Ness Ave & Union St	110	Marin Headlands, Presidio National Park, Marina, Cow Hollow, Union Street, Russian Hill, Polk Gulch, Lower Nob Hill, Financial District
	OB	NA	NA	Weekends 9:30AM - 6:04PM	Van Ness Ave & Union St	325	
90-San Bruno Owl	IB	NA	NA	12:40AM - 5:12AM	Van Ness Ave & Union St	110	Fort Mason, Marina, Russian Hill, Polk Gulch, Pacific Heights, Cathedral Hill, Lower Nob Hill, Tenderloin, Civic Center, SoMa, Mission, Showplace Square, Potrero Hill, Produce Market, Apparel City, Bernal Heights, Portola, Visitacion Valley
	OB	NA	NA	1:17AM - 5:52AM	Van Ness Ave & Union St	325	

Source: SF Muni, 2017; Prepared by CHS Consulting, 2017
Notes:
IB= Inbound; OB = Outbound
1. Headway in minutes. AM peak = 7:00 AM to 9:00 AM and PM peak = 4:00 PM to 7:00 PM
2. Distances are approximate and are measured from the center of the project site along local streets to reach nearest stop. Distances are not measured in a straight line between two points or places.

ATTACHMENT B

SFMTA Ridership Data by Timeperiod



SFMTA Municipal Transportation Agency — AM IB

Fall 2015 Baselines (Version 12)
Rubber Tire Counts: Weekdays, Oct. 5 to Nov. 20, 2015 Rail Counts: Fall 2013 & 2014

Route Name	Direction (s)	Vehicle Capacity 100%	Headways in Minutes	Max Load	Cars per Train	Maximum Load Point	Peak Hour Load	Peak Hour Capacity	Peak Hour Capacity Utilization
NX Judah Express	EASTWARD	63	10.0	39	1	JUDAH ST&19TH AVE SW-NS/	237	378	63%
1 California	EASTWARD	63	4.3	46	1	CLAY ST&TAYLOR ST SE-FS/	650	882	74%
2 Clement	EASTWARD	63	12.0	43	1	POST ST&JONES ST SE-FS/B	213	315	68%
3 Jackson	EASTWARD	63	12.0	38	1	POST ST&LEAVENWORTH ST S	191	315	61%
5 Fulton	EASTWARD	63	6.7	50	1	MCALLISTER ST&GOUGH ST S	353	441	80%
6 Haight-Parnassus	EASTWARD	63	10.0	54	1	HAIGHT ST&BUCHANAN ST SW	324	378	86%
7 Haight-Noriega	EASTWARD	63	10.0	47	1	HAIGHT ST&BUCHANAN ST SW	280	378	74%
9 San Bruno	NORTHWARD	63	12.0	34	1	POTRERO AVE&20TH ST NE-F	172	315	54%
10 Townsend	NORTH FR 24TH ST WEST ON PACIFIC	63	10.0	42	1	2ND ST&TOWNSEND ST N-FS	254	378	67%
12 Folsom-Pacific	NORTH FR 24TH ST WEST ON PACIFIC	63	20.0	40	1	FOLSOM ST&18TH ST NE-FS/	121	189	64%
14 Mission	NORTHWARD	63	8.6	33	1	MISSION ST&26TH ST NE-FS	229	441	52%
18 46th Ave	NORTHWARD	63	20.0	47	1	BALBOA ST&37TH AVE SW-NS	141	189	75%
19 Polk	NORTHWARD	63	15.0	39	1	LARKIN ST&OFARRELL ST SE	156	252	62%
21 Hayes	EASTWARD	63	4.0	36	1	GROVE ST&GOUGH ST SW-NS/	462	819	56%
22 Fillmore	WEST ON 16TH. St. NORTH ON FILLMORE	63	7.5	39	1	16TH ST&GUERRERO ST NE-N	313	504	62%
23 Monterey	EASTWARD	63	20.0	29	1	MONTEREY BLVD&CONGO ST S	87	189	46%
24 Divisadero	NORTHWARD	63	6.7	38	1	CASTRO ST&19TH ST SE-NS/	266	441	60%
25 Treasure Island	WESTWARD	63	10.0	31	1	AVENUE B&9TH AVE NW-NS/S	188	378	50%
27 Bryant	NORTHWARD	63	15.0	39	1	LEAVENWORTH ST&POST ST S	158	252	63%
28 19th Avenue	NORTHWARD	63	10.0	39	1	PARK PRESIDIO BLVD&FULTO	234	378	62%
29 Sunset	NORTHWARD	63	8.6	42	1	PERSIA AVE&PARIS ST E-NS	297	441	67%
30 Stockton	EASTWARD	63	7.5	42	1	STOCKTON ST&JACKSON STS	339	504	67%
31 Balboa	EASTWARD	63	12.0	40	1	TURK ST&STANYAN ST SE-FS	202	315	64%
33 Ashby-18th	WEST THRU MISSION NORTH ON ARGUELLO	63	15.0	33	1	18TH ST&GUERRERO ST NW-F	131	252	52%
35 Eureka	NORTHWARD	45	30.0	23	1	EUREKA ST&20TH ST SE-NS/	45	90	50%
36 Teresita	NORTHWARD	45	30.0	20	1	LAGUNA HONDA BL&CLARENDO	41	90	45%
37 Corbett	NORTHWARD	45	15.0	36	1	CORBETT AVE&DOUGLASS ST	146	180	81%
38 Geary	EASTWARD	94	8.6	60	1	OFARRELL ST&TAYLOR ST S-	418	658	64%
41 Union	EASTWARD	94	5.0	41	1	UNION ST&COLUMBUS AVE S-	496	1,128	44%
43 Masonic	NORTHWARD	63	6.7	52	1	GENEVA AVE&CAYUGA AVE E-	367	441	83%
44 O'Shaughnessy	WESTWARD AND NORTHWARD	63	7.5	43	1	OSHAUGHNESSY BLVD&MALTA	348	504	69%
45 Union - Stockton	EASTWARD	63	7.5	42	1	STOCKTON ST&JACKSON STS	340	504	67%
47 Van Ness	WEST ON HARRISON NORTH ON VAN NESS	63	10.0	46	1	VAN NESS AVE&POST ST E-M	288	378	75%
48 Quintara - 24th Street	EASTWARD	63	12.0	47	1	24TH ST&GUERRERO ST SW-N	237	315	75%
49 Van Ness - Mission	NORTHWARD	94	6.7	43	1	S. VAN NESS AVE&MISSION	301	658	46%
52 Excelsior	NORTHWARD	63	20.0	26	1	ROUSSEAU ST&CAYUGA AVE E	78	189	41%
54 Felton	EASTWARD	63	20.0	42	1	MT VERNON AVE&LOUISBURG	127	189	67%
55 16th Street	WESTWARD	63	15.0	6	1	16TH ST&HARRISON ST NE-N	26	252	10%
56 Rutland	WESTWARD	45	30.0	22	1	SAWYER ST&VISITACION AVE	43	90	48%
57 Parkmerced	EASTWARD	63	20.0	14	1	JUAN BAUTISTA CIR&FONT B	41	189	22%
5R Fulton Rapid	EASTWARD	63	4.0	54	1	MCALLISTER ST&FILLMORE S	810	945	86%
66 Quintara	NORTHWARD	45	20.0	17	1	QUINTARA ST&26TH AVE SE-	52	135	39%
67 Bernal Heights	NORTHWARD	63	20.0	31	1	FOLSOM ST&25TH ST SE-NS/	94	189	50%
7R Haight Noriega Rapid	EASTWARD	63	10.0	50	1	HAIGHT ST&FILLMORE ST SE	301	378	80%
7X Noriega Express	EASTWARD	63	7.5	32	1	LINCOLN WAY&9TH AVE SE-F	254	504	50%
8B BART Shuttle	EASTWARD	63	15.0	35	1	GENEVA AVE&CAYUGA AVE E-	139	252	55%
9R San Bruno Rapid	NORTHWARD	63	7.5	43	1	SF GENERAL HOSPITAL E-MB	342	504	68%
14R Mission Rapid	NORTHWARD	94	8.6	69	1	MISSION ST&RICHLAND AVE	486	658	74%
14X Mission Express	NORTHWARD	94	7.5	55	1	TRUMBULL ST&STONEYBROOK	440	752	59%
1AX California "A" Express	EASTWARD	63	12.0	63	1	CALIFORNIA ST&8TH AVE SW	315	315	100%
1BX California "B" Express	EASTWARD	94	7.5	70	1	CALIFORNIA ST&FILLMORE S	563	752	75%
28R 19th Avenue Rapid	NORTHWARD	63	10.0	38	1	DALY CITY BART STATION W	225	378	60%
30X Marina Express	EASTWARD	63	4.6	48	1	CHESTNUT ST&VAN NESS AVE	621	819	76%
38R Geary Rapid	EASTWARD	94	4.0	75	1	GEARY BLVD&LAGUNA ST SW-	1119	1,410	79%
81X Caltrain Express	NORTHWARD FROM CALTRAIN	63	30.0	25	1	4TH ST&TOWNSEND ST S-FS/	50	126	40%
82X Levi Plaza Express	NORTHWARD FROM CALTRAIN	63	15.0	45	1	4TH ST&TOWNSEND ST S-FS/	179	252	71%
83X Midtown Express	WESTWARD FROM CALTRAIN	63	15.0	7	1	TOWNSEND ST & 8 ST NE-NS	30	252	12%
8AX Bayshore Express	NORTHWARD	94	6.0	61	1	BRYANT ST&5TH ST E-FS/BZ	612	940	65%
8BX Bayshore Express	EASTWARD AND NORTHWARD	94	6.7	66	1	BAYSHORE BLVD&BLANKEN AV	591	846	70%
31AX Balboa "A" Express	EASTWARD	63	10.0	47	1	BALBOA ST&PARK PRESIDIO	281	378	74%
31BX Balboa "B" Express	EASTWARD	63	12.0	43	1	PRESIDIO AVE&GEARY BLVD	215	315	68%
38AX Geary "A" Express	EASTWARD	63	12.0	39	1	GEARY BLVD&25TH AVE SW-N	197	315	62%
38BX Geary "B" Express	EASTWARD	63	12.0	52	1	PRESIDIO AVE&GEARY BLVD	258	315	82%
F Market & Wharves	DOWN MARKET UP EMBARCADERO	60	6.0	57	1	Steuart Loop (to Wharf)	566	600	94%
J Church	NORTHWARD	119	8.0	107	1	Duboce & Church	800	893	90%
K Ingleside (K/T)	NORTHEASTWARD	119	8.0	123	1	Van Ness Station	925	893	104%
L Taraval	NORTHEASTWARD	238	8.0	133	2	Van Ness Station	2001	1,786	112%
M Oceanside	NORTHEASTWARD	238	9.0	131	2	Van Ness Station	1747	1,587	110%
N Judah	NORTHEASTWARD	238	7.0	149	2	Duboce and Church	2558	2,040	125%
T Third (K/T)	NORTHEAST ON MARKET SOUTH ON THIRD ST	119	9.0	78	1	3rd & Marin (from Bayview)	519	793	65%

SFMTA Municipal Transportation Agency — AM OB

Fall 2015 Baselines (Version 12)
Rubber Tire Counts: Weekdays, Oct. 5 to Nov. 20, 2015 Rail Counts: Fall 2013 & 2014

Route Name	Direction (s)	Vehicle Capacity 100%	Headways in Minutes	Max Load	Capacity Utilization 85%	Cars per Train	Maximum Load Point	Net Capacity	Peak Hour Capacity	Peak Hour Capacity Utilization
1 California	WESTWARD	63	4.0	36	0.68	1	SACRAMENTO ST&POLK ST NW	474	819	58%
2 Clement	WESTWARD	63	10.0	23	0.42	1	SUTTER ST&POLK ST NW-FS	136	378	36%
3 Jackson	WESTWARD	63	12.0	14	0.26	1	SUTTER ST&POLK ST NW-FS	70	315	22%
5 Fulton	WESTWARD	63	6.7	23	0.43	1	MCALLISTER ST&LAGUNA ST	162	441	37%
6 Haight-Parnassus	WESTWARD	63	12.0	19	0.35	1	HAIGHT ST&LAGUNA ST NW-F	93	315	30%
7 Haight-Noriega	WESTWARD	63	12.0	22	0.42	1	HAIGHT ST&LAGUNA ST NW-F	112	315	36%
8 Bayshore	SOUTHWARD AND WESTWARD	94	7.5	64	0.8	1	GENEVA AVE&MADRID ST N-F	512	752	68%
9 San Bruno	SOUTHWARD	63	12.0	29	0.54	1	11TH ST&MISSION ST S-FS/	146	315	46%
10 Townsend	SOUTHWARD	63	20.0	46	0.82	1	BROADWAY&MONTGOMERY ST S	134	189	71%
12 Folsom-Pacific	EAST ON PACIFIC SOUTH TO 24TH ST	63	15.0	41	0.75	1	PACIFIC AVE&MASON ST SW-	163	252	65%
14 Mission	SOUTHWARD	94	8.6	22	0.28	1	MISSION ST&19TH ST SW-FS	157	658	24%
18 46th Ave	SOUTHWARD	63	20.0	27	0.5	1	46TH AVE&SANTIAGO ST NW-	81	189	43%
19 Polk	SOUTHWARD	63	15.0	37	0.69	1	8TH ST & MARKET ST S-FS/	148	252	59%
21 Hayes	WESTWARD	63	8.6	16	0.29	1	HAYES ST&FILLMORE ST NW-	110	441	25%
22 Fillmore	SOUTH ON FILLMORE EAST ON 18TH ST.	63	8.6	36	0.7	1	18TH ST&MISSION ST SW-NS	264	441	60%
23 Monterey	WESTWARD	63	20.0	40	0.75	1	BOSWORTH ST&ROTTECK ST N	121	189	64%
24 Divisadero	SOUTHWARD	63	6.7	20	0.37	1	DIVISADERO ST&HAIGHT ST	119	378	31%
25 Treasure Island	EASTWARD	63	10.0	7	0.12	1	BEALE & FOLSOM MB-M	39	378	10%
27 Bryant	SOUTHWARD	63	15.0	34	0.63	1	OFARRELL ST&TAYLOR ST S-	136	252	54%
28 19th Avenue	SOUTHWARD	63	10.0	32	0.59	1	19TH AVE&NORIEGA ST SW-F	192	378	51%
29 Sunset	WESTWARD	63	8.6	51	0.94	1	PERSIA AVE&NAPLES ST W-N	356	441	81%
30 Stockton	WESTWARD	63	5.5	55	0.99	1	STOCKTON ST&SUTTER ST NE	586	693	85%
31 Balboa	WESTWARD	63	12.0	30	0.56	1	EDDY ST&VAN NESS AVE NE-	151	315	48%
33 Ashby-18th	SOUTH ON ARGUELLO EAST THRU MISSION	63	15.0	32	0.59	1	18TH ST&CHURCH ST SE-FS/	127	252	50%
35 Eureka	SOUTHWARD	45	30.0	7	0.19	1	CASTRO ST&20TH ST NW-NS/	15	90	16%
36 Teresita	SOUTHWARD	45	30.0	28	0.75	1	MONTEREY BLVD&ADEN ST S	57	90	63%
37 Corbett	SOUTHWARD	45	15.0	10	0.28	1	14TH ST&CASTRO ST SW-NS/	42	180	23%
38 Geary	WESTWARD	94	7.5	47	0.59	1	GEARY BLVD&VAN NESS AVE	379	752	50%
41 Union	WESTWARD	94	8.0	19	0.24	1	UNION ST&MASON ST NE-NS/	135	658	21%
43 Masonic	SOUTHWARD	63	6.7	33	0.61	1	LAGUNA HONDA BLVD&HOREG	229	441	52%
44 O'Shaughnessy	SOUTHWARD AND EASTWARD	63	8.6	38	0.71	1	SILVER AVE&DARTMOUTH ST	269	441	61%
45 Union - Stockton	WESTWARD	63	7.5	46	0.86	1	STOCKTON ST&SUTTER ST NE	362	504	72%
47 Van Ness	SOUTH ON VAN NESS EAST ON HARRISON	63	12.0	42	0.78	1	VAN NESS AVE&MCALLISTER	210	315	67%
48 Quintara - 24th Street	WESTWARD	63	10.0	42	0.77	1	24TH ST&SOUTH VAN NESS A	250	378	66%
49 Van Ness - Mission	SOUTHWARD	94	6.7	35	0.44	1	VAN NESS AVE&EDDY ST SW-	248	658	38%
52 Excelsior	SOUTHWARD	63	20.0	21	0.39	1	DIAMOND ST&SURREY ST NW-	64	189	34%
54 Felton	WESTWARD	63	20.0	47	0.87	1	GENEVA AVE & MISSION ST	141	189	75%
55 16th Street	EASTWARD	63	15.0	29	0.54	1	16TH ST&SHOTWELL ST SE-F	116	252	46%
56 Rutland	EASTWARD	45	30.0	8	0.22	1	SUNNYDALE AVE&SCHWERIN S	16	90	18%
57 Parkmerced	WESTWARD	63	20.0	7	0.14	1	CHUMASERO DR&FONT BLVD W	22	189	12%
5R Fulton Rapid	WESTWARD	63	4.0	24	0.38	1	MCALLISTER ST&FILLMORE S	265	819	32%
66 Quintara	SOUTHWARD	45	20.0	12	0.32	1	16TH AVE&MORAGA ST NW-NS	37	135	27%
67 Bernal Heights	SOUTHWARD	63	20.0	14	0.27	1	831 ELLSWORTH ST SW-NS/P	43	189	23%
9R San Bruno Rapid	SOUTHWARD	63	7.5	30	0.52	1	11TH ST&MARKET ST S-FS/B	225	504	45%
14R Mission Rapid	SOUTHWARD	94	8.6	30	0.38	1	MISSION ST&24TH ST SW-FS	213	658	32%
28R 19th Avenue Rapid	SOUTHWARD	63	10.0	21	0.39	1	19TH AVE&JUDAH ST SW-FS/	126	378	33%
38R Geary Rapid	WESTWARD	94	4.0	55	0.69	1	GEARY BLVD&VAN NESS AVE	830	1,410	59%
83X Midtown Express	SOUTHWARD TO CALTRAIN	63	15.0	12	0.22	1	8TH ST & MARKET ST S-FS/	48	252	19%
F Market & Wharves	DOWN EMBARCADERO UP MARKET	60	6.0	21	0.42	1	Steuart Loop (From Wharf)	213	600	36%
J Church	SOUTHWARD	119	8.0	26	0.26	1	Duboce & Church	197	893	22%
K Ingleside (K/T)	SOUTHWESTWARD	119	8.0	77	0.77	1	Embarc & Folsom	584	893	65%
L Taraval	SOUTHWESTWARD	238	8.0	27	0.13	2	Van Ness OB	399	1,786	22%
M Oceanside	SOUTHWESTWARD	238	9.0	40	0.2	2	Van Ness OB	538	1,587	34%
N Judah	SOUTHWESTWARD	238	7.0	38	0.19	2	Duboce & Church	653	2,040	32%
T Third (K/T)	NORTH ON THIRD SOUTHWEST ON MARKET	119	8.0	123	1.22	1	Van Ness (to Bayview)	822	793	104%

SFMTA Municipal Transportation Agency — PM IB

Fall 2015 Baselines (Version 12)
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Route Name	Direction (s)	Vehicle Capacity 100%	Headways in Minutes	Max Load	Cars per Train	Maximum Load Point	Net Capacity	Peak Hour Capacity	Peak Hour Capacity Utilization
1 California	EASTWARD	63	7.5	28	1	CALIFORNIA ST&LAUREL ST	225	504	45%
2 Clement	EASTWARD	63	12.0	28	1	POST ST&HYDE ST SE-FS&Z	141	315	45%
3 Jackson	EASTWARD	63	10.0	17	1	POST ST&LEAVENWORTH ST S	102	378	27%
5 Fulton	EASTWARD	63	6.7	27	1	MCALLISTER ST&LAGUNA ST	186	441	42%
6 Haight-Parnassus	EASTWARD	63	10.0	18	1	HAIGHT ST&PIERCE ST SW-N	110	378	29%
7 Haight-Noriega	EASTWARD	63	10.0	33	1	HAIGHT ST&PIERCE ST SW-N	199	378	53%
7 Haight-Noriega	EASTWARD	63	10.0	33	1	HAIGHT ST&PIERCE ST SW-N	199	378	53%
9 San Bruno	NORTHWARD	63	12.0	28	1	11TH ST&HOWARD ST N-FS&B	132	315	42%
10 Townsend	NORTH FR 24TH ST WEST ON PACIFIC	63	20.0	45	1	PACIFIC AVE&STOCKTON ST	136	189	72%
12 Folsom-Pacific	NORTH FR 24TH ST WEST ON PACIFIC	63	20.0	38	1	PACIFIC AVE&POWELL ST NE	113	189	60%
14 Mission	NORTHWARD	63	7.5	28	1	MISSION ST&23RD ST NE-FS	212	504	42%
18 46th Ave	NORTHWARD	63	20.0	27	1	46TH AVE&TARAVAL ST SE-N	81	189	43%
19 Polk	NORTHWARD	63	15.0	36	1	LARKIN ST&GOLDEN GATE AV	145	252	57%
21 Hayes	EASTWARD	63	8.6	22	1	HAYES ST&BUCHANAN ST SE-	155	441	35%
22 Fillmore	WEST ON 16TH. St. NORTH ON FILLMORE	63	6.7	33	1	16TH ST&FOLSOM ST NW-FS/	301	567	53%
23 Monterey	NORTHWARD	63	20.0	30	1	DIAMOND ST&BOSWORTH ST S	90	189	47%
24 Divisadero	NORTHWARD	63	6.7	24	1	CASTRO ST&17TH ST SE-NS/	170	441	39%
25 Treasure Island	WESTWARD	63	15.0	30	1	TREASURE ISLAND MAIN GAT	119	252	47%
27 Bryant	NORTHWARD	63	15.0	41	1	ELLIS ST&MASON ST NE-NS/	164	252	65%
28 19th Avenue	NORTHWARD	63	10.0	43	1	19TH AVE&SANTIAGO ST NE-N	249	378	66%
29 Sunset	EASTWARD	63	12.0	43	1	PLYMOUTH AVE&OCEAN AVE S	203	315	64%
30 Stockton	EASTWARD	63	4.0	28	1	STOCKTON ST&SACRAMENTO S	538	945	57%
31 Balboa	EASTWARD	63	15.0	37	1	TURK ST&TAYLOR ST SE-FS	149	252	59%
33 Ashby-18th	WEST THRU MISSION NORTH ON ARGUELLO	63	15.0	35	1	18TH ST&CHURCH ST NE-NS/	140	252	56%
35 Eureka	NORTHWARD	45	20.0	6	1	EUREKA ST&20TH ST SE-NS/	19	135	14%
36 Teresita	NORTHWARD	45	30.0	26	1	MONTEREY BLVD&ACADIA ST	69	90	77%
37 Corbett	NORTHWARD	45	20.0	22	1	14TH ST&NOE ST NE-NS/P	67	135	49%
38 Geary	EASTWARD	94	6.7	41	1	GEARY BLVD&LAGUNA ST SW-	370	846	44%
39 Coit Tower	FROM TOWER TO WHARF	45	20.0	6	1	STOCKTON ST&UNION ST NW-	27	135	20%
41 Union	EASTWARD	63	8.6	28	1	CLAY ST&MONTGOMERY ST SE	176	441	40%
43 Masonic	NORTHWARD	63	10.0	26	1	LAGUNA HONDA BL&CLARENDO	149	378	40%
44 O'Shaughnessy	WESTWARD AND NORTHWARD	63	8.6	32	1	SILVER AVE&BOYLSTON ST W	222	441	50%
45 Union - Stockton	EASTWARD	63	12.0	33	1	STOCKTON ST&JACKSON STS	160	315	51%
47 Van Ness	WEST ON HARRISON NORTH ON VAN NESS	63	8.6	38	1	VAN NESS AVE&TURK ST NE-	255	441	58%
48 Quintara - 24th Street	EASTWARD	63	12.0	32	1	24TH ST&MISSION ST SW-NS	158	315	50%
49 Van Ness - Mission	NORTHWARD	94	7.5	43	1	VAN NESS AVE&MCALLISTER	346	752	46%
52 Excelsior	NORTHWARD	63	20.0	21	1	DIAMOND ST&CHENERY ST SE	64	189	34%
54 Felton	EASTWARD	63	20.0	37	1	GENEVA AVE&CAYUGA AVE S-	112	189	59%
55 16th Street	WESTWARD	63	15.0	26	1	16TH ST&HARRISON ST NE-N	104	252	41%
56 Rutland	WESTWARD	45	30.0	10	1	WILDE AVE&GIRARD ST NW-F	20	90	22%
57 Parkmerced	EASTWARD	63	15.0	6	1	OCEAN AVE&JUNIPERO SERRA	30	252	12%
5R Fulton Rapid	EASTWARD	63	6.7	27	1	FULTON ST&MASONIC AVE SW	246	567	43%
66 Quintara	NORTHWARD	45	30.0	8	1	LAWTON ST&LOMITA AVE SW-	16	135	12%
67 Bernal Heights	NORTHWARD	63	20.0	11	1	FOLSOM ST&25TH ST SE-NS/	32	189	17%
9R San Bruno Rapid	NORTHWARD	63	7.5	30	1	11TH ST&HARRISON ST N-FS	238	504	47%
14R Mission Rapid	NORTHWARD	94	8.6	40	1	MISSION ST&30TH ST E-FS/	281	658	43%
38R Geary Rapid	EASTWARD	94	4.0	62	1	GEARY BLVD&LAGUNA ST SW-	673	1,222	55%
83X Midtown Express	WESTWARD FROM CALTRAIN	63	20.0	9	1	TOWNSEND ST & 8 ST NE-NS	29	189	15%
F Market & Wharves	DOWN MARKET UP EMBARCADERO	60	6.0	34	1	Steuart Loop (to Wharf)	341	600	57%
J Church	NORTHWARD	119	8.0	32	1	Duboce & Church	241	893	27%
K Ingleside (K/T)	NORTHEASTWARD	119	8.0	118	1	Van Ness Station	859	893	96%
L Taraval	NORTHEASTWARD	238	9.0	46	2	Van Ness Station	644	1,587	41%
M Oceanside	NORTHEASTWARD	238	9.0	91	2	Van Ness Station	1210	1,587	76%
N Judah	NORTHEASTWARD	238	8.0	58	2	Duboce and Church	1007	2,197	46%
T Third (K/T)	NORTHEAST ON MARKET SOUTH ON THIRD ST	119	8.0	143	1	Ember & Harr (fro Bayview)	945	793	119%

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Route Name	Direction (s)	Vehicle Capacity 100%	Headways in Minutes	Max Load	Capacity Utilization 85%	Cars per Train	Maximum Load Point	Net Capacity	Peak Hour Capacity	Peak Hour Capacity Utilization
NX Judah Express	WESTWARD	63	10.0	32	0.59	1	SUTTER ST&SANSOME ST NW-	192	378	0.51
1 California	WESTWARD	63	3.8	51	0.94	1	SACRAMENTO ST&STOCKTON S	812	1,008	81%
2 Clement	WESTWARD	63	12.0	40	0.75	1	SUTTER ST&MASON ST NW-FS	202	315	64%
3 Jackson	WESTWARD	63	12.0	32	0.59	1	SUTTER ST&MASON ST NW-FS	160	315	51%
5 Fulton	WESTWARD	63	6.7	46	0.86	1	MCALLISTER ST&VAN NESS A	277	378	73%
6 Haight-Parnassus	WESTWARD	63	10.0	47	0.88	1	MARKET ST&VAN NESS AVE N	284	378	75%
7 Haight-Noriega	WESTWARD	63	12.0	42	0.78	1	MARKET ST&VAN NESS AVE N	210	315	67%
9 San Bruno	SOUTHWARD	63	12.0	38	0.71	1	POTRERO AVE&24TH ST SW-F	192	315	61%
10 Townsend	EAST ON PACIFIC SOUTH TO 24TH ST	63	20.0	41	0.76	1	TOWNSEND ST&5TH ST N-NS/	123	189	65%
12 Folsom-Pacific	EAST ON PACIFIC SOUTH TO 24TH ST	63	15.0	33	0.6	1	FOLSOM ST&14TH ST SW-FS/	130	252	52%
14 Mission	SOUTHWARD	94	7.5	35	0.44	1	MISSION ST&19TH ST SW-FS	282	752	38%
18 46th Ave	SOUTHWARD	63	20.0	29	0.54	1	46TH AVE&LINCOLN WAY SW-	87	189	46%
19 Polk	SOUTHWARD	63	15.0	32	0.59	1	8TH ST&HOWARD ST S-FS/BZ	127	252	50%
21 Hayes	WESTWARD	63	7.5	42	0.79	1	HAYES ST&VAN NESS AVE NW	339	504	67%
22 Fillmore	SOUTH ON FILLMORE EAST ON 18TH ST.	63	6.7	38	0.7	1	FILLMORE ST&EDDY ST NW-N	342	567	60%
23 Monterey	WESTWARD	63	20.0	30	0.55	1	DIAMOND ST&BOSWORTH ST S	90	189	47%
24 Divisadero	SOUTHWARD	63	6.7	37	0.69	1	CASTRO ST&19TH ST NW-NS/	260	441	59%
25 Treasure Island	EASTWARD	63	15.0	25	0.47	1	TREASURE ISLAND RD&MACAL	102	252	40%
27 Bryant	SOUTHWARD	63	15.0	27	0.49	1	BRYANT ST&17TH ST SW-FS/	107	252	42%
28 19th Avenue	SOUTHWARD	63	10.0	47	0.87	1	19TH AVE&JUDAH ST SW-FS/	281	378	74%
29 Sunset	SOUTHWARD	63	10.0	43	0.8	1	BEVERLY ST&GARFIELD ST N	260	378	69%
30 Stockton	WESTWARD	63	5.0	35	0.64	1	STOCKTON ST&SUTTER ST NE	415	756	55%
31 Balboa	WESTWARD	63	15.0	44	0.82	1	EDDY ST&VAN NESS AVE NE-	177	252	70%
33 Ashby-18th	SOUTH ON ARGUELLO EAST THRU MISSION	63	15.0	28	0.52	1	18TH ST&DOLORES ST SE-FS	112	252	44%
35 Eureka	SOUTHWARD	45	20.0	27	0.71	1	CASTRO ST&19TH ST NW-NS/	81	135	60%
36 Teresita	SOUTHWARD	45	30.0	15	0.4	1	WOODSIDE AVE&PORTOLA DR	31	90	34%
37 Corbett	SOUTHWARD	45	20.0	35	0.92	1	MARKET ST&CASTRO ST W-FS	105	135	78%
38 Geary	WESTWARD	94	6.7	53	0.66	1	GEARY BLVD&TAYLOR ST NW-	473	846	56%
39 Coit Tower	FROM WHARF TO TOWER	45	20.0	9	0.24	1	POWELL ST&LOMBARD ST SW-	27	135	20%
41 Union	WESTWARD	63	7.5	47	0.87	1	UNION ST&MASON ST NE-NS/	375	504	74%
43 Masonic	SOUTHWARD	63	6.7	42	0.77	1	GENEVA AVE&CAYUGA AVE S-	249	378	66%
44 O'Shaughnessy	SOUTHWARD AND EASTWARD	63	7.5	45	0.83	1	SILVER AVE&MISSION ST SE	360	504	71%
45 Union - Stockton	WESTWARD	63	10.0	49	0.91	1	STOCKTON ST&SUTTER ST NE	295	378	78%
47 Van Ness	SOUTH ON VAN NESS EAST ON HARRISON	63	8.6	32	0.59	1	VAN NESS AVE&SUTTER ST S	223	441	50%
48 Quintara - 24th Street	WESTWARD	63	10.0	38	0.7	1	24TH ST&FOLSOM ST NW-FS/	228	378	60%
49 Van Ness - Mission	SOUTHWARD	94	6.7	42	0.53	1	VAN NESS AVE&EDDY ST SW-	337	752	45%
52 Excelsior	SOUTHWARD	63	20.0	28	0.52	1	EXCELSIOR AVE&PARIS ST W	85	189	45%
54 Felton	WESTWARD	63	20.0	43	0.8	1	HOWTH ST&GENEVA AVE W-FS	129	189	68%
55 16th Street	EASTWARD	63	15.0	12	0.22	1	16TH ST&SHOTWELL ST SE-F	48	252	19%
56 Rutland	EASTWARD	45	30.0	5	0.13	1	BAYSHORE BLVD&BLANKEN AV	10	90	11%
57 Parkmerced	WESTWARD	63	20.0	20	0.38	1	95 BUCKINGHAM WAY NE-NS/	61	189	32%
5R Fulton Rapid	WESTWARD	63	6.0	54	1	1	MCALLISTER ST&VAN NESS A	542	630	86%
66 Quintara	SOUTHWARD	45	20.0	14	0.37	1	LAWTON ST&FUNSTON AVE NE	42	135	31%
67 Bernal Heights	SOUTHWARD	63	20.0	28	0.51	1	FOLSOM ST&25TH ST NW-NS/	83	189	44%
7R Haight Noriega Rapid	WESTWARD	63	10.0	44	0.81	1	HAIGHT ST&GOUGH ST NW-FS	263	378	70%
7X Noriega Express	WESTWARD	63	10.0	28	0.52	1	23RD AVE&JUDAH ST NW-NS/	170	378	45%
8B BART Shuttle	WESTWARD	63	20.0	19	0.35	1	MISSION ST&GENEVA AVE W-	57	189	30%
9R San Bruno Rapid	SOUTHWARD	63	8.6	43	0.79	1	POTRERO AVE&24TH ST SW-F	299	441	68%
14R Mission Rapid	SOUTHWARD	94	7.5	64	0.8	1	MISSION ST&24TH ST SW-FS	510	752	68%
14X Mission Express	SOUTHWARD	94	8.6	41	0.52	1	MISSION ST&5TH ST W-FS/B	289	658	44%
1AX California "A" Express	WESTWARD	63	10.0	53	0.98	1	PINE ST&MONTGOMERY ST NE	318	378	84%
1BX California "B" Express	WESTWARD	63	10.0	42	0.77	1	PINE ST&MONTGOMERY ST NE	250	378	66%
28R 19th Avenue Rapid	SOUTHWARD	63	10.0	20	0.38	1	19TH AVE&LINCOLN WAY SW-	122	378	32%
30X Marina Express	WESTWARD	63	7.5	48	0.89	1	SANSOME ST&WASHINGTON ST	386	504	77%
38R Geary Rapid	WESTWARD	94	4.0	70	0.88	1	GEARY BLVD&POWELL ST NW-	1051	1,410	75%
82X Levi Plaza Express	SOUTHWARD TO CALTRAIN	63	15.0	18	0.34	0	BEALE ST & HOWARD ST W-N	74	252	29%
83X Midtown Express	EASTWARD TO CALTRAIN	63	20.0	11	0.2	1	8TH ST & MARKET ST S-FS/	32	189	17%
8AX Bayshore Express	SOUTHWARD	94	6.0	59	0.74	1	STOCKTON ST&SACRAMENTO S	590	940	63%
8BX Bayshore Express	SOUTHWARD AND WESTWARD	94	6.0	57	0.71	1	STOCKTON ST&SACRAMENTO S	571	940	61%
31AX Balboa "A" Express	WESTWARD	63	10.0	43	0.8	1	PINE ST&MONTGOMERY ST NE	258	378	68%
31BX Balboa "B" Express	WESTWARD	63	12.0	37	0.69	1	PINE ST&MONTGOMERY ST NE	187	315	59%
38AX Geary "A" Express	WESTWARD	63	10.0	44	0.81	1	PINE ST&MONTGOMERY ST NE	261	378	69%
38BX Geary "B" Express	WESTWARD	63	10.0	47	0.86	1	PINE ST&MONTGOMERY ST NE	280	378	74%
F Market & Wharves	DOWN EMBARCADERO UP MARKET	60	6.0	79	1.55	1	Steuart Loop (from Wharf)	788	600	131%
J Church	SOUTHWARD	119	8.0	101	1	1	Duboce and Church	758	893	85%
K Ingleside (K/T)	SOUTHWESTWARD	119	8.0	142	1.4	1	Van Ness Station OB	1064	893	119%
L Taraval	SOUTHWESTWARD	238	9.0	124	0.61	2	Van Ness Station OB	1648	1,587	104%
M Oceanside	SOUTHWESTWARD	238	9.0	138	0.68	2	Van Ness Station OB	1836	1,587	116%
N Judah	SOUTHWESTWARD	238	6.5	117	0.58	2	Duboce and Church	2168	2,197	99%
T Third (K/T)	NORTH ON THIRD SOUTHWEST ON MARKET	119	9.0	116	1.13	1	Ember & Harr (from Bayview)	783	793	99%

ATTACHMENT C

SFMTA Transit System Service Categories, Routes, and Designations

TABLE 4

Short Range Transit Plan Service Categories and Routes

Category	Description	Routes
Rapid Bus	These heavily used bus lines include some of the busiest routes in the Muni network. With wider stop spacing, vehicles arriving frequently and transit priority enhancements along the routes, the Rapid bus routes delivers speed and reliability whether customers are heading across town, or simply traveling a few blocks.	5R, 9R, 14R, 28R, 38R
Frequent	These routes combined with Rapid Bus create the Transit Priority Network. They also include transit priority enhancements and frequent service but with more stops along the route than the Rapid bus system.	1, 7, 8, 9, 14, 22, 28, 30, 38, 47, 49
Grid	These citywide routes combine with the Transit Priority Network to form an expansive core grid that lets customers get to their destinations with no more than a short walk, or a seamless transfer. Depending on demand, they typically operate less frequently than the Rapid and Frequent routes.	2, 3, 5, 6, 10, 12, 18, 19, 21, 23, 24, 27, 29, 31, 33, 43, 44, 45, 48, 54
Connector	These bus routes are shorter than the Citywide grid routes and predominantly circulate through San Francisco's hillside residential neighborhoods, filling in gaps in coverage and connecting customers to major transfer hubs, including Muni Metro and BART stations.	25, 35, 36, 37, 39, 52, 55, 56, 57, 66, 67
Specialized	These routes augment existing service during specific times of day to serve a specific need, or serve travel demand related to special events. They include AM and PM commute service, weekend-only service, and special event trips to serve sporting events, large festivals and other San Francisco activities	1AX, 1BX, 7X, 8AX, 8BX, 14X, 30X, 31AX, 31BX, 38AX, 38BX, 41, 76X, 81X, 82X, 83X, 88, NX
Owl	These bus routes operate every 30 minutes from midnight to 6 am, ensuring a basic level of access across the City 24 hours per day.	5, 14, 22, 24, 25, 38, 44, 48, 90, 91, L bus, N bus

ATTACHMENT D

Screening Criteria for Transit Delay Analysis - Supplemental Notes

The following subsections provided additional details supporting the transit delay screening criteria based on a threshold of significance of 4 minutes, or half-headway, if less. Assumptions used to quantify factors that lead to transit delay were determined. The expected number of inbound project vehicle trips at each project driveway during the peak hour that would meet the 4 minute threshold of significance was calculated.

Assumptions		**Notes/Sources**
Delay to each bus from turning vehicle	5 seconds	Based on observed travel time of 63 northbound buses on Mission between 14th and 15th, which cut off buses with green time were delayed by 2.5 seconds. July 5, 2018 for 4840 Mission Transportation Study. 5 seconds is applied conservatively.
# of buses that would be delayed by just project vehicle turning movements to trip 4 minutes	48 buses	240 seconds/5 seconds
Most buses running on any street in one direction in a given hour	31 or one per every 116 seconds	Between 5 and 6 PM in the predominant commute direction, streets with high amounts of transit service: Geary (31 buses), Stockton (31 buses), 3rd Street (29 buses), California (25 buses), Otis/Mission (24 buses) and Van Ness (16 buses). SFMTA, October 5, 2017 email for 30 Otis.
Delay associated with 31 buses	2.6 minutes or 155 seconds	31 buses * 5 seconds

Expected number of buses that would arrive during 200 inbound vehicle trips accessing the curb or driveway	18	**Assumption** 1) The time interval is finite and measures as 10 seconds long (assuming the vehicle clears the ~50 foot conflict area in 10 seconds yields a speed of 3.4mph). 2) That simultaneous bus and vehicle arrival into the conflict area only last 10 seconds. 3) Because of 1) and 2), the peak 1-hour in the denominator is expressed as 360 10-second intervals. 4) We then divide the number of inbound vehicle trips by the 360 to express the probability of a 10-second interval having an inbound vehicle trip. 5) Multiply that by the most number of buses running on any street (31) in a given direction during the PM peak to arrive at the number of buses that would arrive at the same time an inbound vehicle trip would access the driveway.
Expected number of buses that would arrive during 300 inbound vehicle trips accessing the curb or driveway	26	
Expected number of buses that would arrive during 350 inbound vehicle trips accessing the curb or driveway	31	
Expected number of buses that would arrive during 400 inbound vehicle trips accessing the curb or driveway	35	

Assuming that 350 inbound vehicle trips and the associated increase in walking trips would also delays those buses by 1.4 minutes, we landed on this screening criteria.

ATTACHMENT E

Quantitative Approaches to Transit Delay

EXAMPLE 1

Transit Cooperative Research Program 165 methdology.

The following subsections provided additional details regarding quantitative approaches to transit delay analysis. Given that quantitative transit delay analysis could require substantial inputs and data, the department will determine the need for this analysis early in the transportation review process.

- The analysis will quantify to what extent the Project would increase delay experienced by transit on the analysis corridors through the study area. The transit delay analysis will also quantify to what extent transit travel times would be improved by the proposed expanded and upgraded transit-only lanes.
- Data inputs will be gathered at both the individual stop-level and at the corridor-level. Much of the input data has already been collected. SFMTA will provide stop level boarding and alighting data. Plus project and cumulative intersection turning movement volumes will be estimated using the Furnessing method based on SF CHAMP model link volumes.

  Inputs by Proposed Data Source

  - SFMTA Data Request
    - Average boarding volume per bus per stop
    - Average alighting volume per bus per stop
    - Scheduled buses per hour
    - Percent of boarders using farebox
    - Door opening and closing time
  - Observation/General Knowledge
    - Boarding door(s) [All]
    - Fare payment method [Smart Card]
    - Boarding height [Level, Stairs, Steep Stairs]
    - Standees present [Yes, No]
    - Number of doors
    - Available door channels
    - Number of loading areas
    - Loading area design [linear/non-linear]
    - Bus lane type
    - Running way type
    - Stop type [on-line/off-line]
    - Area type [metro CBD, metro non-CBD]
    - Stop location [near-side at signal, far-side at signal, influenced by signal, not influenced by signal]

- The consultant team will request feedback from SFMTA on all tool inputs prior to completing the analysis; although the tool provides default values for many operational measurements, SFMTA may have better, more locally-specific information that could improve accuracy of the tool. Example inputs include: max bus speed on the corridor during the PM peak hour, door opening and closing time, and percent of riders using the farebox.

- The tool outputs average route speed, in MPH, along the defined corridor. This will be easily be converted into travel time, in seconds. This tool will output changes in travel speed and changes in travel time. Therefore, the transit delay threshold, which is yet to be established for this project, should refer to one of these two metrics.

  <u>Outputs</u>

  - Step 1: Average Dwell Time (seconds)
  - Step 2: Bus Stop Capacity (bus/hr) AND Bus facility Capacity (bus/hr)
  - Step 3: Average Travel Speed (mi/hr)

EXAMPLE 2

Transit Delay Analysis Based on Three Components

The following paragraphs detail the methodology used to assess the delay that could potentially be experienced by transit vehicles along a study corridor.

Measures of Delay

The total transit vehicle delay was assumed to be comprised of the three following cumulative elements:

- **Transit Travel Delay** - The transit travel delay represented the additional time experienced by a transit vehicle as it travels between stops across one or more intersections in the corridor due to congestion caused by other vehicular traffic traveling parallel or perpendicular to the transit flow.
- **Transit Reentry Delay** - The transit reentry delay represented the wait for a sufficient gap in traffic flow to allow a bus to pull back into the travel lane.
- **Transit/Bicycle Delay** - The transit/bicycle delay represented the added time caused by the interaction between bicycles and transit vehicles as buses pull in or out of the bus stops.

The three components of the total transit delay were quantified as follows:

Transit Travel Delay

The transit travel delay was quantified using traffic operations data obtained from the intersection LOS calculations performed at study intersections along the corridor. The transit travel delay reflected the approach delay at the intersection for the direction of transit travel. For those intersections within a transit corridor that had not being analyzed for LOS purposes, the travel delay was estimated using the average of the delay (for each approach) for those locations where the intersection delay was available. Average approach delay for signalized and unsignalized intersections was estimated separately. Thus, the total transit travel delay in a transit corridor was calculated as the sum of all the approach delays at those intersections where LOS calculations were available, plus the number of signalized intersections multiplied by the average approach delay for signalized intersections, plus the number of unsignalized intersections multiplied by the average approach delay for unsignalized intersections. The transit travel delay was calculated separately for each direction of transit travel (i.e., eastbound and westbound, or northbound and southbound).

In several instances study intersections operate at LOS F, with average intersection delays above 80 seconds per vehicle and volume-to-capacity (v/c) ratios higher than 1.0, which represent the upper limits of the methodology used to estimate intersection delay. As shown in Figure V.A.3-3, p. V.A.3-16 adapted from the 2000 Highway Capacity Manual (Chapter 16, exhibit 16-14), that displays the relationship between the v/c ratio and the average intersection delay at a given intersection, the average delay increases very rapidly once a v/c value of 1.02 with an associated delay of 100 seconds is reached.

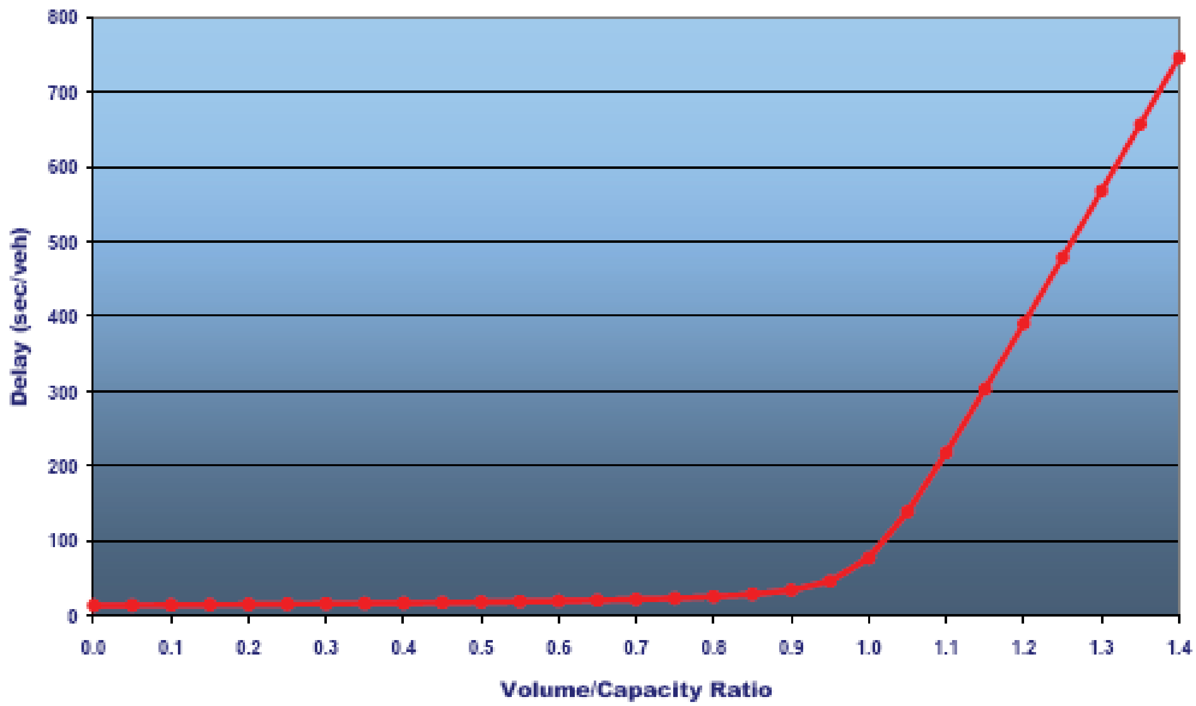


FIGURE V.A.3-3 SENSITIVITY OF VEHICLE DELAY TO VOLUME/CAPACITY RATIO

Source: 2000 Highway Capacity Manual, Chapter 16, exhibit 16-14.

As a result, the vehicle delay values estimated by the HCM methodology in those instances when the intersection operated at LOS F and had a v/c ratio well above 1.02, outside its range of application, would be unrealistically high. Thus, an adjusted methodology was used to calculate transit delays at those locations where the LOS degrades to F for the approach on which transit vehicles operate. The methodology had two components, one that was applied to each individual intersection on a transit corridor and another that was applied globally to each transit corridor.

Individual Intersection Delay Adjustments – Three possible cases occurred:

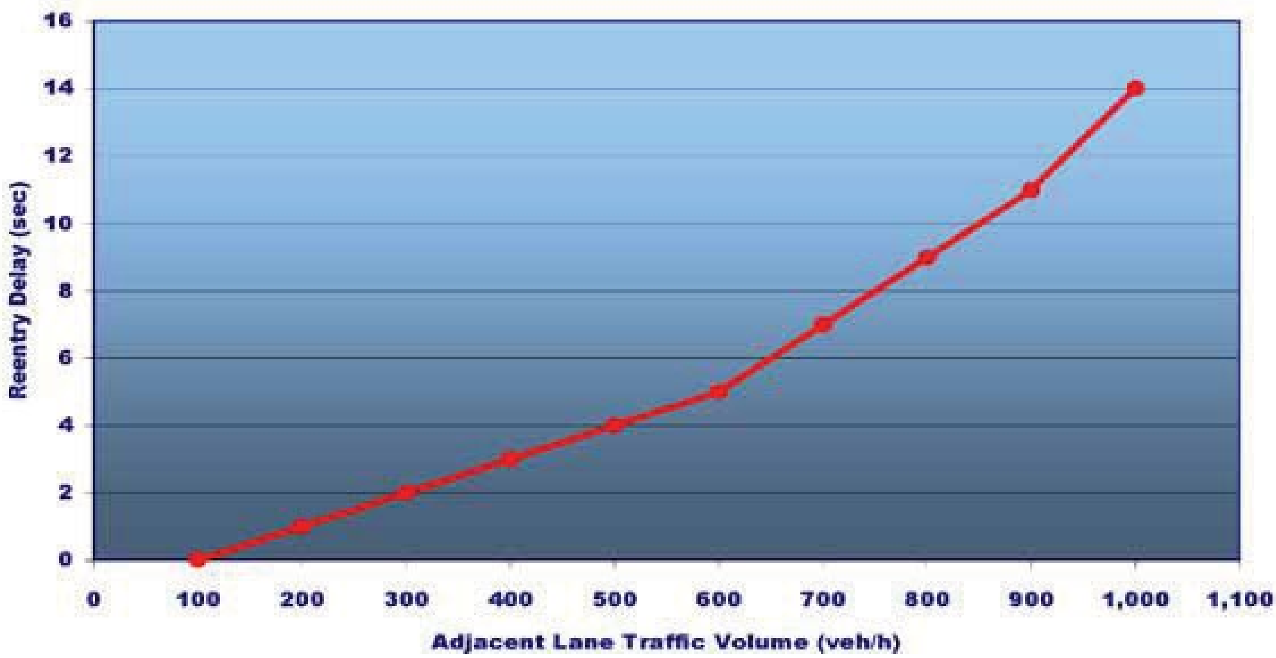
1. Intersection operated at LOS F with a calculated average delay of less than or equal to 100 seconds per vehicle – Used the average delay resulting from the application of the HCM methodology.
2. Intersection operated at LOS F with a calculated average delay greater than 100 seconds per vehicle and the v/c ratio is less than or equal to 1.02 – Assumed an additional 100 seconds of delay per vehicle to a base delay of 100 seconds. The total intersection delay in this case was 200 seconds per vehicle (100+100 = 200).
3. Intersection operated at LOS F with a calculated average delay greater than 100 seconds per vehicle and the v/c ratio was greater than 1.02 – Assumed an additional 140 seconds of delay to a base delay of 100 seconds. The total intersection delay in this case was 240 seconds per vehicle (100+140 = 240).

Corridor Delay Adjustments – Subsequently, additional adjustments were made to calculate the total delay along a transit corridor for those intersections that met any of the three cases noted above:

a. In those instances where there were consecutive intersections operating at LOS F on a transit corridor, the intersection delay calculations was increased by a factor of 10 percent per intersection. For example if there were three consecutive intersections in a transit corridor that operated at LOS F and met the criterion noted under case 3 above, the total delay for these three intersections was increased by 30 percent. In this case, the total intersection delay for these three locations became 312 seconds per vehicle (240 x 1.3 = 312).
b. In those instances where there were transit-only lanes or other meaningful transit priority treatments, the transit travel delay calculated from above was decreased. Adjustments were generally made based on individual transit lane situations and other factors such as lane configurations, external (e.g., freeway) traffic, etc. As general guidelines, at those locations where transit lanes were regularly enforced, the transit travel delay was assumed to be very small. At those locations where there was no strong transit lane enforcement, a 50 percent adjustment was made to decrease the calculated transit corridor delay.

Transit Reentry Delay

The transit reentry delay at a given transit stop was estimated using empirical data presented in the 2000 Highway Capacity Manual (HCM). Figure V.A.3-4, p. V.A.3-18, summarizes the HCM data. The total transit reentry delay in a transit corridor was calculated as the sum of the individual transit reentry delays at each bus stop. The transit reentry delay was calculated separately for each way of transit travel (i.e., eastbound and westbound, or northbound and southbound).



Transit/Bicycle Delay

Thorough analyses of the interaction between transit vehicles and bicycles operating on a parallel path do not exist.

The methodology described in the 2000 HCM as well as similar approaches developed by the Transit Cooperative Research Program (TCRP) and the Federal Transit Administration (FTA) to estimate transit service capacity reduction factors only evaluate a) the amount of motor vehicles traveling in the lane adjacent and to the left of a bus, and b) the number of vehicles turning right in front of a bus. In either case, the presence of bicycles is not accounted for in the calculation of the capacity reduction coefficients and it is assumed not quantifiable for the purposes of this study.

Implementation

The estimated total transit vehicle delay obtained following the methodology discussed above was then reviewed for reasonableness for each transit corridor. Any additional professional judgment factors used was also documented.

The average transit travel delay for the intersections without LOS delay data was estimated based on the average delay data obtained from those intersections where LOS calculation was conducted for the direction of transit travel. Similarly, the calculation of transit reentry delay required the estimation of traffic volumes on the adjacent travel lane using the data obtained from the intersection LOS calculations performed at study intersections along the corridor.

Transit Corridors without Study Intersections

There were some transit corridors without study intersections. No lane reductions or similarly substantial lane changes have been proposed on these corridors as part of the Bicycle Plan. Thus, the transit conditions on these corridors were evaluated qualitatively with a general description of the potential for transit delays.

ATTACHMENT F

Mitigation and Improvement Measures

1. MITIGATION MEASURES FOR LAND USE DEVELOPMENT PROJECTS LOCATED WITHIN AN AREA PLAN

Rincon Hill Plan

No applicable mitigation or improvement measures were identified.

Market and Octavia Neighborhood Plan

No applicable mitigation or improvement measures were identified.

Visitacion Valley Redevelopment Plan

No applicable mitigation or improvement measures were identified.

Balboa Park Station Area Plan

No applicable mitigation or improvement measures were identified.

Eastern Neighborhoods Rezoning and Area Plan

Mitigation Measure E-5: Enhanced Transit Funding: As a mitigation measure to adequately serve increased transit demand generated by the Eastern Neighborhoods rezoning, ensure that sufficient operating and capital funding is secured. Mitigation may be achieved through some or all of the following measures:

- Establish an impact fee to supplement the current Transit Impact
- Development Fee on all new residential and non-residential development in the Eastern Neighborhoods.
- Establish other fee-based sources of revenue such as, for example, parking benefit districts.
- Establish a congestion-charge scheme for downtown San Francisco, with all or a portion of the revenue collected going to support improved transit service on lines that serve downtown and the Eastern Neighborhoods.
- Seek grant funding for specific capital improvements from regional, state and federal sources.

Mitigation Measure E-6: Transit Corridor Improvements: As a mitigation measure to accommodate project transit demand, provide improved transit service in corridors that are affected by new transit trips generated by the Eastern Neighborhoods rezoning and area plans. Corridors may include Mission Street between 14th and Cesar Chavez Streets, 16th Street between Mission and Third Streets, Bryant Street or other parallel corridor between Third and Cesar Chavez Streets, a north- south corridor through portions of SoMa west of

Fifth Street, and service connecting Potrero Hill with SoMa and downtown. Mitigation may be achieved through some or all of the following measures:

- Reduce headways on transit lines serving the Eastern Neighborhoods, so that capacity utilization factors meet Muni's capacity utilization standard of 85 percent. Candidate lines for changes to headways include those along the east-west corridors in the Mission District, especially where these corridors connect with BART and connect with the Showplace Square/Potrero Hill and Central Waterfront neighborhoods (such as the 22-Fillmore and

48-0uintara), along the north-south corridors that serve the eastern half of the Mission District and Showplace Square/Potrero Hill neighborhoods (such as the 9-San Bruno and the 27-Bryant), and lines linking the Market Street subway with East SoMa, with Mission Bay, and with Showplace Square. On some lines where peak load demand would be the greatest, peak period headways may be reduced by half (for example, on the 22-Fillmore and 9-San Bruno).

- Decrease travel times and improve reliability on transit lines through a variety of means, including transit-only lanes, transit signal priority, transit "queue jumps," lengthening of spacing between stops, and establishment of limited or express service.
- On key routes expected to carry a significant portion of new ridership generated by the Eastern Neighborhood rezoning and area plans (such as the 22-Fillmore between Market Street and the Central Waterfront, and the 9-San Bruno along Potrero Avenue) develop "premium" service such as a Bus Rapid Transit line or a corridor enhanced with high-level transit preferential treatments.

Mitigation Measure E-7: Transit Accessibility: As a mitigation measure to enhance transit accessibility, establish a coordinated planning process to link land use planning and development in the Eastern Neighborhoods to transit and other alternative transportation mode planning in the eastern portion of the City. Mitigation may be achieved through some or all of the following measures:

- Implement the service recommendations from the Transit Effectiveness Project (TEP}, which is currently in progress. The TEP will focus on near- term and medium-term transit improvements.
- Implement recommendations of the Better Streets Plan that are designed to make the pedestrian environment safer and more comfortable for walk trips throughout the day, especially in areas where sidewalks, crosswalks and other realms of the pedestrian environment are notably unattractive and intimidating for pedestrians and discourage walking as a primary means of circulation. This includes traffic calming strategies in areas with fast-moving, one-way traffic, long blocks, narrow sidewalks and tow-away lanes, as may be found in much of South of Market.
- Implement building design features that promote primary access to buildings from transit stops and pedestrian areas, and discourage the location of primary access points to buildings through parking lots and other auto-oriented entryways.
- Implement key portions of the 2005 Bicycle Plan when it is ready for implementation, particularly along segments called out in the 2005 Bicycle Plan that close gaps in the bicycle network in the Eastern Neighborhoods.
- Develop Eastern Neighborhoods transportation implementation programs that manage and direct resources brought in through pricing programs and development-based fee assessments, as outlined above, to further the multimodal implementation and maintenance of these transportation network

Mitigation Measure E-8: Muni Storage and Maintenance: As a mitigation measure to ensure that Muni is able to service additional transit vehicles needed to serve increase demand generated by development in the rezoned areas in the Eastern Neighborhoods, provide maintenance and storage facilities. Mitigation may be achieved through some or all of the following measures:

- Provide a portion of the cost of expanding or constructing a bus facility that may be linked to the increased demand created by land use development pursuant to the Eastern Neighborhoods rezoning and area plans.
- Employ transit-preferential treatments for non- revenue service where transit vehicle volumes are high, and where access to these facilities may be impaired by other traffic.

Mitigation Measure E-9: Rider Improvements: As a mitigation measure to make it easy and comfortable to use transit service in the Eastern Neighborhoods, provide improved passenger information and amenities. Mitigation may be achieved through some or all of the following measures:

- Provide "Next Bus" type passenger information for all lines at key stops.
- Provide for facilities that allow cross-agency sharing of real time arrival information for transit vehicle operators where regional and local feeder transit agencies connect, but where operators do not have visual contact with each other or with the complete connection path that transferring passengers must make (for example, between BART and feeder buses, such as the 53-Southern Heights, which terminates at the 16th Street BART station and the 67-Bernal Heights, which terminates at the 24th Street BART station).
- Provide accurate and usable passenger information and maps.
- Provide adequate light, shelter and spaces to sit at all stops, with enhanced amenities at key stops.
- Encourage the consolidation of sheltered, well-lit, Next-Bus-served ground floor land uses open to the public for extended hours (e.g., cafes, bookstores and institutional building lobbies) within immediate sightline/walking distance of major surface transit stations and stops to allow waiting transit customers options to sit in sheltered comfort, and to increase pedestrian activity and casual monitoring around the transit stations.

Mitigation Measure E-10: Transit Enhancement: As a mitigation measure to minimize delays to transit vehicles due to projected traffic congestion, provide improved transit service in corridors that are subject to traffic congestion induced at least in part by the land use growth due to Eastern Neighborhoods rezoning and area plans. Mitigation may be achieved through some or all of the following measures:

- Reduce headways on transit lines serving Eastern Neighborhoods, including those corridors that connect with BART, AC Transit, SamTrans, Golden Gate Transit and Caltrain, to reduce the overall transit travel time for regional trips that when made by automobiles add to the congestion in the street grid and freeway ramp system in the Eastern Neighborhoods.
- Prioritize and expand the use of Transit Preferential Street technologies to prioritize transit circulation in the Eastern Neighborhoods.
- Improve and expand the use of programs that increase transit rider awareness, real-time connectivity and transfer reliability, such as Next Bus, and the display of schedules and maps.

Treasure Island and Yerba Buena Island Redevelopment Plan

No applicable mitigation or improvement measures were identified.

Glen Park Community Plan

No applicable mitigation or improvement measures were identified.

Transit Center District Plan and Transit Tower

M-TR-3a: Installation and Operation of Transit-Only and Transit Queue-Jump Lanes: To reduce or avoid the effects of traffic congestion on Muni service, at such time as the transit-vehicle delay results in the need to add additional vehicle(s) to one or more Muni lines, the Municipal Transportation Agency (MTA) could stripe a portion of the approach lane at applicable intersections to restrict traffic to buses only during the p.m. peak period, thereby allowing Muni vehicles to avoid traffic queues at certain critical intersections and minimizing transit delay. Each queue-jump lane would require the prohibition of parking during the p.m. peak period for the distance of the special lane. For the 41 Union, MTA could install a p.m. peak-hour transit-only lane along Beale Street approaching and leaving the intersection of Beale/Mission Street, for a distance of 150 to 200 feet. Five parking spaces on the west side of Beale Street north of Mission Street could be eliminated when the transit lane is in effect to allow for a right-turn pocket. MTA could also install a p.m. peak-hour queue-jump lane on the eastbound Howard Street approach to the intersection of Beale/ Howard Streets, for a distance of 100 feet. If the foregoing were ineffective, MTA could consider re-routing the 41 Union to less-congested streets, if available, or implementing actions such as providing traffic signal priority to Muni buses.

For the 11-Downtown Connector and 12 Folsom Pacific, MTA could install a p.m. peak-hour queue- jump lane on the southbound Second Street approach to the intersection to the intersection of Second/Folsom Streets, for a distance of approximately 150 feet. When the lane is in effect, five on-street parking spaces on the west side of Second Street north of Folsom Street could be eliminated, as well as a portion of the southbound bicycle lane approaching the intersection. If the foregoing were ineffective, MTA could consider re-routing the 11-Downtown Connector and 12 Folsom to less-congested streets, if available, or implementing actions such as providing traffic signal priority to Muni buses.

The MTA could also evaluate the effectiveness and feasibility of installing an eastbound transit-only lane along Folsom Street between Second and Third Streets, which would minimize delays incurred at these intersections by transit vehicles. The study would create a monitoring program to determine the implementation extent and schedule, which may include conversion of one eastbound travel lane into a transit-only lane.

M-TR-3b: Exclusive Muni Use of Mission Street Boarding Islands: To reduce or avoid conflicts between Muni buses and regional transit service (Golden Gate Transit and SamTrans) using the relocated transit-only center lanes of Mission Street between First and Third Streets, MTA could reserve use of the boarding islands for Muni buses only and provide dedicated curbside bus stops for regional transit operators. Regional transit vehicles would still be allowed to use the transit-only center lanes between stops, but would change lanes to access the curbside bus stops. This configuration would be similar to the existing Muni stop configuration along Market Street, where two different stop patterns are provided, with each route assigned to only one stop pattern.

M-TR-3c: Transit Improvements on Plan Area Streets: To reduce or avoid the effects of traffic congestion on regional transit service operating on surface streets (primarily Golden Gate Transit and SamTrans), MTA, in coordination with applicable regional operators, could conduct study the effectiveness and feasibility of transit improvements along Mission Street, Howard Street, Folsom Street, First Street, and Fremont Street to reduce delays incurred by transit vehicles when passing through the Plan area. The study would examine a solution including, but not limited to the following:

- Installation of transit-only lanes along Howard Street and Folsom Street, which could serve both Muni buses (e.g., 12 Folsom-Pacific) and Golden Gate Transit buses heading to / from Golden Gate's yard at Eighth and Harrison Streets.
    - Extension of a transit-only lane on Fremont Street south to Howard Street and installation of transit-actuated queue-jump phasing at the Fremont Street / Mission Street intersection to allow Golden Gate Transit buses to make use of the Fremont Street transit lane (currently only used by Muni vehicles); and
    - Transit signal priority treatments along Mission, Howard, and Folsom Streets to extend major- street traffic phases or preempt side-street traffic phases to reduce signal delay incurred by SamTrans and Golden Gate Transit vehicles.
    - Golden Gate Transit and SamTrans could consider rerouting their lines onto less-congested streets, if available, in order to improve travel times and reliability. A comprehensive evaluation would need to be conducted before determining candidate alternative streets, considering various operational and service issues such as the cost of any required capital investments, the availability of layover space, and proximity to ridership origins and destinations.

M-TR-3d: Increased Funding to Offset Transit Delays: Sponsors of development projects within the Plan area could be subject to a fair share fee that would allow for the purchase of additional transit vehicle(s) to mitigate the impacts on transit travel time. In the case of Muni operations, one additional vehicle would be required. For regional operators, the analysis also determined that on-street delays could require the deployment of additional buses on some Golden Gate Transit and SamTrans routes.

- Funds for the implementation of this measure are expected to be generated from a delineated portion of the impact fees that would be generated with implementation of the draft Plan, and are projected to be adequate and sufficient to provide for the capital cost to purchase the additional vehicle and facility costs to store and maintain the vehicle.

M-TR-3e: Increased Funding of Regional Transit: Sponsors of development projects within the Plan area could be subject to one or more fair share fees to assist in service improvements, such as through the purchase of additional transit vehicles and vessels or contributions to operating costs, as necessary to mitigate Plan impacts. These fee(s) could be dedicated to Golden Gate Transit, North Bay ferry operators, AC Transit, BART, and/or additional North Bay and East Bay transit operators. Depending on how the fee(s) were allocated, Caltrain and SamTrans might also benefit, although lesser impacts were identified for these South Bay operators.

Funds for the implementation of this measure are expected to be generated from a delineated portion of the impact fees that would be generated with implementation of the draft Plan, and are projected to be adequate and sufficient to provide for the capital cost to purchase the additional vehicle and facility costs to store and maintain the vehicle.

Western SoMa Community Plan

M-C-TR-2: Impose Development Impact Fees to Offset Transit Impacts: Additional transit capacity would be required in order to reduce the corridor impacts identified above for the Draft Plan, and reduce capacity utilization to levels below the 85 percent capacity utilization threshold. In order to increase capacity, however, additional funding would have to be identified, either from public or private sources, or a combination, thereof, potentially including project sponsors of individual development projects within the Draft Plan Area. Sponsors of development projects within the Draft Plan Area could be subject to a fair share fee that would pay for augmenting transit capacity. These funds would be used to purchase and operate additional transit vehicles, or if necessary, to reduce the corridor impacts, execute large-scale upgrades to transit network capacity.

Adoption of the Western SoMa Community Plan is anticipated to be accompanied by development impact fees, such as those adopted for the Eastern Neighborhoods Area Plan and Market/Octavia Area Plan. Funds are expected to be generated from a delineated portion of the impact fees that would be generated with implementation of the Draft Plan. However, it is not known whether or how much additional funding would be generated for transit service improvements, and no other definite funding sources have been identified. As a result, the Draft Plan's contribution to the 2030 Cumulative capacity utilization exceedances for Muni operations would remain significant and unavoidable.

Central SoMa Plan

Mitigation Measure M-TR-3a: Transit Enhancements: The following are City actions that would reduce local and regional transit impacts associated with implementation of the Central SoMa Plan and proposed street network changes.

- **Enhanced Transit Funding**. To accommodate project transit demand, the City shall ensure that sufficient operating and capital funding is secured, including through the following measures:

- Establish fee-based sources of revenue such as parking benefit districts.
- Establish a congestion-charge scheme for downtown San Francisco, with all or a portion of the revenue collected going to support improved local and regional transit service on routes that serve Downtown and the Central SoMa Plan Area.
- Seek grant funding for specific capital improvements from regional, State and federal sources.

- **Transit Corridor Improvement Review.** During the design phase, the SFMTA shall review each street network project that contains portions of Muni transit routes where significant transit delay impacts have been identified (routes 8 Bayshore, 8AX Bayshore Express, 8BX Bayshore Express, 10 Townsend, 14 Mission, 14R Mission Rapid, 27 Bryant, 30 Stockton, 45 Union-Stockton, and 47 Van Ness). Through this review, SFMTA shall incorporate feasible street network design modifications that would meet the performance criteria of maintaining accessible transit service, enhancing transit service times, and offsetting transit delay. Such features could include, but shall not be limited to, transit-only lanes, transit signal priority, queue jumps, stop consolidation, limited or express service, corner or sidewalk bulbs, and transit boarding islands, as determined by the SFMTA, to enhance transit service times and offset transit delay. Any subsequent changes to the street network designs shall be subject to a similar review process.
- **Transit Accessibility**. To enhance transit accessibility, the Planning Department and the SFMTA shall establish a coordinated planning process to link land use planning and development in Central SoMa to transit and other alternative transportation mode planning. This shall be achieved through some or all of the following measures:
  - Implement recommendations of the Better Streets Plan that are designed to
    make the pedestrian environment safer and more comfortable for walk trips throughout the day, especially in areas where sidewalks and other realms of the pedestrian environment are notably unattractive and intimidating for pedestrians and discourage walking as a primary means of circulation. This includes traffic calming strategies in areas with fast-moving, one-way traffic, long blocks, narrow sidewalks and towaway lanes, as may be found in much of the Central SoMa area.
  - Implement building design features that promote primary access to buildings from transit stops and pedestrian areas, and discourage the location of primary access points to buildings through parking lots and other auto-oriented entryways.
  - Develop Central SoMa transportation implementation programs that manage and direct resources brought in through pricing programs and development-based fee assessments, as outlined above, to further the multimodal implementation and maintenance of these transportation improvements.
- **Muni Storage and Maintenance**. To ensure that Muni is able to service additional transit vehicles needed to serve increased demand generated by development in Central SoMa, the SFMTA shall provide maintenance and storage facilities. In 2013, the SFMTA prepared a Real Estate and Facilities Vision for the 21st Century report.1

  The document provides a vision for addressing Muni's storage and maintenance needs, particularly in light of substantial growth in fleet as well as changes in the fleet composition.

Mitigation Measure M-TR-3b: Boarding Improvements: The SFMTA shall implement boarding improvements such as low floor buses and pre-payment that would reduce the boarding times to mitigate the impacts on transit travel times on routes where Plan ridership increases are greatest, such as the 8 Bayshore, 8AX/8BX Bayshore Expresses, 10 Townsend, 14 Mission, 14R Mission Rapid, 27 Bryant, 30 Stockton, 45 Union-Stockton, and 47 Van Ness routes. These boarding improvements, which would reduce delay associated with passengers boarding and alighting, shall be made in combination with Mitigation Measures M-TR-3c, Upgrade Transit-only Lanes on Third Street, M-TR-3d, Signalization and Intersection Restriping at Townsend/Fifth Streets, and M-TR-3e, Implement Tow-away Lanes on Fifth Street, which would serve to reduce delay associated with traffic congestion along the transit route.

Mitigation Measure M-TR-3c: Signalization and Intersection Restriping at Townsend/Fifth Streets: The SFMTA shall design and construct a new traffic signal at the intersection of Townsend/Fifth Streets, and reconfigure the Townsend Street eastbound approach to provide one dedicated left-turn lane (with an exclusive left turn phase) adjacent to a through lane. This reconfiguration would require restriping of the two existing travel lanes at the eastbound approach to this intersection.

Mitigation Measure M-TR-3d: Implement Tow-away Transit-only Lanes on Fifth Street: The SFMTA shall implement a northbound tow-away transit-only lane on Fifth Street between Townsend and Bryant Streets during the p.m. peak period to mitigate the impacts on transit travel times on the 47 Van Ness. This peak period transit-only lane can be implemented by restricting on-street parking (about 30 parking spaces) on the east side of Fifth Street between Townsend and Bryant Streets during the 3:00 to 7:00 p.m. peak period.

2. MITIGATION AND IMPROVEMENT MEASURE EXAMPLES FOR POTENTIALLY HAZARDOUS CONDITIONS

The following lists the typical types of measures that can mitigate or lessen impacts of potentially hazardous conditions to transit.

Potentially Hazardous Conditions	Measures
Inadequate Sightlines and visibility	» Remove or relocate bus zone, bus stop shelter, loading, or parking spaces to increase sightline(s) and visibility; » Establish safe sight distances (e.g., daylighting, relocation of curb cuts or new structures) » Provide on-site signs promoting safety for people walking, bicycling, driving, or riding transit (e.g., signs at the garage exit reminding people driving to slow down and yield to people walking on the sidewalk), including where the slope or curvature of the right-of-way or driveway results in inadequate sightlines;
Inadequate transit facilities and/or potential conflicts with transit operations	» Improve or provide adequate transit facilities adjacent to the project site, and/or network improvements such as transit bulbouts, between the project site and intersections, adjacent transit stations/stops, and other major destinations to meet Better Street Plan policies; » Relocate convenient off-street or on-street loading space(s) away from travel lane which transit operates in or at a transit stop/station location » Coordinate freight and service deliveries to reduce conflicts with transit facilities adjacent to on-site and off-site loading zones;
Hazardous vehicle turning movements	» Signalize vehicle turning movements or restrict vehicle movements on red; » Employ Queue Abatement Measures or pursue design modifications to proposed garage or driveway entrances/exits to accommodate queuing vehicles (see next page for Queue Abatement Sample Language)

3. MITIGATION AND IMPROVEMENT MEASURE EXAMPLES FOR TRANSIT DELAY

Based on the report of delay identified, the following lists the typical SFMTA Travel Time Reduction Proposal Time-Savings (TTRP) Measures that could address transit delay. (See next page for definitions of TTRP measures).

Delay Type Addressed	TTRP Measures	Estimated Travel Time Savings (in seconds unless otherwise noted)
Traffic congestion delay	» Establish transit-only lanes	» 30
	» Establish transit queue jump/bypass lanes	» 5 – 30
	» Establish dedicated turn lanes	» 5
	» Widen travel lanes through lane reductions	» 5 – 30
	» Implement turn restrictions	» 5 - 30
	» Widen travel lanes through parking restrictions	» 5
	» Install traffic signals at all-way stop-controlled intersections	» 5 – 30
	» Replace all-way stop-controlled intersections with traffic calming measures	» 10 – 30
	» Install pedestrian bulbs	» 2
Passenger boarding/ alighting delay	» Install transit boarding islands	» 5
Re-entry delay	» Install transit bulbs	» 5
	» Install transit boarding islands	» 5
	» Convert flag stops to transit zones	» 5
	» Install pedestrian refuge islands	» 5
Other/multiple	» Remove or consolidate stops	» 5-30
	» Optimize transit stop locations at intersections	» 15-30
	» Extend transit zone to accommodate two vehicles at a time	» 2

Source: SFMTA Transportation Engineering. “Travel Time Reduction Proposals: Transit Preferential Toolkit,” December 6, 2012

TRANSIT PREFERENTIAL TOOLKIT MEASURE DEFINITIONS

Measure	Definition
» Establish transit-only lanes	» "A transit-only lane is a travel lane that is dedicated for the exclusive use of transit vehicles."
» Establish transit queue jump/bypass lanes	» "A transit queue jump/bypass lane allows transit vehicles to bypass general traffic stopped at a signalized intersection and move through the intersection with an exclusive traffic signal phase ahead of general traffic."
» Establish dedicated turn lanes	» "Dedicated turn lanes can reduce transit travel times by providing a dedicated space for turning vehicles to queue at an intersection approach without blocking the thru-movement of transit vehicles and other traffic."
» Widen travel lanes through lane reductions	» "Widening travel lanes can decrease transit travel times and improve reliability by reducing friction with other vehicles, eliminating the need for buses and other large vehicles to straddle two travel lanes and providing additional space for maneuvering around parking vehicles."
» Implement turn restrictions	» "Turn restrictions can reduce transit travel times by preventing turning vehicles from blocking the thru-movement of transit vehicles and other traffic."
» Widen travel lanes through parking restrictions	» "Widening travel lanes through parking restrictions can reduce transit travel times by eliminating the need for buses and other large vehicles to straddle two travel lanes, by reducing delays associated with parking maneuvers and by providing additional space for through-moving transit vehicles."
» Install traffic signals at all-way stop-controlled intersections	» "Replacing all-way STOP sign intersection controls with traffic signals."
» Replace all-way stop-controlled intersections with traffic calming measures	» "Removing STOP signs and adding traffic calming measures at intersection approaches with transit service can reduce transit travel time along a corridor by allowing transit vehicles to proceed slowly through intersections without coming to a complete stop."

TRANSIT PREFERENTIAL TOOLKIT MEASURE DEFINITIONS

Measure	Definition
» Install pedestrian bulbs	» "Pedestrian bulbs are sidewalk extensions at non-transit stop intersection corners, typically about the same width as the adjoining parking lane."
» Install transit boarding islands	» "Transit boarding islands are raised islands within the street that allow vehicles to use a center lane within the roadway to pick-up and drop-off customers at transit stops.""Transit bulbs are sidewalk extensions at the location of a transit stop, typically about the same width as the adjoining parking lane."
» Convert flag stops to transit zones	» "Converting flag stops to transit zones allows buses to pull into the zone to serve customers directly at the curb, rather than from the street."
» Install pedestrian refuge islands	» "Pedestrian refuge islands are raised island in the street that provide space for pedestrians to wait while crossing a street."
» Remove or consolidate stops	» "Consolidating transit stops involves removing two adjacent transit stops and establishing a new transit stop at an intermediate location."
» Optimize transit stop locations at intersections	» "Placement of a transit stop either near or far-side at an intersection to reduce STOP sign or traffic signal delay."
» Extend transit zone to accommodate two vehicles at a time	» "Providing sufficient space at transit stops to allow all doors of transit vehicles to align with curb or boarding island and to allow multiple transit vehicles to serve stops concurrently."

TRANSPORTATION IMPACT ANALYSIS GUIDELINES

APPENDIX J
EMERGENCY ACCESS

San Francisco Planning

Appendix J
Emergency Access Memorandum

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Date: February 14, 2019
Case No: 2015-012094GEN
Prepared by: Lana Wong and Jenny Delumo
Reviewed by: Manoj Madhavan and Wade Wietgrefe
RE: **Transportation Impact Analysis Guidelines Update, Emergency Access**

INTRODUCTION

This memorandum updates the prior guidance provided in the Transportation Impact Analysis Guidelines for the emergency access[1] topic. The department prepared this memorandum in consultation with stakeholders (e.g., city and county agencies, consultants). The department will issue memoranda that provide updates to other topics (e.g., public transit, loading) within the guidelines. When the department issues a memorandum about a topic, it will supersede existing guidance regarding that topic.

This memorandum provides specific guidance on the methodology and impact analysis required for the emergency access transportation topic. Overall guidance on conducting transportation analysis for environmental review, including developing the project description, how to address the significance criteria, methodology, and impact analysis, is in the Transportation Impact Analysis Guidelines. The guidance provided herein assumes a land use development project located outside of an area plan that requires a transportation study. Guidance on other types of projects, such as projects located in an area plan or infrastructure projects, is discussed below under the "Other" subsection. The department may use this guidance for multiple projects, but the department has discretion on how to apply the guidance on a project-by-project basis.

The organization of the memorandum is as follows:

1) Project Description
2) Significance Criteria
3) Existing and Existing plus Project
   a) Methodology
   b) Existing Baseline
   c) Impact Analysis
4) Cumulative
   a) Methodology
   b) Impact Analysis
5) Other (covers different types of projects)

[1] This memorandum addresses impacts to emergency access. Emergency access refers to the following emergency service operators: Fire Department, Police Department, and ambulance services.

Attachments to this memorandum are under separate cover and are attached to the end of this memorandum. The department may update the attachments to the memoranda more frequently than the body of the memoranda.

PROJECT DESCRIPTION

Refer to the Transportation Impact Analysis Guidelines Appendix A, Tables 1-3, for a list of the typical physical, additional physical, and programmatic features for existing and existing plus project conditions, as applicable. The geographic extent of these features must, at a minimum, include the project's frontage and may include the entirety of the project's block.

Appendix A, Table 4 of the guidelines provides a non-exhaustive list of approvals from agencies other than the planning department that a project sponsor may need to obtain for the project description features described in the guidelines. The San Francisco Department of Building Inspection, the San Francisco Fire Department, the San Francisco Public Utilities Commission, and Public Works reviews projects for compliance with city and state regulations such as building standards, fire protection, water connections for fire hydrants, and hydrology requirements for adequate water pressure. As part of building permit review the San Francisco Fire Department assesses the ability of fleet vehicles to access the public right of way on new or altered streets and from their facilities, or whether emergency service operators have adequate access to a building's entrances and exits from the curb line.

In addition, the San Francisco Fire Department, and other city agencies as part of the Transportation Advisory Staff Committee, reviews project changes in the public right-of-way.

Attachment A of this memorandum includes examples of figures that illustrate how to graphically represent emergency access conditions.

SIGNIFICANCE CRITERION

San Francisco Administrative Code Chapter 31 directs the department to identify environmental effects of a project using as its base the environmental checklist form set forth in Appendix G of the California Environmental Quality Act (CEQA) Guidelines. As it relates to emergency access, Appendix G states: "would the project result in inadequate emergency access?" The department uses the following significance criterion to evaluate that question: A project would have a significant impact if it: would result in inadequate emergency access.[2]

EXISTING AND EXISTING PLUS PROJECT

Methodology

This section describes the typical methodology required to address the significance criteria. The methodology section identifies the collection, generation, and approach to analyze data. The department will determine whether to adjust the methodology as necessary to inform the analysis.

The guidelines provide direction on the typical geographical area and period required for analysis. Additional guidance on the typical methodology for evaluating existing and existing plus project conditions for this topic, including data collection, is provided below. This section also indicates in bracketed text [ ] whether the presentation of typical methodological elements in other sections of a transportation study (e.g., baseline, impact analysis) could occur in text, a figure, and/or a table (see

[2] Emergency service operator facilities include police departments, fire departments, hospitals, or other public safety buildings for emergency vehicle fleets.

Appendix A of the guidelines for examples of typical tables and Attachment A of this memorandum for examples of emergency access-related figures).

Existing Conditions

The following identifies the typical methodology assessing existing conditions.

Counts

The methodology may include prior counts collected from other studies or sources combined with (e.g., an average of three different dates with counts at the same intersection, global positioning system user data) or in isolation from the counts collected for the project. The use of prior counts must be justified, in consultation with the department. Typically, the use of prior counts may occur if these counts have not changed substantially under existing conditions (e.g., due to lack of new development, circulation changes, or travel patterns). The methodology shall include counts of emergency vehicles entering and exiting the emergency service operator facility, if the project site is an emergency service operator facility or is near one. [text, table]

Visual Analysis with Recorded Observations

Data collection for the project should include a site visit for a visual analysis, with recorded observations of features listed in the project description and a description of the weather conditions. In addition, the site visit must record any existing potential, or observed instances of vehicles queuing or blocking emergency vehicles or existing, conditions that may conflict with emergency vehicles movements such as the presence of transit overhead wires, narrow roads or alleys, or tight turning movements.

Street Design Characteristics

Obtain the following general characteristics of streets within the study area:

- Location and type of traffic control devices (e.g., stop signs and signals) [text, figure]
- Number of travel lanes by type (e.g., mixed flow, parking, bicycle, transit-only, etc.) [text, figure]

In addition, obtain the following additional characteristics of streets within the study area to the extent applicable:

- Width of travel lanes, parking lanes, and bike lanes [text, figure]
- Number of travel lanes by type at intersections (if different from midblock) [text, figure]
- Cross sections showing location and dimensions of travel lanes, parking lanes, bicycle facilities, and sidewalks on the street(s) adjacent to the project frontage [figure]

Emergency Service Operator Facilities and Turning Movements

Obtain the following additional information with the study area:

- Emergency service operator facilities [text, figure]
- Turning movements for emergency vehicles [figure]

Existing plus Project Conditions

The following identifies the typical methodology for assessing existing plus project conditions.

Travel Demand Analysis

Estimate the number of people driving from the project. [text, table] In addition, the methodology will distribute and assign the project's vehicle trips to roadways, intersections, loading zones, and driveways to the extent applicable. Describe the project's entrance and exit locations and emergency service operator facilities within the project study area. [text, figure]

Inadequate Emergency Access

Use the travel demand analysis and project elements to determine if the project would potentially cause inadequate emergency access. The methodology should assess to the extent applicable:

- The ability of facilities on or near the project site to accommodate emergency service operators [text]
- Any changes to the public right-of-way that would result in changes to turning movements or alter the ability of emergency service operators to access streets and buildings in the project study area [text, figure]
- The ability of emergency service operator facilities near the project site to conduct operations that could interact with project trips [text]

Existing Baseline

Refer to the guidelines for direction on including existing baseline in transportation studies.

Impact Analysis

This section ties the project description, methodology, and baseline for existing conditions together to address the significance criteria for existing plus project conditions. This section addresses the typical approach for the impact analysis and provides more details related to emergency access impacts for emergency service operators. The impact analysis section should present a format (text, figure, or table) consistent with earlier sections of this memorandum for easy comparison.

The impact analysis must address whether the project would result in inadequate emergency access for emergency service operators. Too many factors mentioned in the methodology affect inadequate emergency access conditions. Instead, the department will determine significance on a project-by-project basis. Refer to the guidelines for direction on what to consider when conducting the existing plus project impact analysis and how to present the findings.

Inadequate Emergency Access

The following examples are some of the circumstances that may result in inadequate emergency access. This is not an exhaustive list of circumstances, under which, inadequate emergency access impacts would occur:

- A project would conflict with adopted city code regarding street widths and turning movements by modifying curb lines (e.g., sidewalk widening, bulb-outs, open spaces, mid-block crossings) that would substantially affect emergency service operator access (e.g., un-mountable curbs)
- A project would create new publicly-accessibility rights-of-way that restrict all emergency service operator access
- A project would install or relocate live overhead lines making off-site buildings that could require use of aerial ladder operations during emergencies inaccessible to emergency service operators
- A project would permanently add a physical barrier[3] to a street restricting all vehicles, including emergency service operators, which would impede access to the surrounding area

[3] Permeant physical barriers refer to unmovable features that would not allow for emergency service operator vehicle access during an emergency (e.g., walls, inoperable bollards). Permanent physical barriers do not refer to physical features that an emergency service operator vehicle could mount or navigate around during an emergency (e.g., curbs such as raised bicycle facility or bulb out, a parking lane, cones, safe hit posts, operable bollards).

- A project would close a street to all vehicles, including emergency service operators, which would impede access to the surrounding area
- A project would locate a garage entrance/exit on the same street as an emergency service operator facility and would add a substantial number of vehicle trips that could not be accommodated[4] by the garage entrance/exit resulting in queuing on the street near the emergency service operator's facility thereby blocking access to the facility

CUMULATIVE

Methodology

The guidelines detail the typical methodology for cumulative analysis, including the geographical area, period, cumulative projects, and adjustments (refer to Appendix B) under cumulative conditions. The cumulative section in transportation studies must present (text, figure, or table) the applicable elements included in the methodology.

Impact Analysis

This section ties the methodology and description of cumulative conditions together to address the significance criterion for cumulative conditions. Refer to the guidelines for direction on what to consider when conducting the cumulative impact analysis and how to present the findings. The same examples of the types of circumstances that could result in an inadequate emergency access impact that were provided for existing plus project conditions apply here, except for cumulative conditions.

OTHER

The guidance provided in this memorandum assumes a land use development project located outside of an area plan that requires a transportation study. This section describes the type of additional or different information that may be necessary to address emergency access impacts for the following circumstances: land use development project located within an area plan, an area plan, or infrastructure project (which may be located in a different county than San Francisco).

Land Use Development Project Located within an Area Plan

For projects that are consistent with an area plan for which an environmental impact report (EIR) was certified, pursuant to CEQA guidelines section 15183, the assessment must limit its analysis to such conditions specified in that section. The guidelines provide direction on how to analyze a land use development project in an area plan and a list of area plan EIRs that have been certified as of February 2019.

Attachment B of this memorandum identifies mitigation and improvement measures from area plan EIRs related to emergency access. The department will list emergency access-related mitigation and improvement measures from future area plan EIRs in Attachment B after the Planning Commission or Board of Supervisors certifies those EIRs.

Area Plans

For area plans, the assessment will typically use the significance criterion identified herein. The following subsections describe the type of additional or different information that may be necessary to address emergency access impacts for project description, methodology, and impact analysis. For area plans that

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[4] Accommodate refers to design of the facility (e.g., can vehicles be accommodated without queuing based upon throat length, gate location, etc.) and not the capacity (e.g., does the number of spaces accommodate the demand) of the facility as many variables affect the demand to and from a facility.

also include infrastructure changes (e.g., street redesigns), please see the Infrastructure Project subsection for additional or different information that may be necessary.

Project Description

Typically, the department conducts an analysis to estimate the amount of future development that could occur in the plan area as a result of its implementation. The department typically does not have all the project description details described herein. However, the project description may include policies that may relate to the methodology and impact analysis (e.g., location and dimensions of proposed bike lanes, removal of on-street parking, sidewalk widenings or other proposed street network changes).

Methodology

The assessment will typically use the same methodology identified herein, except the methodology will use a larger geographical study area and require less site-specific information (e.g., driveway locations at each site) except to document circumstances where vehicles may not be allowed (e.g., curb cut restrictions). While an individual project may not require some elements listed in the Existing and Existing plus Project Methodology subsection, area plans typically will include all these elements. The department should select sidewalks, streets, and intersections most impacted by the area plan to represent the impacts that may occur at other locations. In addition, the analysis should identify the location of any emergency service operator facilities within the study area.

Impact Analysis

For analysis of area plans, assess the projected amount of growth and infrastructure changes associated with the rezoning within the area plan boundaries. The analysis of potentially inadequate emergency access impacts should be similar to that described under the Existing plus Project and Cumulative Impact Analysis subsections. The analysis should assume individual land use development projects within the area plan would be subject to requirements related to property specific infrastructure changes (e.g., Better Streets Plan).

While individual projects may result in more localized emergency access impacts, an area plan could generate a substantial volume of vehicle traffic which could lead to emergency access impacts at the area plan level. The analysis of emergency access impacts in area plans should analyze the vehicle trips that could be generated across the plan area in combination with infrastructure changes (e.g., street redesigns) proposed as part of the area plan. This would typically be a qualitative analysis. Given the potential time gap between land use development and completion of infrastructure changes, the analysis should also discuss the potential short-term effects of that potential time gap. Examples of circumstances that would result in significant impacts are described under the Existing Plus Project Impact Analysis subsection.

Infrastructure Project

For infrastructure projects (e.g., new roads, bridge repair, sewer and water lines, rail service, roadway modifications, bicycle lanes etc.), the assessment of the project description, significance criteria, and impact analysis should be similar to private development projects. The analysis typically does not require trip generation analysis as infrastructure projects usually do not generate trips.[5] However, some infrastructure projects may induce trips, such as the addition of through lanes on existing or new highways or streets.[6] In

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[5] Governor's Office of Planning and Research, *Revised Proposal on Updates to the CEQA Guidelines on Evaluating Transportation Impacts in CEQA*, January 20, 2016.

[6] Generally, minor transportation projects would not result in additional trips. Examples include, but are not limited to, rehabilitation, maintenance, and repair of transportation infrastructure; installation, removal or reconfiguration of non-through traffic lanes and

addition, infrastructure projects may generate short-term trips due to construction workers and vehicles accessing the project site.

Project Description

The project description must describe the typical physical, additional physical, and programmatic features for existing and project conditions, as applicable. The project description must provide the geographic boundaries of the project and street cross sections.

Methodology

The assessment will typically use the same methodology identified herein, except the methodology will pay particular attention to proposed closures and rerouting.

Impact Analysis

The analysis of potentially hazardous conditions and accessibility impacts should be similar to that described under the Existing plus Project Impact Analysis subsection. Examples of circumstances that would result in significant impacts are described under the Existing plus Project and Cumulative Impact Analysis subsections.

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traffic control devices; removal of through lanes; installation of traffic calming measures and wayfinding; removal of on- or off-street parking. Governor's Office of Planning and Research, *Technical Advisory on Evaluating Transportation Impacts in CEQA*, November 2017.

ATTACHMENT A

Existing and Proposed Project Figures

Introduction

Attachment A represents typical figures necessary to illustrate conditions relevant to the analysis of emergency access in a transportation study. All figures should include basic elements (e.g., north arrow, title, legend, references, acronyms, etc.). Symbology should reflect that documents may be printed in black and white. All figures and tables should include all the information the reader would need to understand the information presented. The figures presented herein are from previous transportation studies and are illustrative only and may not include all the basic elements.

FIGURE 1

Site Plan with Emergency Operator Facilities

Figure 1 is an example of a site plan that includes emergency operator facilities adjacant to the project site. Site plans of this type shall clearly depict where the proposed project's parking access and emergency operator facilities are located. This example shows Fire Department Station #8.

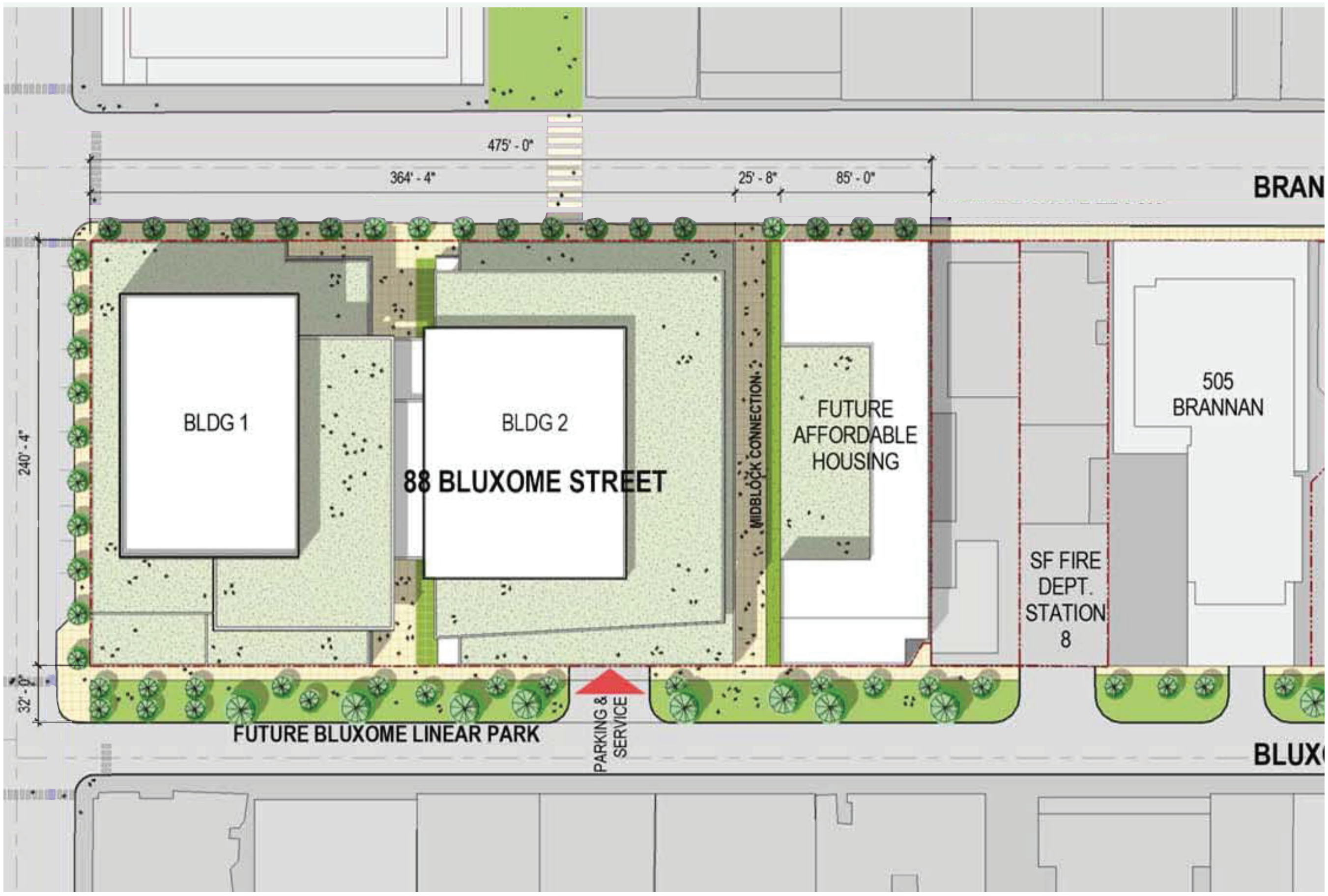


FIGURE 2

Keep Clear Zones

Figure 2 is an example of a plan that shows a keep clear zone. When developing a figure similar to the one shown, include the linear dimensions of the keep clear zones. Site plans of this type shall clearly depict the locations of existing emergency operator facilities. This example shows the public safety building.

Keep Clear Zone Dimensions

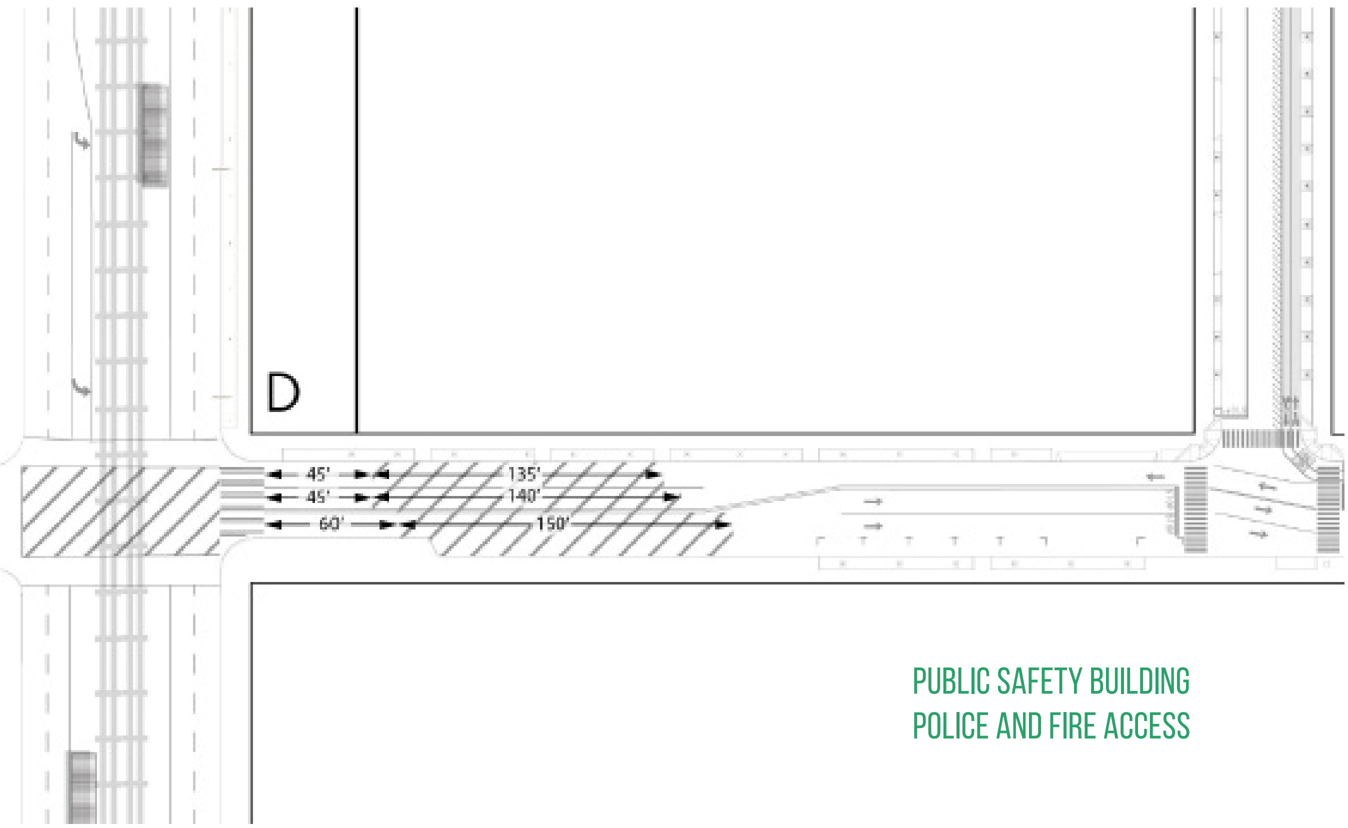


FIGURE 3

Fire Truck Turn Templates

Figure 3 is an example of a plan that includes fire truck turning templates and the driveway location of the emergency operator facilities.

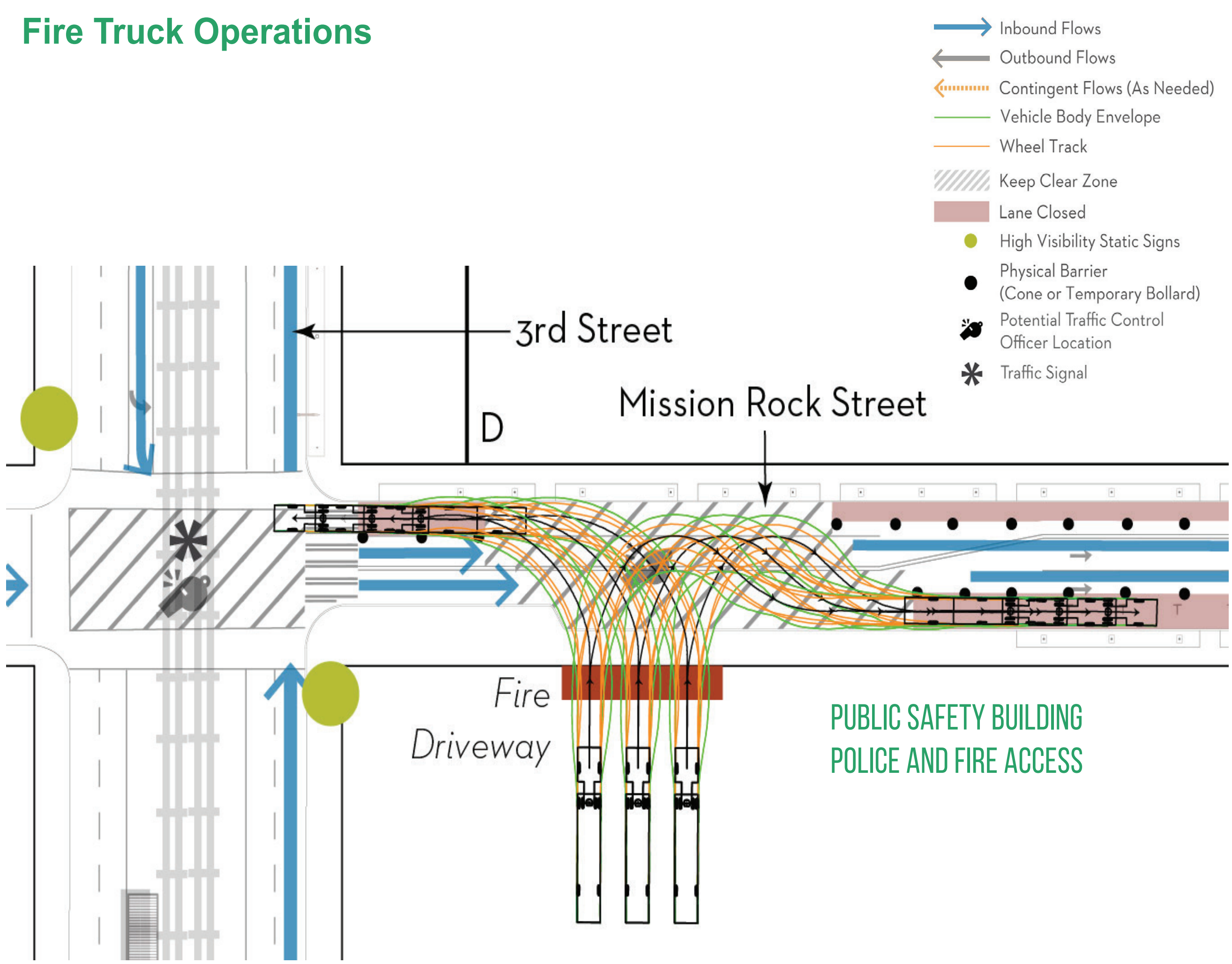
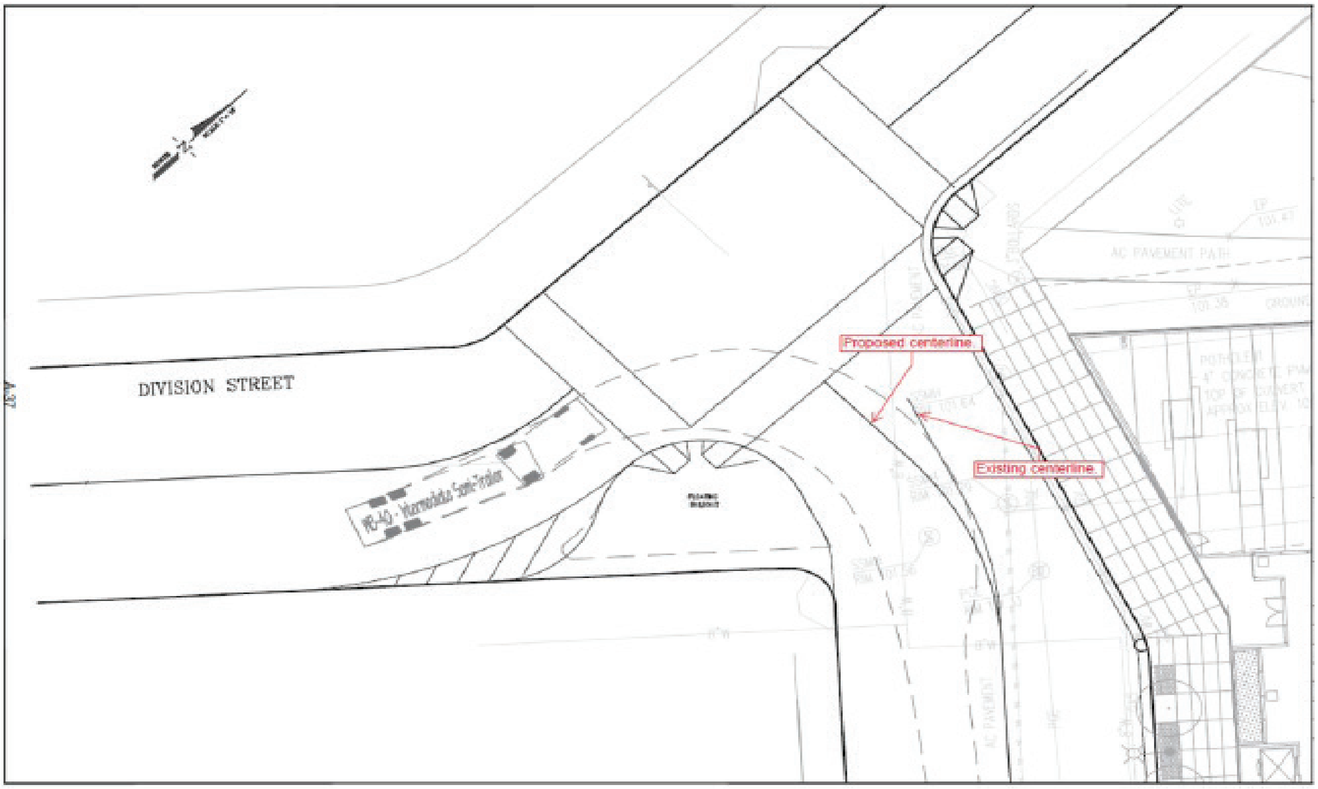


FIGURE 4

Fire Truck Turn Templates

Figure 4 is an example of a plan that includes fire truck turning templates for a project that made changes to the street network. A WB-40 truck was used to approximate a fire truck for this template. However, consultants are encouraged to use emergency service vehicle operator custom templates when available.



ATTACHMENT B

Mitigation and Improvement Measures

MITIGATION MEASURES FOR LAND USE DEVELOPMENT PROJECTS LOCATED WITHIN AN AREA PLAN

Central SoMa Plan

***Improvement Measure M-TR-8:* Emergency Vehicle Access Consultation**

For street network projects that reduce the number of available vehicle travel lanes for a total distance of more than one block where transit-only lanes are not provided: Street network projects shall be designed to comply with adopted city codes regarding street widths, curb widths, and turning movements. To the degree feasible while still accomplishing safety-related project objectives, SFMTA shall design street network projects to include features that create potential opportunities for cars to clear travel lanes for emergency vehicles. Examples of such features include: curbside loading zones, customized signal timing, or other approaches developed through ongoing consultation between SFMTA and the San Francisco Fire Department.

Rincon Hill Plan

No applicable mitigation or improvement measures were identified.

Market and Octavia Neighborhood Plan

No applicable mitigation or improvement measures were identified.

Visitacion Valley Redevelopment Plan

No applicable mitigation or improvement measures were identified.

Balboa Park Station Area Plan

No applicable mitigation or improvement measures were identified.

Eastern Neighborhoods Rezoning and Area Plan

No applicable mitigation or improvement measures were identified.

Treasure Island and Yerba Buena Island Redevelopment Plan

No applicable mitigation or improvement measures were identified.

Glen Park Community Plan

No applicable mitigation or improvement measures were identified.

Transit Center District Plan

No applicable mitigation or improvement measures were identified.

Western SoMa Community Plan

No applicable mitigation or improvement measures were identified.

MITIGATION AND IMPROVEMENT MEASURE EXAMPLES

The following lists the typical types of measures that can avoid or lessen emergency access impacts:

- Provide a roadway design that accommodates emergency service operator vehicles (e.g., provide adequate street widths and turning movements)
- Remove permanent physical barriers that obstruct emergency service operator vehicles access
- Use temporary or moveable features instead of permeant physical features to allow access for emergency service operator vehicles (e.g., moveable bollards and moveable street furniture)
- Use mountable features (e.g., mountable curbs, floating islands, rumble strips, and paint) for visual and physical lane delineation
- Relocate or underground live wires to allow for emergency service operator vehicle access to buildings
- Relocate entrances/exits to off-street garage/loading docks away from emergency service operator facilities
- Employ queue abatement measures or pursue design modifications to off-street vehicular entrances/exits to accommodate queuing vehicles (see queue abatement language below) from emergency service operator facilities

TRANSPORTATION IMPACT ANALYSIS GUIDELINES

APPENDIX K
LOADING

San Francisco Planning

Appendix K
Loading Memorandum

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Case No:	2015-012094GEN
Prepared by:	Colin Clarke, Lana Wong, & Dan Wu
Reviewed by:	Manoj Madhavan and Wade Wietgrefe
RE:	**Transportation Impact Analysis Guidelines Update, Loading**

INTRODUCTION

This memorandum updates the prior guidance provided in the Transportation Impact Analysis Guidelines for the loading topic. The department considers "loading" as a topic for purposes of environmental review to include loading and unloading of goods, services, and passengers. The department prepared this memorandum in consultation with stakeholders (e.g., city and county agencies, consultants). The department will issue memoranda that provide updates to other topics (e.g., public transit, people bicycling) within the guidelines. When the department issues a memorandum about a topic, it will supersede existing guidance regarding that topic.

This memorandum provides specific guidance on the methodology and impact analysis required for the loading transportation topic. Overall guidance on conducting transportation analysis for environmental review, including developing the project description, how to address the significance criteria, methodology, and impact analysis, is in the Transportation Impact Analysis Guidelines.

The guidance provided herein assumes a land use development project located outside of an area plan that requires a transportation study. Guidance on other types of projects, such as projects located in an area plan or infrastructure projects, is discussed below under the "Other" subsection. The department may use this guidance for multiple projects, but the department has discretion on applying the guidance on a project-by-project basis.

The organization of the memorandum is as follows:

1) Project Description
2) Significance Criteria
3) Existing and Existing plus Project
   a) Methodology
   b) Existing Baseline
   c) Impact Analysis
4) Cumulative
   a) Methodology
   b) Impact Analysis
5) Other (covers different types of projects)

Attachments to this memorandum are under separate cover and are attached to the end of this memorandum. The department may update the attachments to the memoranda more frequently than the body of the memoranda.

PROJECT DESCRIPTION

Refer to the Transportation Impact Analysis Guidelines Appendix A, Tables 1-3, for a list of the typical physical, additional physical, and programmatic features for existing and existing plus project conditions, as applicable. The geographic extent of these features must, at a minimum, include the project's frontage and may include the entirety of the project's block. Appendix A, Table 4 of the guidelines provides a non-exhaustive list of approvals from agencies other than the planning department that a project sponsor may need to obtain for the project description features described in the guidelines. Attachment A of this memorandum includes examples of figures that illustrate how to graphically represent loading conditions.

SIGNIFICANCE CRITERION

San Francisco Administrative Code chapter 31 directs the department to identify environmental effects of a project using as its base the environmental checklist form set forth in Appendix G of the California Environmental Quality Act (CEQA) Guidelines. As it relates to loading, Appendix G states: "would the project conflict with a program plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?" The department uses the following significance criterion to evaluate that question: A project would have a significant impact if:

1A) it would result in a loading deficit, and
1B) the secondary effects would:
create potentially hazardous conditions for people walking, bicycling, or driving; or
substantially delay public transit.

EXISTING AND EXISTING PLUS PROJECT

Methodology

This section describes the typical methodology required to address the significance criteria. The methodology section identifies the collection, generation, and approach to analyze data. The department will determine whether to adjust the methodology as necessary to inform the analysis.

The guidelines provide direction on the typical geographical area and period required for analysis. Additional guidance on the appropriate period of study for loading demand and the typical methodology for evaluating existing and existing plus project conditions for this topic, including data collection, is provided below. This section also indicates in bracketed text [ ] whether the presentation of typical methodological elements in other sections of a transportation study (e.g., baseline, impact analysis) could occur in text, a figure, and/or a table (see Appendix A of the guidelines for examples of typical tables and Attachment A of this memorandum for examples of loading-related figures).

Period

For loading demand, the period will differ depending upon the land use and type of loading activity. The following periods assume residential, office, and commercial land uses and commercial or passenger loading. For other land uses and other loading activities, the department will determine the appropriate period. For example, tourist and entertainment uses may require a period during different hours for passenger loading.

For commercial vehicle loading, such as freight and delivery service vehicles[1], the weekday mid-day is the average peak period (Tuesday, Wednesday, or Thursday from 11 a.m. to 2 p.m.).

For passenger vehicle loading[2], consisting of private and for-hire vehicles, the weekday average peak period is (Wednesday, Thursday, or Friday, p.m. peak period is from 5 p.m. to 8 p.m.[3]) However, for child care facilities and schools, the weekday average peak period is the (Tuesday, Wednesday, or Thursday) a.m. peak period and p.m. peak period of the use.[4]

For shuttle loading, the department will determine the period on a project-by-project basis based on the project's proposal (e.g., hours of operation and frequency of the route).

Existing Conditions

The following identifies the typical methodology for projects. The department will determine the appropriate methodology as necessary to inform the impact determination:

<u>Counts</u>

The methodology should include counts of vehicles associated with people loading (e.g., commercial (freight and delivery service), passenger, and shuttle loading instances[5]). The methodology may include prior counts collected from other studies or sources combined with (e.g., an average of three different dates with counts at the same intersection, global positioning system user data) or in isolation from the counts collected for the project. The use of prior counts must be justified, in consultation with the department. Typically, the use of prior counts may occur if these counts have not changed substantially under existing conditions (e.g., due to lack of new development, circulation changes, or travel patterns). [text, table]

<u>Visual Analysis</u>

Data collection for the project should include a site visit for a visual analysis, with recorded observations of the absence, discontinuity, or presence of the features listed in the project description, and a description of the weather conditions. The site visit should also include commercial (freight and delivery service) loading, passenger loading, and shuttle bus loading instances within the study area, including observations of loading instances in the travel lane. This observation should associate to the extent feasible, existing instances of loading with the land uses or buildings in the study area. In addition, the site visit must record any existing potential or observed hazards at locations in the study area between loading vehicles and other modes of travel and delays to public transit as a result of loading activity.

In addition to a site visit, the methodology may also include a recorded (e.g., camera) observation of loading zones or spaces for particular locations in the study area. The methodology may record snapshot observations at various increments (e.g., every few minutes) for commercial vehicle loading or continuously during the study period for commercial and passenger vehicle loading. For large projects

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[1] Delivery service typically refers to pick-up trucks, light trucks or vans such as box trucks, moving trucks, or vans, etc. (e.g., SU-30 i.e. a wheel base between 22 to 30 feet). The larger end of the light truck vehicle type may occupy approximately 30-40 linear feet, which includes the space for loading and maneuvering. Large freight trucks refers to heavy trucks with wheelbases length of 40 feet or more, whose total length may approach 65 feet, 14 feet in height and 8.5 feet in width (e.g., WB-40 and larger up to WB-65).

[2] Passenger vehicle may typically occupy 22 linear feet, which includes the space for loading and maneuvering. When observing passenger vehicles in the field it shall be noted in cases where deliveries are made via passenger vehicles.

[3] SFCTA, *TNCs Today*, June 2017, Figures 5 and 6 show Friday as the peak day of the entire week for for-hire vehicles.

[4] San Francisco Planning Department, *Transportation Review of Childcare and Schools Memorandum*, June 2018

[5] If an observed passenger loading instance is over 10 minutes, the methodology shall consider it as short term parking.

and atypical land uses, the methodology may also include 24-hour observations. These recorded observations could capture the following:

- Number of loading instances by loading activity type and vehicle type
- Loading activity and occupancy of loading zones, including by vehicle type
- Loading activity outside of loading zones, including vehicle type
- Average loading activity duration by activity type
- Potential or observed hazards at locations in the study area between loading vehicles and other modes of travel or delays to public transit as a result of loading activity

See Attachment A for a sample loading observation form.

Street Design Characteristics

Obtain the following general characteristics of streets within the study area:

- Number and directionality of travel lanes by type (e.g., mixed-flow, parking, bicycle, transit-only, one-way, two-way, etc.) [text, figure]
- Location of and type of traffic control devices at intersections (e.g., stop signs, signals, crosswalk, countdown signals, audible warning devices) [text, figure]

Obtain the following additional characteristics of streets within the study area to the extent applicable:

- Width of travel lanes [text, figure]
- Size of blocks [text, figure]
- Data regarding the location and causes of collisions within past five years [text, figure]
- Nearby public transit stations/stops, amenities (e.g., shelters), and service information (e.g., frequency) [text, figure, table]
- Day and time restrictions [text, figure]
- Parking or loading restrictions (e.g., tow away zones, parking and loading hour restrictions, signs restricting double-parking in commercial areas) [text]
- Parking pricing rates (e.g., hourly, daily, weekly, monthly, including ranges)

Existing plus Project Conditions

The following identifies the typical methodology for assessing existing plus project conditions.

Loading Demand and Travel Demand Analysis

Estimate[6] the number of commercial (freight and delivery service), passenger, and shuttle loading demand from the project. [text, table] In addition, distribute and assign the project's vehicle trips to roadways, intersections, loading zones, and driveways to the extent applicable. [text, figure]

For most projects, calculate the peak hour throughout the average peak period. However, if the project site is located along a non-center running public transit rapid network route or unprotected bicycle facility (e.g., no safe-hit post, parking/loading in between, or raised sidewalk), then calculate demand for the peak 15 minutes of the average peak period.

Refer to the travel demand memorandum for additional guidance on calculating freight and delivery loading and passenger loading demand.

[6] Refer to Travel Demand memo for estimating commercial (freight and delivery service), and passenger loading demand.

Turning Movement and Off-Street Loading Facility Dimensions

Provide turning movement(s) of vehicles entering and exiting on- and off-street loading facilities, as applicable, to assess the ability of the loading facilities to accommodate the loading demand. The turning movements will use the vehicle type anticipated to access the loading facility (e.g., WB-40, SU-30) [text, figure]. In addition, assess whether the loading facility can physically accommodate the anticipated vehicle type (i.e., length, height, width) [text, figure].

Demand versus Supply

Assess to the extent applicable, including accounting for time-of-day restrictions, demand-responsive pricing, directionality of the project frontage roadways, distance and type of intersections in relation to the project site, parking and loading restrictions, and overlap of demand for mixed uses:

- The ability of off-street or on-street facilities to accommodate the average peak period of loading demand for commercial (freight and delivery service), passenger, and shuttle loading, including accounting for turning movement and dimension methodology [text, table]
- The location of the project in relation to on-street loading facilities, alleys, and ADA curb ramps [text, figure]
- For unmet on-site loading demand, the ability of on-street or off-street (if shared) loading facilities in the study area to conveniently accommodate the average peak period of loading demand for commercial (freight and delivery service), passenger, and shuttle loading [text, figure, table]

Potentially Hazardous Conditions

Use the existing conditions, including of geographic areas with characteristics as that would exist with implementation of the project, travel demand analysis, and demand versus supply analysis to determine if the project would cause secondary loading impacts related to potentially hazardous conditions. The methodology should assess to the extent applicable:

- The potential for unmet loading demand to occur within sidewalks or crosswalks, bicycle, transit facilities, or travel lanes [text]
- The number of people walking, bicycling, or driving in the respective facilities [text, figure]
- The sightlines and speed of vehicle trips in relation to the travel lanes [text]

Potential Public Transit Delays

Use the existing conditions, including of geographic areas with characteristics as that would exist with implementation of the project, travel demand analysis and demand versus supply analysis to determine if the project would cause potential delays to public transit. The methodology should assess to the extent applicable:

- The potential for unmet loading demand to occur within travel lanes used by public transit [text]
- The location of the project in relation to public transit facilities and amount of public transit service at those facilities [text, figure]

Existing Baseline

Refer to the guidelines for direction on including existing baseline in transportation studies.

Impact Analysis

This section ties the project description, methodology, and existing baseline together to address the significance criteria for existing plus project conditions. This section addresses the typical approach for the impact analysis and provides more details related to loading impacts. The impact analysis section should present a format [[text, figure, or table]] consistent with earlier sections of this memorandum for easy comparison.

The impact analysis must address whether the project would result in loading impacts. Too many factors mentioned in the methodology affect loading conditions. Instead, the department will determine significance on a project-by-project basis. Refer to the guidelines for direction on what to typically consider when conducting the existing plus project impact analysis and how to present the findings.

Demand versus Supply

The first step in the analysis is to determine whether the project would accommodate the anticipated loading demand during the peak periods and, if not, whether study area loading facilities can accommodate the anticipated loading demand. Calculate average loading demand throughout the average peak period. In some cases, peak period of loading activity types may overlap. The supply shall consider simultaneous loading of different types. The following examples are some of the circumstances that may result in a project not accommodating the anticipated loading demand. This is not an exhaustive list of circumstances, under which, a project would not meet its loading demand:

- A project would include no loading facilities and no existing convenient loading facilities exist
- A project would include loading facilities, but the anticipated loading demand exceeds the supply
- A project would include loading facilities to meet the anticipated loading demand, but the loading facilities are inconveniently located for the intended user (e.g., person driving a commercial vehicle to a project land use) and thus those people would likely not use those loading facilities
- A project would include an off-street loading facility, but the design of the facility would not accommodate the intended user (e.g., person driving a truck cannot physically make the turn or fit the truck within the facility) and thus those people cannot use those loading facilities
- A project would include an off-street turntable[7] for vehicles using the off-street loading facility, but the project does not include a operation and maintenance plan, and thus the turntable could become inoperable
- A project would propose on-street loading facilities to meet the anticipated loading demand, but the permitting agency would be inclined not to grant the on-street loading facility

If the project accommodates the anticipated loading demand during the peak period, then the analysis is complete.

If the project does not meet the anticipated loading demand, then the impact analysis must address whether the project would create potentially hazardous loading conditions for people walking, bicycling, or driving (e.g., as a result of loading vehicles blocking facilities used by people) or would create potential delays to public transit. The subsections below provide specific examples of the types of circumstances that could potentially result in a hazardous condition impact or public transit delay impact under existing plus project conditions.

[7] A turntable typically allows vehicles to enter the off-street facility forward facing and exit the off-street facility forward facing because the turntables rotates the vehicle.

Potentially Hazardous Conditions

The department provides examples of some of the circumstances that may result in potentially hazardous conditions associated with different ways people travel (e.g., people walking, bicycling, or driving) in the applicable transportation topic memorandum of these guidelines. The following examples are some of the additional non-exhaustive list of circumstances that could result in potentially hazardous conditions that the department did not list in the other memorandums:

- A project would result in a substantial amount of loading activity in sidewalks or crosswalks, or bicycle facilities used by a substantial number of people walking or bicycling (e.g., based on counts or projections), respectively
- A project would result in a substantial amount of loading activity in travel lanes on a slope that may obstruct sightlines used by a substantial number of people driving (e.g., based on counts or projections)

Public Transit Delay

The department provides examples of some of the circumstances that may result in potential delays to public transit in the public transit memorandum of these guidelines. Below is a non-exhaustive list of an example circumstance that could result in public transit delay that the department did not list in the public transit memorandum:

- A project would result in a substantial amount of loading activity in travel lanes used by a substantial number of people riding public transit (e.g., based on Muni service type designation)

CUMULATIVE

Methodology

The guidelines detail the typical methodology for cumulative analysis, including the geographical area, period, cumulative projects, and adjustments (refer to Appendix B of the guidelines) under cumulative conditions. The cumulative section in transportation studies must present (text, figure, or table) the applicable elements included in the methodology.

Impact Analysis

This section ties the methodology and description of cumulative conditions together to address the significance criteria for cumulative conditions. Refer to the guidelines for direction on what to consider when conducting the cumulative impact analysis and how to present the findings. The same examples of the types of circumstances that could result in a potential hazardous condition impact or public transit delay that were provided for existing plus project conditions apply here, except for cumulative conditions.

Demand versus Supply

The first step in the cumulative analysis is to determine whether the project, in combination with reasonably foreseeable cumulative projects within the study area, would accommodate the anticipated loading demand during the peak periods and, if not, whether study area loading facilities can accommodate the anticipated loading demand. The same examples of projects not accommodating the anticipated loading demand as provided for existing plus project conditions apply here, except for cumulative conditions.

If the cumulative projects would not result in a substantial loading deficit, then the analysis is complete.

Potentially Hazardous Conditions and Public Transit Delay

If the project does result in a loading deficit, then the impact analysis must address whether the project would create secondary effects from loading. The department provides examples of some of the circumstances that may result in potentially hazardous conditions or public transit delay associated with different ways people travel (e.g., people walking, bicycling, driving, or riding public transit) in the applicable transportation topic memorandum of these guidelines and under the Existing Plus Project and Cumulative Impact Analysis subsections.

OTHER

The guidance provided in this memorandum assumes a land use development project located outside of an area plan that requires a transportation study. This section describes the type of additional or different information that may be necessary to address loading impacts for the following circumstances: land use development project located within an area plan, an area plan, or infrastructure project (which may be located in a different county than San Francisco).

Land Use Development Project Located within an Area Plan

For projects that are consistent with an area plan for which an environmental impact report (EIR) was certified, pursuant to CEQA Guidelines section 15183, the assessment must limit its analysis to such conditions specified in that section. The guidelines provide direction on how to analyze a land use development project in an area plan and lists area plan EIRs that have been certified as of February 2019.

Attachment B of this memorandum identifies mitigation and improvement measures from area plan EIRs related to loading. The department will list loading-related mitigation and improvement measures from future area plan EIRs in Loading Memorandum Attachment B once the Planning Commission or Board of Supervisors certifies those EIRs.

Area Plans

For area plans, the assessment will typically use the significance criteria identified herein. The following subsections describe the type of additional or different information that may be necessary to address loading impacts for project description, methodology, and impact analysis. For area plans that also include infrastructure changes (e.g., street redesigns), refer to the Infrastructure Project subsection below for additional or different information that may be necessary.

Project Description

Typically, the department conducts an analysis to estimate the amount of future development that could occur in the plan area as a result of its implementation. The department typically does not have all of the project description details described herein. However, the project description may include policies that may relate to the methodology and impact analysis (e.g., curb cut restrictions). One example of a programmatic project feature of an area plan’s project description may include an overall loading strategy description that identifies and prioritizes certain streets and locations where various types of loading should occur. Another example of a project description programmatic feature would be planning code revisions that address loading.

Methodology

The assessment will typically use the same methodology identified herein, except the methodology will use a larger geographical study area and require less site-specific information (e.g., driveway locations at each site) except to document circumstances where vehicles may not be allowed (e.g., curb cut restrictions). While an individual project may not require some elements listed in the Existing and

Existing plus Project Methodology subsection, area plans typically will include all of these elements. The department should select streets and intersections most impacted by the area plan to represent the impacts that may occur at other locations, for analysis. Furthermore, the methodology would extrapolate loading data collected at representative locations or land uses to the entire study area, and based on this data collection, qualitatively assess the ability of the proposed streetscapes changes to accommodate loading activities.

Impact Analysis

For analysis of area plans, assess the projected amount of growth and infrastructure changes associated with the rezoning within the area plan boundaries. The analysis of demand versus supply and the secondary impacts of potentially hazardous conditions and potential delays to public transit should be similar to that described under the Existing plus Project and Cumulative Impact Analysis subsections. Examples of circumstances that would result in significant impacts are described under the Existing plus Project Impact Analysis subsection.

Infrastructure Project

For infrastructure projects (e.g., trails, new roads, bridge repair, sewer line, rail service, roadway modifications, etc.), the assessment of the project description, significance criteria, and impact analysis should be similar to private development projects. The analysis typically does not require trip generation analysis as infrastructure projects usually do not generate trips.[8] However, some infrastructure projects may induce trips, such as the addition of through lanes on existing or new highways or streets.[9] In addition, infrastructure projects may generate short-term trips due to construction workers and vehicles accessing the project site.

Project Description

The project description must describe the typical physical, additional physical, and programmatic features for existing and project conditions, as applicable. The project description must provide the geographic boundaries of the project and street cross-sections.

Methodology

The assessment will typically use the same methodology identified herein, except the methodology will pay particular attention to proposed closures and changes to color curb zones.

Impact Analysis

The analysis of potentially hazardous conditions and potential delays to public transit should be similar to that described under the Existing plus Project and Cumulative Impact Analysis subsections.

<u>Demand versus Supply</u>

Infrastructure projects are unlikely to generate a loading demand, as they typically are not associated with a land use change or growth inducement and would not generate trips. However, should the infrastructure project generate trips or remove loading, the first step in the analysis is to determine

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[8] Governor's Office of Planning and Research, Revised Proposal on Updates to the CEQA Guidelines on Evaluating Transportation Impacts in CEQA, January 20, 2016.

[9] Generally, minor transportation projects would not result in additional trips. Examples include, but are not limited to, rehabilitation, maintenance, and repair of transportation infrastructure; installation, removal or reconfiguration of non-through traffic lanes and traffic control devices; removal of through lanes; installation of traffic calming measures and wayfinding; removal of on- or off-street parking. Governor's Office of Planning and Research, Technical Advisory on Evaluating Transportation Impacts in CEQA, November 2017.

whether the infrastructure project would accommodate the anticipated loading demand and, if not, whether the study area loading facilities can accommodate the anticipated loading demand. If the project does not meet the demand at the project site or study area loading facilities, then determine if the loading deficit is substantial. The following examples are some of the circumstances that may result in a project not accommodating the anticipated loading demand. This is not an exhaustive list of circumstances, under which, a project would not meet its loading demand:

- A project would permanently remove a substantial number of loading spaces in a location without remaining convenient loading facilities
- A project would include a geometric design feature that render the use of a substantial number of existing loading facilities infeasible to use by the intended user (e.g., turning movements) in a location without remaining convenient loading facilities

If the project would not result in a substantial parking deficit, then the analysis is complete.

<u>Potentially Hazardous Conditions and Public Transit Delay</u>

If the project does result in a loading deficit, then the impact analysis must address whether the project would create secondary effects from loading. The department provides examples of some of the circumstances that may result in potentially hazardous conditions or result in public transit delay associated with different ways people travel (e.g., people walking, bicycling, driving, or result in transit delay) in the applicable transportation topic memorandum of these guidelines and under the Existing Plus Project and Cumulative sections Impact Analysis subsections.

ATTACHMENT A

Existing and Proposed Project Figure and Table Examples

Introduction

Attachment A represents typical figures necessary to illustrate conditions that could result in loading impacts included in a transportation study. All figures should include basic elements (e.g., north arrow, title, legend, references, acronyms, etc.). Symbology should reflect that documents may be printed in black and white. All figures and tables should include all the information the reader would need to understand the information presented. Some of the figures presented below were from previous transportation studies and are illustrative only and may not include all the basic elements.

FIGURE 1

Potential Loading Locations

Figure 1 is an example of convenient loading locations. As shown, this generally includes up to 250 feet from the project site.

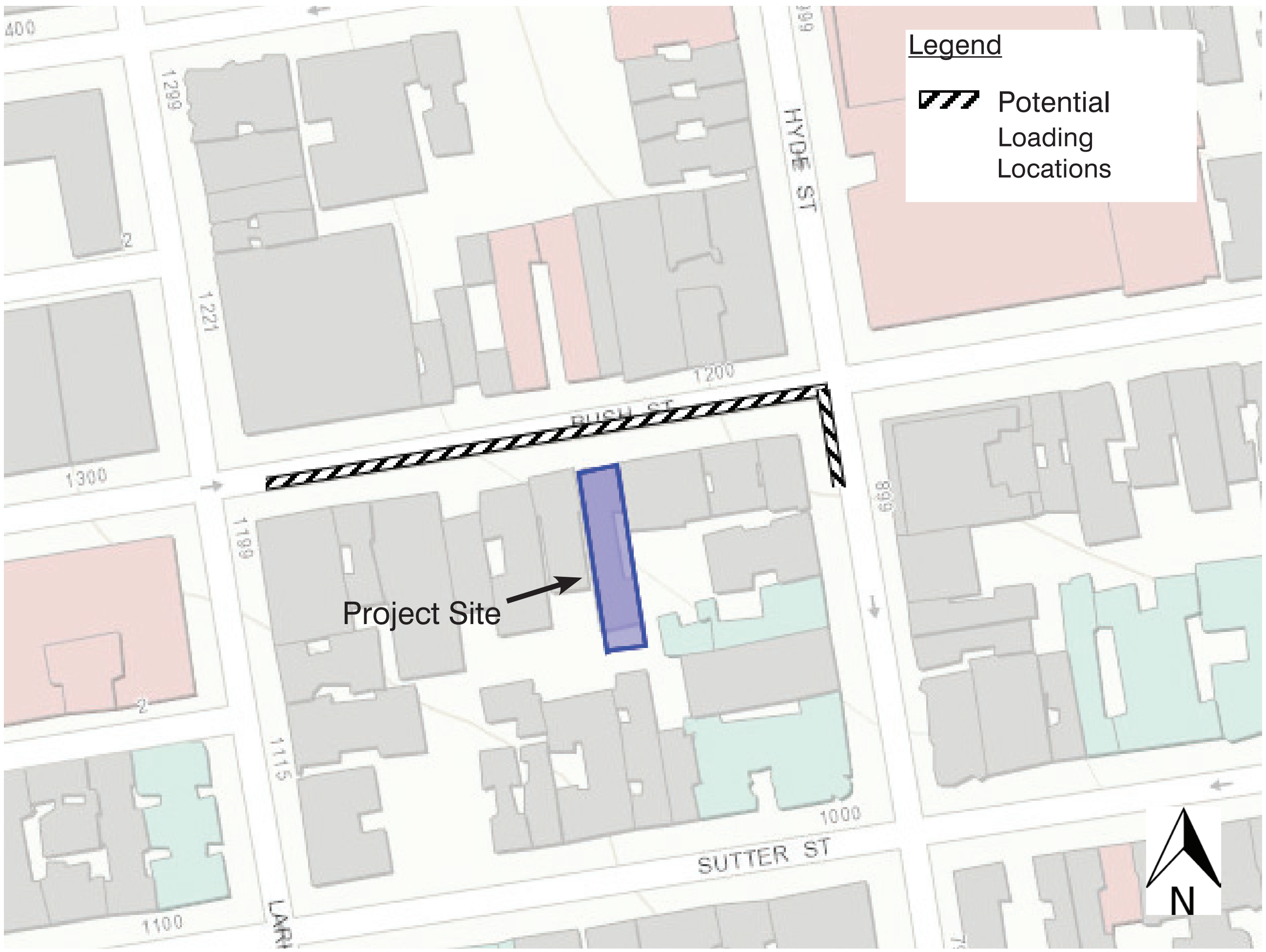

FIGURE 2

Existing On-Street Loading Plan

Figure 2 below is an example of a site plan that includes a detailed description of existing on-street commercial loading zones and existing parking. When developing a map similar to the one shown, include the linear dimensions of the existing loading zones, match the color of the zones to those used in the SFMTA Color Curb Program, and make existing changes explicit.

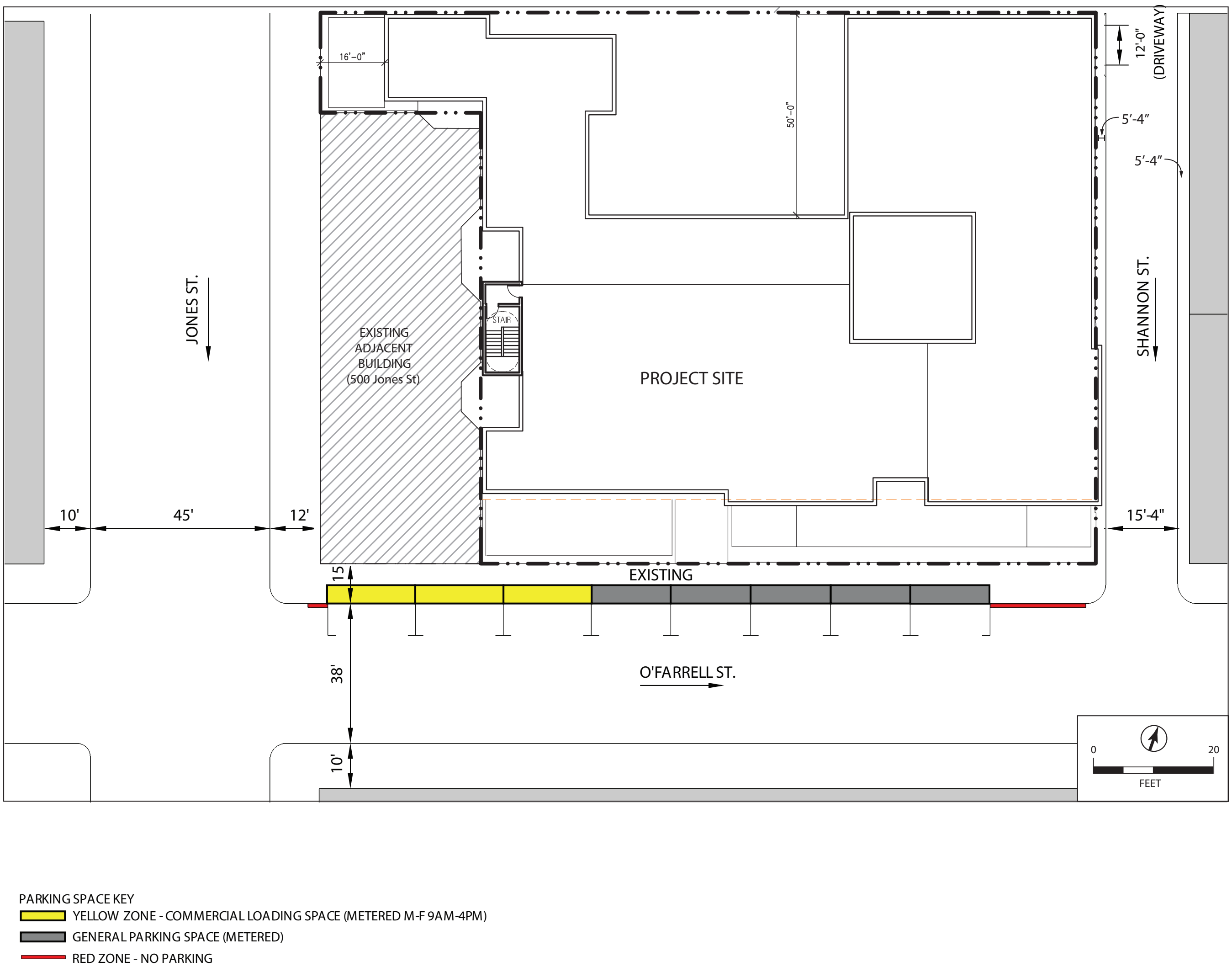

FIGURE 3

Proposed On-Street Loading Plan

Figure 3 below is an example of a site plan that includes a detailed description of proposed on-street commercial and passenger loading zones. When developing a map similar to the one shown, include the linear dimensions of the proposed loading zones, match the color of the zones to those used in the SFMTA Color Curb Program, and make proposed changes explicit.

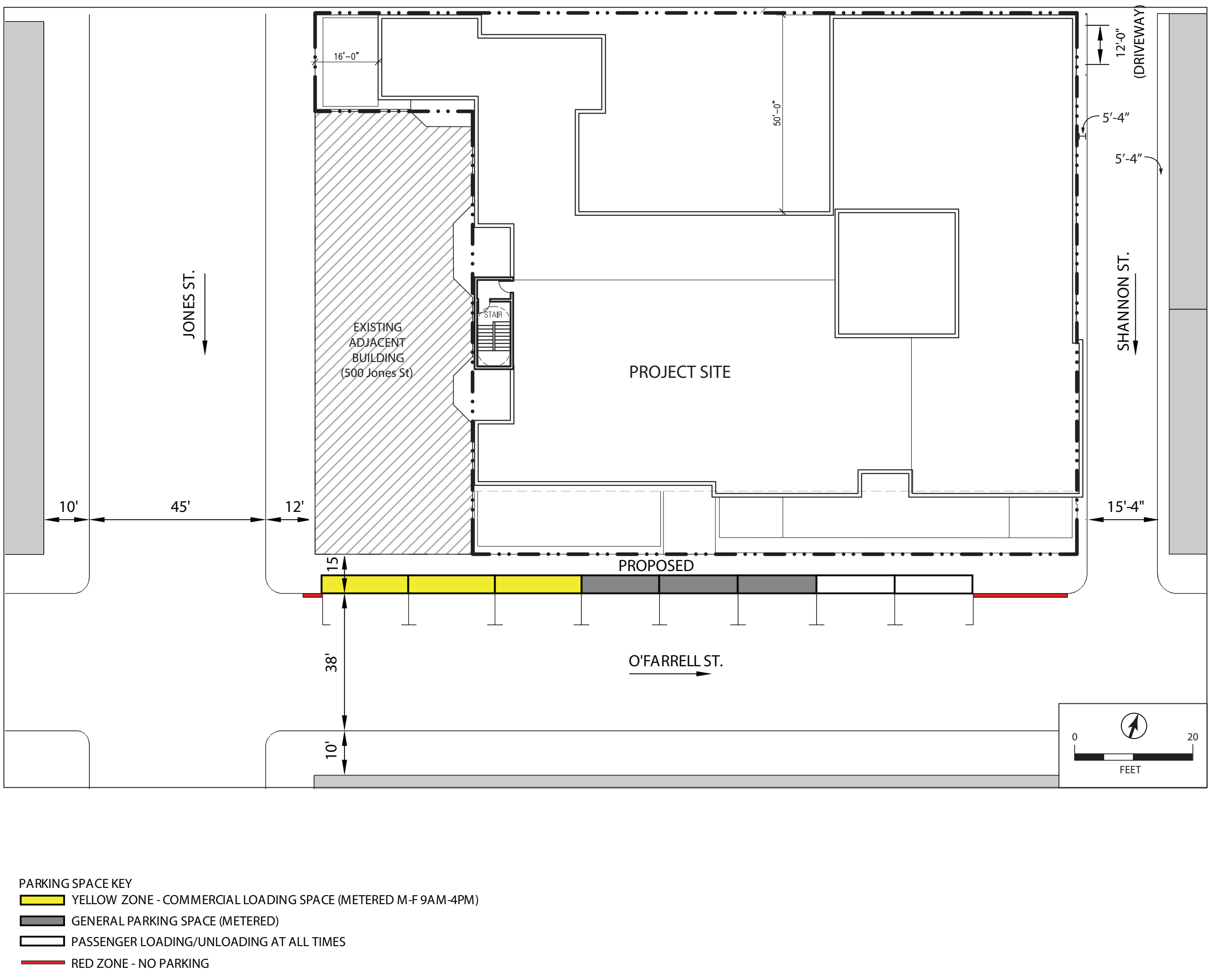

FIGURE 4

Loading Dimensions and Turn Template Into Garage

Figure 4 below shows the typical format to present off-street freight loading dimensions, including vertical clearance, width of driveway entry, and turn templates into the garage.

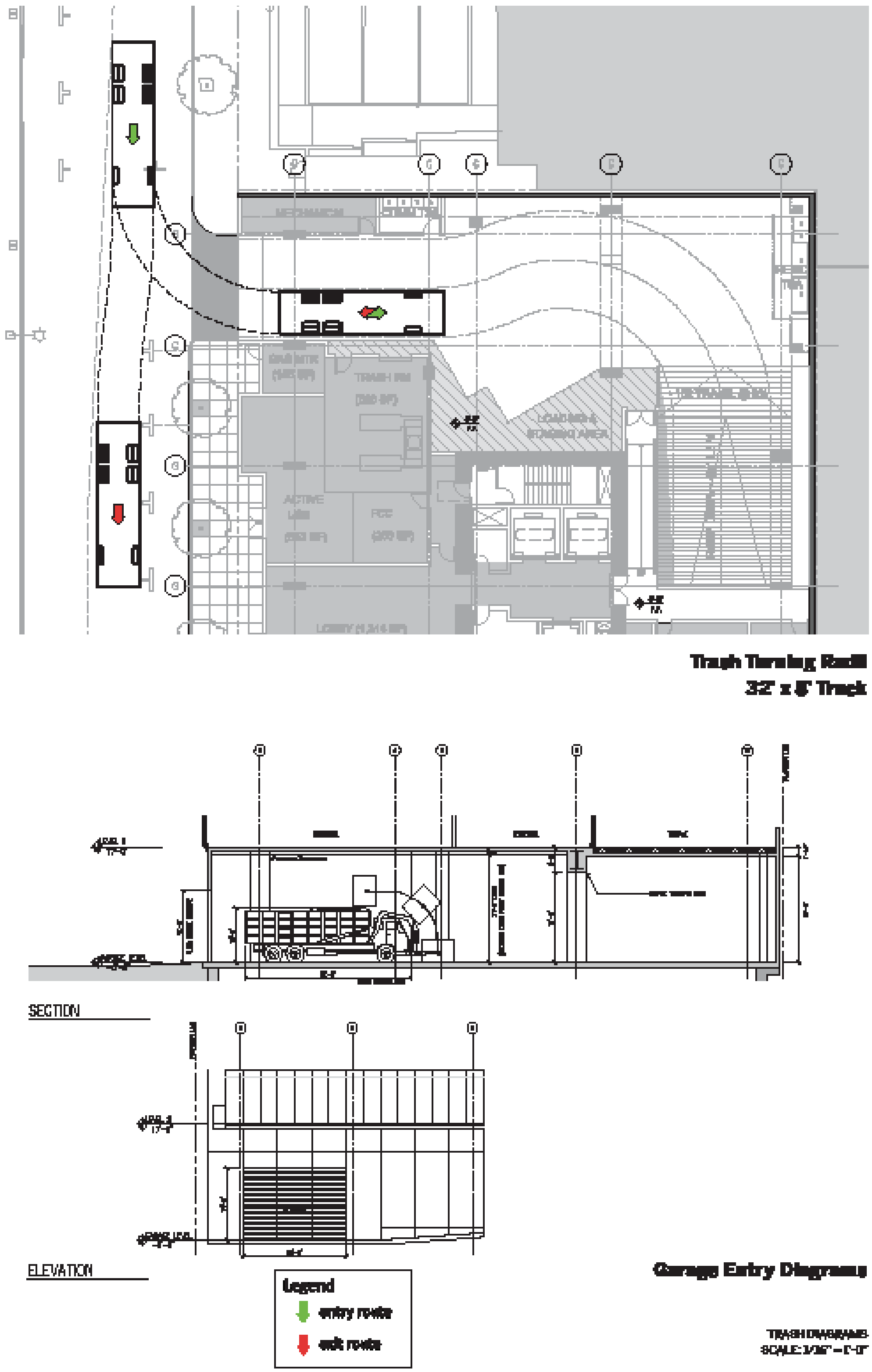

FIGURE 5

Turn Template Into/Out of Off-Street Loading Space

Figure 5 below shows the typical format to present off street freight loading turn templates into the loading space.

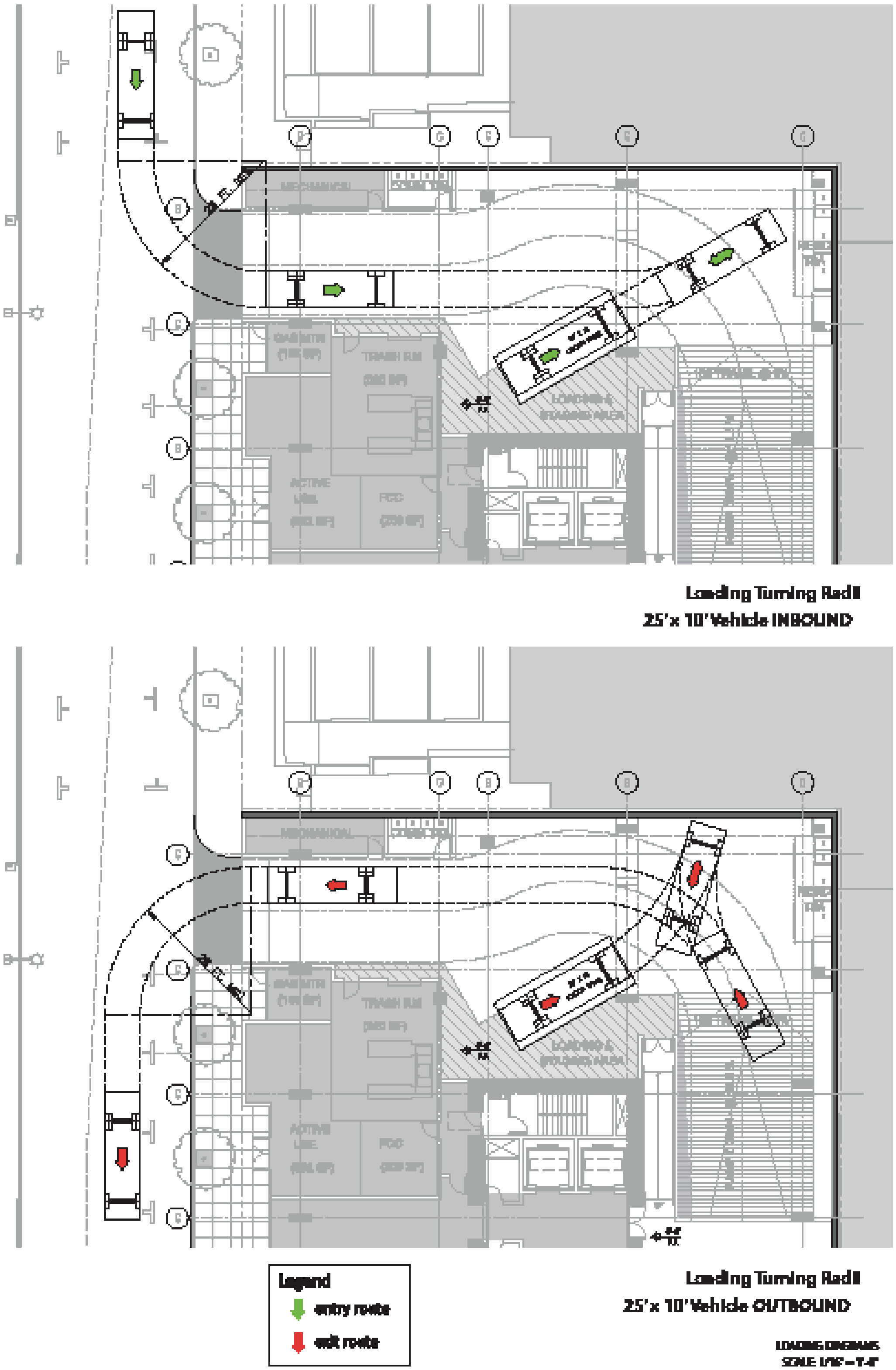

FIGURE 6

Loading Observation Form and Template Sample

Figure 6 below shows the typical format to present commercial and passenger loading observations. This form should be included in the appendices of the transportation study.

LOADING STUDY

Location: (fill in exact project location here)
Please fill in all white cells. Gray cells will auto-calculate.

City: San Francisco **Date:** **Day & Time:**

Peak Period Observations (3 consecutive hours based on maximum counts of all vehicles traveling in direction of observation											
Vehicle No.	Passenger Car	Passenger Car Delivery	Common Delivery Service	Large Frieght Truck	Extra Legal Trucks	Arrival Time (marked by the moment that the vehicle pull to a stop in the travel lane, transit lane, bike lane, or along the curb)	Departure Time (marked by the moment that the vehicle pull to a stop in the travel lane, transit lane, bike lane, or along the curb)	Stop Along Curb? (Y/N)	Is the loading event associated with the subject building? (Y/N)	Duration Time	Notes (e.g. blocked a bike lane/sidewalk/transit only lane; seemed like a potential hazard to people walking/biking)
1										0:00:00	
2										0:00:00	
3										0:00:00	
4										0:00:00	
5										0:00:00	
6										0:00:00	
7										0:00:00	
8										0:00:00	
9										0:00:00	
10										0:00:00	
11										0:00:00	
12										0:00:00	
13										0:00:00	
14										0:00:00	
15										0:00:00	
16										0:00:00	
17										0:00:00	
18										0:00:00	
19										0:00:00	
20										0:00:00	
21										0:00:00	
22										0:00:00	
23										0:00:00	
24										0:00:00	
25										0:00:00	
26										0:00:00	
27										0:00:00	
28										0:00:00	

FIGURE 6

Loading Observation Form and Template Sample (continued)

Daily total count of vehicles	
Daily passenger loading instances	
Daily passenger loading instances for subject building	
Daily freight loading instances	
Daily freight loading demand for subject building	

Day & Time: **Date:** **Direction of travel -**

	Daily Count (24 hours)									
Time	**Did you see a vehicle in the direction of travel within the distance specified including moving and stopped? Please count here!**	**Did you see a vehicle you counted in the first column pick up or drop off people that arrived during this 5 minute interval? Please count here! Do not double count in subsequent intervals.**	**Did you see the vehicle you counted in the previous column pick up or drop off people from the subject building? Please count here!**	**Was a vehicle observed for longer than 5 minutes at the same location? Please count here in the interval they depart!**	**Did you see a vehicle you counted in the first column pick up or drop off goods (including trash/recycling) that arrived during this 5 minute interval? Please count here! Do not double count in subsequent intervals.**	**Did you see the vehicle you counted in the previous column pick up or drop off goods from the subject building? Please count here!**	**Was a vehicle observed for longer than 30 minutes at the same location? Please count here in the interval they depart!**	**Count of subject building Driveway In's**	**Count of subject building Driveway Out's**	**Notes**
12:00:00 AM										
12:05:00 AM										
12:10:00 AM										
12:15:00 AM										
12:20:00 AM										
12:25:00 AM										
12:30:00 AM										
12:35:00 AM										
12:40:00 AM										
12:45:00 AM										
12:50:00 AM										
12:55:00 AM										
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1:05:00 AM										
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3:45:00 AM										

ATTACHMENT B

Mitigation and Improvement Measures

MITIGATION MEASURES FOR LAND USE DEVELOPMENT PROJECTS LOCATED WITHIN AN AREA PLAN

Rincon Hill Plan
No applicable mitigation or improvement measures were identified.

Market and Octavia Neighborhood Plan
No applicable mitigation or improvement measures were identified.

Visitacion Valley Redevelopment Plan
No applicable mitigation or improvement measures were identified.

Balboa Park Station Area Plan

Improvement Measure Truck Loading at Kragen Auto Parts site: Restrict truck access to the food market loading dock to 30 foot trucks or shorter.

- If longer trucks are needed, restrict deliveries to the early morning to avoid peak morning and peak evening commute periods.
- Schedule all deliveries to reduce the potential for trucks waiting to enter the loading dock (which may cause a back-up onto Ocean Avenue). Traffic volumes along Ocean Avenue are constantly high throughout the day; therefore, deliveries between 7:00 a.m. and 7:00 p.m. should be avoided.
- Maintain accurate truck logs to document the time and duration of truck activities.
- Station loading dock personnel at the corner of the Ocean/Lee intersection and at the loading dock to assist truck maneuvers and to manage traffic flows.
- Work with MTA to prohibit on-street parking along Lee Avenue during the peak loading periods to provide sufficient right-of-way for truck maneuvers.

Improvement Measure Truck Loading Phelan Loop site: Restrict truck access to the loading dock to 30 foot trucks or shorter.

- Schedule all deliveries to reduce the potential for trucks waiting to enter the loading dock (which may cause a back-up onto Ocean Avenue). Traffic volumes along Ocean Avenue are constantly high throughout the day; therefore, deliveries between 7:00 a.m. and 7:00 p.m. should be avoided.
- Maintain accurate truck logs to document the time and duration of truck activities.
- Station loading dock personnel at the corner of the Ocean/Lee intersection and at the loading dock to assist truck maneuvers and to manage traffic flows.
- Work with MTA to prohibit on-street parking along Lee Avenue during the peak loading periods to provide sufficient right-of-way for truck maneuvers.

Eastern Neighborhoods Rezoning and Area Plan

No applicable mitigation or improvement measures were identified.

Treasure Island and Yerba Buena Island

Redevelopment Plan No applicable mitigation or improvement measures were identified.

Glen Park Community Plan

No applicable mitigation or improvement measures were identified.

Transit Center District Plan and Transit Tower

M-TR-1f: Third/Harrison Streets Restriping: At the intersection of Third and Harrison Streets, the Municipal Transportation Agency (MTA) could convert one of the two eastbound lanes leaving the intersection into an additional westbound through lane by restriping the east (Harrison Street) leg of the intersection. In order to allow sufficient turning radius and clearance for heavy vehicles such as buses and trucks, two on-street parking spaces on the south side of Harrison Street east of the intersection would be removed.

M-TR-5: Garage/Loading Dock Attendant: If warranted by project-specific conditions, the project sponsor of a development project in the Plan area shall ensure that building management employs attendant(s) for the project's parking garage and/or loading dock, as applicable. The attendant would be stationed as determined by the project specific analysis, typically at the project's driveway to direct vehicles entering and exiting the building and avoid any safety-related conflicts with people walking on the sidewalk during the a.m. and p.m. peak periods of traffic and pedestrian activity, with extended hours as dictated by traffic and pedestrian conditions and by activity in the project garage and loading dock. (See also Mitigation Measure M-TR-4b, above.) Each project shall also install audible and/or visible warning devices, or comparably effective warning devices as approved by the Planning Department and/or the Sustainable Streets Division of the Municipal Transportation Agency, to alert people walking of the outbound vehicles from the parking garage and/or loading dock, as applicable.

M-TR-7a: Loading Dock Management:To ensure that off-street loading facilities are efficiently used and that trucks longer than can be safely accommodated are not permitted to use a building's loading dock, the project sponsor of a development project in the Plan area shall develop a plan for management of the building's loading dock and shall ensure that tenants in the building are informed of limitations and conditions on loading schedules and truck size. Such a management plan could include strategies such as the use of an attendant to direct and guide trucks (see Mitigation Measure M-TR-5), installing a "Full" sign at the garage/loading dock driveway, limiting activity during peak hours, installation of audible and/or visual warning devices, and other features. Additionally, as part of the project application process, the project sponsor shall consult with the Municipal Transportation Agency concerning the design of loading and parking facilities.

M-TR-7b: Augmentation of On-Street Loading Space Supply: To ensure the adequacy of the Plan area's supply of on-street spaces, the Municipal Transportation Agency (MTA) could convert existing on-street parking spaces within the Plan Area to commercial loading use. Candidate streets might include the north side of Mission Street between Second Street and First Street, both sides of Howard Street between Third Street and Fremont Street, and both sides of Second Street between Howard Street and Folsom Street. The MTA and Planning Department could also increase the supply of on-street loading "pockets" that would be created as part of the draft Plan's public realm improvements. Increasing the supply of on-street loading spaces would reduce the potential for disruption of traffic and transit circulation in the Plan Area as a result of loading activities. However, the feasibility of increasing the number of on-street loading spaces is unknown. Locations for additional loading pockets have not been identified, and the feasibility of adding spaces is uncertain, as any such spaces would reduce pedestrian circulation area on adjacent sidewalks. Locations adjacent to transit-only lanes would also not be ideal for loading spaces because they may introduce new conflicts between trucks and transit vehicles. Given these considerations, potential locations for additional on-street loading spaces within the Plan area are limited, and it is unlikely that a sufficient amount of spaces could be provided to completely offset the net loss in supply.

Western SoMa Community Plan

No applicable mitigation or improvement measures were identified.

Central SoMa Plan

Mitigation Measure M-TR-6a: Driveway and Loading Operations Plan (DLOP): Sponsors of development projects that provide more than 100,000 square feet of residential, office, industrial, or commercial uses shall prepare a DLOP, and submit the plan for review and approval by the Planning Department and the SFMTA in order to reduce potential conflicts between driveway operations, including loading activities, and pedestrians, bicycles and vehicles, and to maximize reliance of on-site loading spaces to accommodate new loading demand. The DLOP shall be submitted along with a building permit and approval should occur prior to the certificate of occupancy. Prior to preparing the DLOP, the project sponsor shall meet with the Planning Department and the SFMTA to review the proposed number, location, and design of the on-site loading spaces, as well as the projected loading demand during the entitlement/environmental review process. In addition to reviewing the on-site loading spaces and projected loading demand, the project sponsor shall provide the Planning Department and SFMTA a streetscape plan that shows the location, design, and dimensions of all existing and proposed streetscape elements in the public right-of-way. In the event that the number of on-site loading spaces does not accommodate the projected loading demand for the proposed development, the project sponsor shall pursue with the SFMTA conversion of nearby on-street parking spaces to commercial loading spaces, if determined feasible by the SFMTA.

The DLOP shall be revised to reflect changes in accepted technology or operation protocols, or changes in conditions, as deemed necessary by the Planning Department and the SFMTA. The DLOP shall include the following components, as appropriate to the type of development and adjacent street characteristics:

- **Loading Dock Management.** To ensure that off-street loading facilities are efficiently used, and that trucks that are longer than can be safely accommodated are not permitted to use a building's loading dock, the project sponsor of a development project in the Plan Area shall develop a plan for management of the building's loading dock and shall ensure that tenants in the building are informed of limitations and conditions on loading schedules and truck size. The management plan could include strategies such as the use of an attendant to direct and guide trucks, installing a "Full" sign at the garage/loading dock driveway, limiting activity during peak hours, installation of audible and/or visual warning devices, and other features. Additionally, as part of the project application process, the project sponsor shall consult with the SFMTA concerning the design of loading and parking facilities.
- **Garage/Loading Dock Attendant.** If warranted by project-specific conditions, the project sponsor of a development project in the Plan Area shall ensure that building management employs attendant(s) for the project's parking garage and/or loading dock, as applicable. The attendant would be stationed as determined by the project-specific review analysis, typically at the project's driveway to direct vehicles entering and exiting the building and avoid any safety-related conflicts with pedestrians on the sidewalk during the a.m. and p.m. peak periods of traffic, bicycle, and pedestrian activity, with extended hours as dictated by traffic, bicycle and pedestrian conditions and by activity in the project garage and loading dock. Each project shall also install audible and/or visible warning devices, or comparably effective warning devices as approved by the Planning Department and/or the SFMTA, to alert pedestrians of the outbound vehicles from the parking garage and/or loading dock, as applicable.

- **Large Truck Access.** The loading dock attendant shall dictate the maximum size of truck that can be accommodated at the on-site loading area. In order to accommodate any large trucks (i.e., generally longer than 40 feet) that may require occasional access to the site (e.g., large move-in trucks that need occasional access to both residential and commercial developments), the DLOP plan shall include procedures as to the location of on-street accommodation, time of day restrictions for accommodating larger vehicles, and procedures to reserve available curbside space on adjacent streets from the SFMTA.
- **Trash/Recycling/Compost Collection Design and Management.** When designs for buildings are being developed, the project sponsor or representative shall meet with the appropriate representative from Recology (or other trash collection firm) to determine the location and type of trash/recycling/compost bins, frequency of collections, and procedures for collection activities, including the location of Recology trucks during collection. The location of the trash/recycling/compost storage room(s) for each building shall be indicated on the building plans prior to submittal of plans to the Building Department. Procedures for collection shall ensure that the collection bins are not placed within any sidewalk, bicycle facility, parking lane or travel lane adjacent to the project site at any time.
- **Delivery Storage.** the loading dock area to allow for unassisted delivery systems (i.e., a range of delivery systems that eliminate the need for human intervention at the receiving end), particularly for use when the receiver site (e.g., retail space) is not in operation. Examples could include the receiver site providing a key or electronic fob to loading vehicle operators, which enables the loading vehicle operator to deposit the goods inside the business or in a secured area that is separated from the business. The final DLOP and all revisions shall be reviewed and approved by the Environmental Review Officer or designee of the Planning Department and the Sustainable Streets Director or designee of the SFMTA. The DLOP will be memorialized in the notice of special restrictions on the project

MITIGATION AND IMPROVEMENT MEASURE EXAMPLES

The following lists the typical types of measures that can mitigate or lessen impacts to passenger and commercial loading:

Potentially Hazardous Conditions and Transit Delays

- Appropriately place loading to maintain sightlines and visibility;
- Provide convenient off-street or on-street loading space(s) that meet demand;
- Relocate convenient off-street or on-street loading space(s) for intended users;
- Relocate driveways for people away from off-street garage/loading docks;
- Relocate entrances/exits (for people walking) away from off-street garage/loading docks;
- Manage freight and service deliveries, and passenger loading (e.g., active loading management plan, staff monitoring);
- Provide operations and maintenance plan for off-street loading turntable;
- Employ queue abatement measures or pursue design modifications to off-street vehicular entrances/exits to accommodate queuing vehicles (see queue abatement language below);
- Relocate convenient off-street or on-street loading space(s) away from travel lane which transit operates in or at a transit stop/station location; and
- Other measures that are related to potential hazards and transit delays can be found in appendices of the other relevant modes' memos of the guidelines

TRANSPORTATION IMPACT ANALYSIS GUIDELINES

APPENDIX L
VEHICLE MILES TRAVELED (VMT)/ INDUCED AUTOMOBILE TRAVEL

SEAL OF THE CITY AND COUNTY OF SAN FRANCISCO

San Francisco Planning

SAN FRANCISCO PLANNING DEPARTMENT

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Appendix L
Vehicle Miles Traveled/Induced Automobile Travel Memorandum

Date:	February 14, 2019
To:	Record No. 2015-012094GEN
Prepared by:	Daniel Wu, Jenny Delumo, and Christopher Espiritu
Reviewed by:	Wade Wietgrefe
RE:	**Transportation Impact Analysis Guidelines Update, Vehicle Miles Traveled/Induced Automobile Travel**

INTRODUCTION

The prior Transportation Impact Analysis Guidelines did not include the Vehicle Miles Traveled (VMT) topic. VMT is a measure of the amount and distance of vehicle travel attributable to a project, including induced automobile travel. On March 3, 2016, the San Francisco Planning Commission adopted a resolution to modify the environmental review process by removing automobile delay, as described solely by level of service or similar measures of vehicular capacity or traffic congestion, as a significant impact on the environmental pursuant to the California Environmental Quality Act and replacing it with VMT criteria.[1]

This memorandum provides guidance on the VMT topic. The department prepared this memorandum in consultation with stakeholders (e.g., city and county agencies, consultants). The department will issue memoranda that provide updates to other topics (e.g., transit, loading) within the guidelines. When the department issues a memorandum about a topic, it will supersede existing guidance regarding that topic.

This memorandum provides specific guidance on the methodology and impact analysis required for the VMT transportation topic. Overall guidance on conducting transportation analysis for environmental review, including developing the project description, how to address the significance criteria, methodology, and impact analysis, is in the guidelines.

The guidance provided herein assumes a land use development project located outside of an area plan that requires a transportation impact study. Guidance on other types of projects, such as projects located in an area plan or infrastructure projects, is discussed below under the "Other" subsection. The department may use this guidance for multiple projects, but the department has discretion on applying the guidance on a project by project basis.

[1] Planning Commission Resolution No. 19579, adopted March 3, 2016.

The organization of the memorandum is as follows:

1) Project Description
2) Significance Criteria
3) Existing and Existing plus Project
   a) Methodology
   b) Existing Baseline
   c) Impact Analysis
4) Cumulative
   a) Methodology
   b) Impact Analysis
5) Other (covers different types of projects)

Attachments are under separate cover. Attachment A includes a screening criteria checklist. If a project meets the screening criteria, then the project would not be subject to the contents within this memorandum. The department may update the attachments to the memoranda more frequently than the body of the memoranda.

PROJECT DESCRIPTION

Refer to the Transportation Impact Analysis Guidelines Appendix A, Tables 1-3, for a list of the typical physical, additional physical, and programmatic features for existing and existing plus project conditions, as applicable. The geographic extent of these features must, at a minimum, include the project's frontage and may include the entirety of the project's block. Appendix A, Table 4 of the guidelines provides a non-exhaustive list of approvals from agencies other than the planning department that a project sponsor may need to obtain for the project description features described in the guidelines.

SIGNIFICANCE CRITERIA

San Francisco Administrative Code chapter 31 directs the department to identify environmental effects of a project using as its base the environmental checklist form set forth in Appendix G of the California Environmental Quality Act (CEQA) Guidelines. As it relates to VMT, Appendix G states: "For a land use project, would the project conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b)?" The department uses the following significance criteria to evaluate that question: A project would have a significant impact if it:

1) Causes substantial additional vehicle miles traveled; or
2) Substantially induces additional automobile travel by increasing physical roadway capacity in congested areas (i.e. by adding new mixed flow travel lanes) or by adding new roadways to the network.

EXISTING AND EXISTING PLUS PROJECT

Methodology

This section describes the typical methodology required to address the significance criteria. The methodology section identifies the collection, generation, and approach to analyze data. The department will determine whether to adjust the methodology as necessary, to inform the analysis. General guidance on the typical methodology for a transportation analysis can be found in the guidelines. Specific direction on the appropriate geographical area and period of study for evaluating existing and existing plus project conditions for this topic, including data collection, is provided below. This section also indicates in bracketed text [ ] whether the presentation of typical methodological elements in other sections of a transportation study (e.g., baseline, impact analysis) could occur in text, a figure, and/or a table (see Appendix A of the guidelines for examples of typical tables).

Geography

The methodology will typically focus on the transportation analysis zone[2] that the project site is in or multiple transportation analysis zones if the project site is in more than one zone as well as the nine-county San Francisco Bay Area region.

Period

The methodology should typically reflect weekday daily VMT using an efficiency metric (e.g. VMT per capita or VMT per employee).

Existing Conditions

The following identifies the typical methodology for assessing existing conditions.

<u>VMT</u>

For most projects, use a travel demand model to estimate existing VMT. The travel demand model should, to the extent information is available, account for multiple variables that affect travel behavior and calibrate to reflect observed data. A travel demand model, the San Francisco County Transportation Authority's San Francisco Chained Activity Modeling Process (SF-CHAMP), accounts for many of these variables and the transportation authority calibrates the model to reflect observed data.[3] The travel demand model should, to the extent information is available, account for VMT associated with private automobiles and for-hire vehicles.

For residential-type projects, estimate existing daily household VMT. The estimate should use a tour-based analysis (i.e., the outputs account for the entire chain of trips to and from a home). Then divide the total daily household VMT by the applicable geographic area household population to estimate VMT per capita. [text, figure, table]

For office-type projects, the methodology must estimate existing daily work-related VMT. The estimate should use a tour-based analysis (i.e., an output that accounts for the entire chain of trips to and from a job, including intermediary trips going to and from the workplace). Then divide the total daily work-related VMT by the applicable geographic area job population to estimate VMT per office employee. [text, figure, table]

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[3] The California Household Travel Survey 2010-2012 is the most current available household travel survey for the San Francisco Bay Area. SF-CHAMP is updated periodically as new data becomes available.

[3] The California Household Travel Survey 2010-2012 is the most current available household travel survey for the San Francisco Bay Area. SF-CHAMP is updated periodically as new data becomes available.

For retail-type projects, estimate existing daily VMT. The estimate should use a trip-based analysis (i.e., the outputs account for trips to and from the project, not the chain) that allows apportioning of all retail related VMT to retail sites without double counting.[4] Then divide the total daily retail related VMT by the applicable geographic area retail job population to estimate VMT per retail employee.[5] [text, figure, table]

For mixed-use projects, estimate VMT for each the project land use type separately. For each applicable land use, present the appropriate existing VMT per employee or per capita for the project site transportation analysis zone(s) and region. The methodology must also present the existing regional VMT minus 15 percent. Refer to the definitions section of Attachment A for definitions of other land uses in relation to these three land uses.[6]

<u>Transit Proximity</u>

For most projects, identify if the existing site is within a half mile of an existing major transit stop.[7]

Existing plus Project Conditions

The following identifies the typical methodology for assessing existing plus project conditions.

<u>VMT</u>

Identify if the project site VMT is 15 percent below the regional VMT average for each applicable land use: residential, office, and retail. The department uses VMT efficiency metrics (per capita or per employee) for thresholds of significance. VMT per capita reductions mean that individuals will, on average, travel less by automobile than previously but, because the population will continue to grow, it may not mean an overall reduction in the number of miles driven.

<u>Transit Proximity</u>

For most projects, identify if the existing site is within a half mile of an existing major transit stop and if the project includes a floor area ratio greater than 0.75; includes parking less than or equal to the amount required or allowed by planning code, without a conditional use; and is consistent with the applicable Sustainable Communities Strategy.[8]

<u>Vehicular Parking Rate Comparison</u>

Most travel demand models do not directly account for vehicular parking supply in their VMT estimates. However, travel demand models may indirectly account for parking supply in their VMT estimates to the

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[4] To state another way: a tour-based assessment of VMT at a retail site would consider the VMT for all trips in the tour, for any tour with a stop at the retail site. If a single tour stops at two retail locations, for example, a coffee shop on the way to work and a restaurant on the way back home, then both retail locations would be allotted the total tour VMT. A trip-based approach allows the apportioning of all retail- related VMT to retail sites without double-counting.

[5] Regional travel demand models do not typically explicitly capture retail travel. Rather, they typically include a generic "Other" purpose which includes retail shopping, medical appointments, visiting friends or family, and all other non-work, non-school tours. For SF-CHAMP, the retail efficiency metric captures all of the "Other" purpose travel generated by Bay Area households. The denominator of employment (including retail; cultural, institutional, and educational; and medical employment; school enrollment, and number of households) represents the size, or attraction, of the zone for this type of “Other” purpose travel.

[6] Other land use projects mean a land use other than residential, retail, and office. OPR has not provided methodology for other types of land uses.

[7] CEQA section 21064.3 defines a major transit stop as a rail transit station, a ferry terminal served by either a bus or rail transit service, or the intersection of two or more major bus routes with a frequency of service interval of 15 minutes or less during the morning and afternoon peak commute periods.

[8] The department considers a project inconsistent with the Sustainable Communities Strategy if the Sustainable Communities Strategy did not identify the project site in area contemplated for development.

extent the parking supply affects the travel behavior of people within different geographic locations. For projects with a substantial amount of parking,[9, 10] the methodology can address this indirect relationship. In these instances, include an estimate of the existing parking supply rate in the surrounding neighborhood (e.g., neighborhood parking rate) in comparison to the project's parking rate. Neighborhood parking rate[11] is the number of existing accessory parking spaces per 1,000 square feet of non-residential uses or the number of parking spaces per dwelling unit for residential uses for each transportation analysis zone within San Francisco. Alternatively, the methodology could estimate neighborhood parking rate using other methodologies the department identified in the Parking memorandum.

Transportation Demand Management Measures

Most travel demand models also do not directly account for other (i.e., besides parking) site-specific transportation demand management measures, that are applicable to the project, in their VMT estimates. If the project site VMT is not 15 percent below the regional VMT average for each applicable land use and the projects includes a substantial amount of parking that exceed the existing parking supply rate in the surrounding neighborhood (e.g., neighborhood parking rate), the methodology should, to the extent substantial evidence for transportation demand management measures' VMT reduction effectiveness is available, account for these transportation demand management measures being applied to the project by applying a percentage reduction to the VMT estimates derived using the above methodologies. For most transportation demand management measures, the percentage reduction would apply to the modal split calculation of the VMT analysis, while the vehicle occupancy and trip length would remain constant. If substantial evidence for transportation demand management measures is not available to quantify a percentage reduction, the methodology should qualitatively discuss whether the measures or other attributes of the project would reduce VMT per capita or employee.

Existing Baseline

Refer to the guidelines for direction on including existing baseline in transportation studies.

Impact Analysis

This section ties the project description, methodology, and existing baseline together to address the significance criteria for existing plus project conditions. This section addresses the typical approach for the impact analysis and provides more details related to VMT. The impact analysis section should present a format (text, figure, or table) consistent with earlier sections of this memorandum for easy comparison.

The impact analysis must address whether the project would create substantial VMT impacts. Refer to the guidelines for direction on what to consider when conducting the existing plus project impact analysis and how to present the findings.

Substantial VMT Impacts

The department uses the following quantitative thresholds of significance to address the substantial additional VMT significance criterion:

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[9] Refer to San Francisco Planning Commission, *Standards for the Transportation Demand Management Program*, August 4, 2016 or subsequent updates, for projects that meet this definition.

[10] Throughout this memo, the term "substantial amount" or "substantial number" is used but not defined. This is because what constitutes a substantial amount or number of people, vehicles, etc., depends on the context in which the project is being evaluated (e.g., existing conditions, proposed land uses, and other variables).

[11] The methodology should use the neighborhood parking rate most appropriate for the project proposed (i.e., residential or non-residential uses). This neighborhood parking rate may differ from that rate used in the city's transportation demand management program (planning code section 169).

- A residential-type project would exceed the existing city household VMT[12] per capita minus 15 percent and the existing regional household VMT per capita minus 15 percent
- An office-type project would exceed the existing regional VMT per employee minus 15 percent
- A retail-type project would exceed the existing regional VMT per retail employee minus 15 percent

The following examples are some of the circumstances which may result in substantial VMT impacts. This is not an exhaustive list of circumstances, under which, potential VMT impacts may occur:

- A project site is in a transportation analysis zone with average daily VMT per capita and/or employee greater than 15 percent below the regional average daily VMT per capita and/or employee and project characteristics (e.g., code compliant TDM) would not reduce VMT to 15 percent below the existing regional average daily VMT per capita and/or employee
- A project site is in a transportation analysis zone with average daily VMT per capita and/or employee at or less than 15 percent below the regional average daily VMT per capita and/or employee and project characteristics (e.g., project parking rate substantially higher than the neighborhood parking rate) would increase site level VMT to greater than 15 percent below the existing regional average daily VMT per capita and/or employee, even accounting for other project characteristics (e.g., code compliant TDM) that would reduce VMT

CUMULATIVE

Methodology

VMT by its nature is largely a cumulative impact. The number of trips and distances of these trips of past, present, and future projects might cause people to contribute to the physical environmental impacts associated with VMT. It is likely that no single project by itself would be sufficient in size to prevent the region or state in meeting its VMT reduction goals. Instead, a project's individual VMT contributes to cumulative VMT impacts. The department set existing plus project-level thresholds of significance for VMT based on levels at which the department does not anticipate new projects to conflict with state and regional long-term greenhouse gas emission reduction targets and statewide VMT per capita reduction targets.

The guidelines detail the typical methodology for cumulative analysis, including the geographical area, period, cumulative projects, and adjustments (refer to Appendix B) under cumulative conditions. Further direction on identifying reasonably foreseeable projects for this topic under cumulative conditions is provided below. The cumulative section only needs to expand upon the methodology section for existing and existing plus project to the extent the methodology differs. The department will determine the appropriate methodology as necessary to inform the impact determination. The cumulative section in transportation studies must present (text, figure, or table) the applicable elements included in the methodology.

Vehicular Parking Rate Comparison

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[12] Governor's Office of Planning and Research, Revised Proposal on Updates to the CEQA Guidelines on Evaluating Transportation Impacts in CEQA, January 20, 2016recommends the city average as a possible threshold for areas where residential VMT is substantially higher than the regional average. Given San Francisco has lower residential VMT compared to the regional average, the department has chosen to use the regional average as the appropriate metric because the intent of the OPR Guidelines was not to disincentive developments that were located in proximity to major transit stops.

The methodology may require a list-based approach of cumulative projects (refer to the guidelines for a discussion of conducting a cumulative analysis using a list-based approach), as described above for projects that require a neighborhood parking rate comparison under existing plus project conditions analysis. The department has not projected neighborhood parking rate for cumulative conditions. To conduct a cumulative neighborhood parking rate comparison, the methodology should identify private development projects in the project site transportation analysis zone or adjacent transportation analysis zones actively undergoing environmental review, recently completed environmental review, or are anticipated to undertake environmental review in the near future with sufficient project definition. For these developments projects, the methodology should estimate the parking rate per residential unit and/or the parking rate per 1,000 square feet of non-residential use. Then, the methodology should qualitatively describe how existing neighborhood parking rate could change under cumulative conditions with development of the project in combination with these cumulative development projects. If the baseline neighborhood parking rate stays the same or goes down between existing and cumulative conditions, the project that is proposing parking greater than the neighborhood parking rate under existing plus project conditions would continue to have a parking rate higher than the neighborhood parking rate under cumulative conditions.

Impact Analysis

This section ties the methodology and description of cumulative conditions together to address the significance criteria for cumulative conditions. Refer to the guidelines for direction on what to consider when conducting the cumulative impact analysis and how to present the findings. The same examples of the types of circumstances that could result in a substantial VMT impact that were provided for existing plus project conditions apply here, except for cumulative conditions.

Substantial VMT Impacts

The impact analysis must address whether the cumulative projects would create substantial VMT impacts. The department uses the following thresholds of significance to address the substantial additional VMT significance criterion:

- The region would not meet its Sustainable Communities Strategy long-range greenhouse gas reduction goals or VMT reduction goals (if applicable)

If a cumulative impact would occur, the department uses the following quantitative thresholds of significance to address whether a project would contribute considerably to the substantial additional VMT significance criterion:

- A residential-type project would exceed the future city household VMT per capita minus 15 percent and the future regional household VMT per capita minus 15 percent
- An office-type project would exceed the future regional VMT per employee minus 15 percent
- A retail-type project would exceed the future regional VMT per retail employee minus 15 percent

The following examples are some of the circumstances which may result in substantial cumulatively considerable VMT impacts. This is not an exhaustive list of circumstances, under which, potential cumulatively considerable VMT impacts may occur:

- A project site is in a transportation analysis zone with future average daily VMT per capita and/or employee greater than 15 percent below the future regional average daily VMT per capita and/or employee and project characteristics (e.g., code compliant TDM) would not reduce VMT to 15 percent below the future regional average daily VMT per capita and/or employee
- A project site is in a transportation analysis zone with future average daily VMT per capita and/or employee at or less than 15 percent below the future regional average daily VMT per

capita and/or employee and project characteristics (e.g., project parking rate substantially higher than the neighborhood parking rate) would increase site level VMT to greater than 15 percent below the existing regional average daily VMT per capita and/or employee, even accounting for other project characteristics (e.g., code compliant TDM) that would reduce VMT

OTHER

The guidance provided in this memorandum assumes a land use development project located outside of an area plan that requires a transportation impact study. This section describes the type of additional or different information that may be necessary to address VMT impacts for the following circumstances: land use development project located within an area plan, an area plan, atypical trip generators, or infrastructure project (which may be located in a different county than San Francisco). In addition, this section describes the extent to which a code compliance analysis and/or a discussion of policy inconsistencies may be necessary.

Land Use Development Project Located within an Area Plan

For projects that are consistent with an area plan for which an environmental impact report (EIR) was certified, pursuant to CEQA guidelines section 15183, the assessment must limit its analysis to such conditions specified in that section. The guidelines provide direction on how to analyze a land use development project in an area plan and a list of area plan EIRs that have been certified as of February 2019.No mitigation and improvement measures from these abovementioned EIRS are related to VMT.

Area Plans

This section applies to area plans that include both land use (e.g. changes to existing zoning) and/or infrastructure changes (e.g. street redesign).

Project Description

Typically, the department conducts an analysis to estimate the amount of future growth and the infrastructure changes that could occur in the plan area as a result of its implementation. The department typically does not have all the project description details described herein. However, the project description may include policies that may relate to the methodology and impact analysis (e.g., off-street parking requirements). The department will determine the inclusion of programmatic features in the project description based on whether they are inherent project features, which may typically be considered, or whether they are actions related to project operations that are used to avoid a significant impact (e.g., funding mechanisms).

Methodology

The assessment will estimate daily VMT per appropriate efficiency metric associated with implementation of the area plan using the approach described in the Existing and Existing plus Project Methodology subsection. The methodology will estimate the appropriate efficiency metric using larger study geography such as transportation analysis zones in the plan area and the region.

Impact Analysis

If implementation of the area plan is consistent with the latest Sustainable Community Strategy (Plan Bay Area), then the area plan would not have a significant impact. Additionally, the analysis of VMT impacts should present daily VMT per efficiency metric for the plan area and region with and without implementation of the area plan. For example, the impact analysis will assess whether the area plan is located within an area contemplated for development in the latest Plan Bay Area and, if applicable, if its implementation leads to daily VMT per efficiency metric that is equal to or less than the VMT per efficiency metric reduction goal or projected for the plan area within the latest Plan Bay Area cumulative year land use forecast and transportation system changes and policies.

Atypical Trip Generators or Substantial Rezoning

This section applies to projects that would require rezoning outside of area plans[13], such that the development density allowed at a site would substantially increase, and the following non-exhaustive list of atypical trip generators: large event centers (e.g., museums, sports arenas, or public parking garage). For these projects, the assessment of the project description and significance criteria should be similar to Existing and Existing plus Project conditions identified herein.

Methodology

The methodology may typically require a different methodology than identified herein, including potentially requiring its own travel demand model run or VMT estimation based on sketch tools or other spreadsheet tools that estimate VMT based on land use and transportation characteristics. See Attachment B for examples of these sketch tools and spreadsheet tools. The methodology may identify, in order of preference, existing land uses and/or sources of data (e.g., surveys data, global positioning system user data) that are similar to the proposed atypical land use in San Francisco, the bay area, or California or nationally recognized transportation engineering materials. Based on that information, under both existing and existing plus project conditions, estimate to the extent applicable:

- The components of average daily VMT: trip generation, automobile modal split, vehicular occupancy, and automobile trip length
- Daily population or other relevant size variables such as employees, seats, size, rooms, etc.
- Average Daily VMT per appropriate efficiency metric using the relevant size variables above
- Change in total VMT of the site between existing and existing plus project

The methodology should also qualitatively describe the project in relation to the criteria set forth in California Senate Bill 743 (Public Resources Code Section 21099(b)(1)).[14] For example, qualitatively describe the project in relation to diverting existing trips, reducing existing trip lengths, or overall reduction in existing trips.

Impact Analysis

The department may rely on one or more criteria to determine project impacts, including but not limited to: VMT per efficiency metric quantitative thresholds of significance mentioned for typical land use projects; change in total VMT; and the criteria set forth in California Senate Bill 743.

Infrastructure Project

For infrastructure projects (e.g., new roads, bridge repair, sewer line, rail service, roadway modifications, etc.), the assessment of the project description, significance criteria, and impact analysis should be similar to private development projects. The analysis typically does not require trip generation analysis as infrastructure projects usually do not generate trips.[15] However, some infrastructure project may induce

[13] On occasion, redevelopment of large areas within the city consisting of multi-structure, multi-phased development is proposed that is not within a formal plan area. These proposals often require rezoning in the form of special use districts or changes to zoning similar to the rezoning under an area plan. In terms of the project description, development for some aspects or phases may be well defined, while others may rely on consistency/conformance with associated design guidelines or performance standards.

[14] The criteria for determining the significance of transportation impacts for projects "shall promote the reduction of greenhouse gas emissions, the development of multimodal transportation networks, and a diversity of land uses."

[15] Governor's Office of Planning and Research, Revised Proposal on Updates to the CEQA Guidelines on Evaluating Transportation Impacts in CEQA, January 20, 2016.

trips, such as the addition of through lanes on existing or new highways or streets.[16] In addition, infrastructure projects may generate short-term trips due to construction workers and vehicles accessing the project site. See Attachment C for research regarding infrastructure projects and their effects on VMT (as well as other research).

Project Description

The department will determine the inclusion of programmatic features in the project description based on whether they are inherent project features, which may typically be considered, or whether they are actions related to project operations that are used to avoid a significant impact (e.g., funding mechanisms).

Methodology

Use the following methodology to assess a transportation project's impacts to VMT.

- Assess whether the proposed infrastructure project can be considered an active transportation, rightsizing, transit project or a minor transportation project (see the definitions section of Attachment A for definition of these projects) or a non-trip inducing infrastructure project (e.g. installation of sewer lines, water lines, or other utilities).
- If the transportation project is not considered an active transportation, rightsizing, transit project or a minor transportation project, in consultation with the planning department, qualitatively and/or quantitatively assess impacts as follows:
  - Qualitative: Consider whether the transportation project would result in lower automobile travel time thereby causing trip-making changes, changes in mode choice, route changes, or newly generated trips, that could increase vehicle travel.
  - Quantitative: Estimate VMT induced by the transportation project using approaches such as 1) simulating potential trip-making changes due the transportation project with a travel demand model, and 2) use an elasticity model to estimate the amount of induced vehicle travel resulting from the transportation project (e.g. additional lane mile of roadway capacity added). See Attachment D for guidance on quantitative analysis for transportation projects.

Impact Analysis

The analysis of VMT impacts should compare the project's estimated VMT to the department's quantitative threshold of significance. The department uses a threshold of significance of approximately 2 million VMT per year in order to meet the greenhouse gas emission reduction goal of 40 percent below 1990 levels by 2030 set forth in California Senate Bill 32.[17] A project that leads to an addition of more VMT than the threshold of significance may indicate a significant impact on VMT.

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[16] Generally, minor transportation projects would not result in additional trips. Examples include, but are not limited to, rehabilitation, maintenance, and repair of transportation infrastructure; installation, removal or reconfiguration of non-through traffic lanes and traffic control devices; removal of through lanes; installation of traffic calming measures and wayfinding; removal of on- or off-street parking. Governor's Office of Planning and Research, *Technical Advisory on Evaluating Transportation Impacts in CEQA*, November 2017.

[17] This estimate is based on the methodology outlined by Governor's Office of Planning and Research, Revised Proposal on Updates to the CEQA Guidelines on Evaluating Transportation Impacts in CEQA, January 20, 2016, page III:31. To the extent information is available, the department may revise this estimate to reflect data within California Air Resources Board reports, Plan Bay Area, or other sources to account for the latest allowable increases VMT increases to meet long-range greenhouse gas reduction goals and estimated total number of transportation projects by greenhouse gas reduction goal target year.

The impact analysis must address whether the infrastructure project would substantially induce additional automobile travel by increasing physical roadway capacity in congested areas or by adding new roadways to the network. The following examples are some of the circumstances relevant to infrastructure projects, which may result in impacts related to VMT. This is not an exhaustive list of circumstances under which an impact would occur:

- A project would include new roadways, bridges, or expansion of existing roadway capacity on a roadway
- A project would include the creation of new or addition of roadway capacity that would worsen conditions for people walking, bicycling, and, if applicable, riding transit (e.g. construction of new freeway on/off-ramps) thereby reducing the number of people that would use non-automobile modes
- A project would add a substantial number of new on-street parking spaces
- Conversion of existing managed lanes (e.g., HOV, HOT, or trucks) or transit lanes to general purpose lanes (including vehicle ramps) or parking
- Removal of existing transit service without comparable transit service nearby or creation of new routes to maintain existing transit service

ATTACHMENT A

Screening Criteria (SB 743 Checklist)

The Planning Department created a SB743 Checklist in response to California Environmental Quality Act (CEQA) Section 21099 – Modernization of Transportation Analysis for Transit Oriented Projects and Planning Commission Resolution 19579. Planning Commission Resolution 19579 replaces automobile delay with vehicle miles traveled analysis. This appendix lists out the screening criteria from the SB743 Checklist used by the Planning Department to identify types, characteristics or locations of projects and a list of transportation project types that would not result in significant transportation impacts under the VMT metric. These screening criteria are consistent with CEQA Section 21099 and the screening criteria recommended by OPR. If a project would generate VMT, but meets the screening criteria in Tables 1 and 2, or falls within the types of transportation projects listed in Table 3, then a detailed VMT analysis is not required for a project.

Attachment A-1 below provides definitions related to the these screening criteria, and Attachment A-2 would be customized for each project to show major transit stops within a half mile radius of the project site.

TABLE 1

Vehicle Miles Traveled Analysis – Screening Criterion If a project meets the screening criterion listed below, then a detailed VMT analysis is not required. See Attachment A-1 for definitions and other terms.	
☒	**Criterion 1. Is the proposed project site located within the *"map-based screening"* area?** [Identify regional, and transportation analysis zone (TAZ) VMT per efficiency metric. Consult with transportation planner if project does not meet this screening criterion.]

Note: Projects with a substantial amount of parking may not meet screening criterion.

TABLE 2

Vehicle Miles Traveled Analysis – Additional Screening Criteria Identify whether a project meets any of the additional screening criteria. See Attachment A-1 for definitions and other terms.	
☒	**Criterion 1. Does the proposed project qualify as a "*small project*"? or** [Identify number of daily vehicle trips from whole of the project – show your work]
☒	**Criterion 2. Proximity to Transit Stations (must meet all four sub-criteria)** Is the proposed project site located within a half mile of an existing major transit stop; and [NOTE: this is definition is different than transit priority area, as it does not include planned major transit stops. Add transit stop headway/schedule, or other applicable qualifying information such as nearby rail transit station or multi-modal ferry terminal.] Would the proposed project have a floor area ratio of greater than or equal to 0.75, and Would the project result in an amount of parking that is less than or equal to that required or allowed by the Planning Code without a conditional use authorization, and Is the proposed project consistent with the Sustainable Communities Strategy? [NOTE: if project site is located in priority development area, reference that. Refer to Attachment 1 of 2013 staff report for San Francisco's priority development areas: http://www.sf-planning.org/ftp/files/plans-and-programs/emerging_issues/scs/Plan-Bay-Area-Memo-5_02_13.pdf.) As noted by footnote, however, a project site does not need to be within a priority development area to be consistent. All land within San Francisco, except for parks and open spaces was considered for development in Plan Bay Area.]

TABLE 3

Induce Automobile Travel Analysis If a project contains transportation elements and fits within the general types of projects described below, then a detailed VMT analysis is not required. See Attachment A-1 for definitions and other terms.	
☒	**Project Type 1. Does the proposed project qualify as an "*active transportation, rightsizing (aka Road Diet) and Transit Project*"? or** [Specify how project meets this criterion – state n/a if no transportation elements]
☒	**Project Type 2. Does the proposed project qualify as an "*other minor transportation project*"?** [Specify how project meets this criterion – state n/a if no transportation elements]

ATTACHMENT A-1
DEFINITIONS

Active transportation, rightsizing (aka road diet) and transit project means any of the following:

- Reduction in number of through lanes
- Infrastructure projects, including safety and accessibility improvements, for people walking or bicycling
- Installation or reconfiguration of traffic calming devices
- Creation of new or expansion of existing transit service
- Creation of new or conversion of existing general purpose lanes (including vehicle ramps) to transit lanes
- Creation of new or addition of roadway capacity on local or collector streets, provided the project also substantially improves conditions for people walking, bicycling, and, if applicable, riding transit (e.g., by improving neighborhood connectivity or improving safety)

Employment center project means a project located on property zoned for commercial uses with a floor area ratio of no less than 0.75 and that is located within a transit priority area. If the underlying zoning for the project site allows for commercial uses and the project meets the rest of the criteria in this definition, then the project may be considered an employment center.

Floor area ratio means the ratio of gross building area of the development, excluding structured parking areas, proposed for the project divided by the net lot area.

Gross building area means the sum of all finished areas of all floors of a building included within the outside faces of its exterior walls.

Infill opportunity zone means a specific area designated by a city or county, pursuant to subdivision (c) of Section 65088.4, that is within one-half mile of a major transit stop or high-quality transit corridor included in a regional transportation plan. A major transit stop is as defined in Section 21064.3 of the Public Resources Code, except that, for purposes of this section, it also includes major transit stops that are included in the applicable regional transportation plan. For purposes of this section, a high-quality transit corridor means a corridor with fixed route bus service with service intervals no longer than 15 minutes during peak commute hours.

Infill site means a lot located within an urban area that has been previously developed, or on a vacant site where at least 75 percent of the perimeter of the site adjoins, or is separated only by an improved public right-of-way from, parcels that are developed with qualified urban uses.

Lot means all parcels utilized by the project.

Major transit stop is defined in CEQA Section 21064.3 as a rail transit station, a ferry terminal served by either a bus or rail transit service, or the intersection of two or more major bus routes with a frequency of service interval of 15 minutes or less during the morning and afternoon peak commute periods.

Map-based screening means the proposed project site is located within a transportation analysis zone that exhibits low levels of VMT.

Net lot area means the area of a lot, excluding publicly dedicated land and private streets that meet local standards, and other public use areas as determined by the local land use authority.

Other land use projects mean a land use other than residential, retail, and office. OPR has not provided proposed screening criteria or thresholds of significance for other types of land uses, other than those that meet the definition of a small project.

- Student housing, single room occupancy hotels, and group housing land uses should be treated as residential for screening and analysis.
- Tourist hotel workers, childcare, K-12 schools, post-secondary institutional (non-student housing), Medical, and production, distribution, and repair (PDR) land uses should be treated as office for screening and analysis.
- Tourist hotels, grocery stores, local-serving entertainment venues, religious institutions, parks, and athletic clubs land uses should be treated as retail for screening and analysis.
- Public services (e.g., police, fire stations, public utilities) and do not generally generate VMT. Instead, these land uses are often built in response to development from other land uses (e.g., office and residential). Therefore, these land uses can be presumed to have less-than-significant impacts on VMT. However, this presumption would not apply if the project is sited in a location that would require employees or visitors to travel substantial distances and the project is not located within ½ mile of a major transit stop or does not meet the small project screening criterion.
- Event centers and regional-serving entertainment venues would most likely require a detailed VMT analysis. Therefore, no screening criterion is applicable.

Other minor transportation project means any of the following:

- Rehabilitation, maintenance, replacement and repair projects designed to improve the condition of existing transportation assets (e.g., highways, roadways, bridges, culverts, tunnels, transit systems, and bicycle and pedestrian facilities) and that do not add additional motor vehicle capacity
- Installation, removal, or reconfiguration of traffic lanes that are not for through traffic, such as left, right, and U-turn pockets, or emergency breakdown lanes that are not used as through lanes
- Conversion of existing general purpose lanes (including vehicle ramps) to managed lanes (e.g., HOV, HOT, or trucks) or transit lanes
- Grade separation to separate vehicles from rail, transit, pedestrians or bicycles, or to replace a lane in order to separate preferential vehicles (e.g. HOV, HOT, or trucks) from general vehicles
- Installation, removal, or reconfiguration of traffic control devices, including Transit Signal Priority (TSP) features
- Traffic metering systems
- Timing of signals to optimize vehicle, bicycle or pedestrian flow on local or collector streets
- Installation of roundabouts
- Adoption of or increase in tolls
- Conversion of streets from one-way to two-way operation with no net increase in number of traffic lanes
- Addition of transportation wayfinding signage
- Removal of off- or on-street parking spaces

- Adoption, removal, or modification of on-street parking or loading restrictions (including meters, time limits, accessible spaces, and preferential/reserved parking permit programs)

Small project means the project would not result in over 100 vehicle trips per day or would have less than or equal to a 10,000 square feet of retail.

Transit priority area means an area within one-half mile of a major transit stop that is existing or planned, if the planned stop is scheduled to be completed within the planning horizon included in a Transportation Improvement Program adopted pursuant to Section 450.216 or 450.322 of Title 23 of the Code of Federal Regulations.

Vehicle miles traveled measures the amount and distance that a project might cause people to drive and accounts for the number of passengers per vehicle.

ATTACHMENT A-2
MAJOR TRANSIT STOPS

[insert map showing stops within a half-mile radius of the project site]

ATTACHMENT B

Vehicle Miles Traveled Sketch Tools

This appendix provides an overview of existing sketch tools and spreadsheet tools for estimating VMT based on land use and transportation characteristics. For each tool, this appendix provides a summary of the its functionality, inputs and outputs, and where the tool has been applied. The Planning Department provides this appendix for informational purpose and does not endorse these tools. Please consult Planning Department staff prior to using any of the tools for VMT analysis.

ASAP (Plan+, MXD+, TDM+)

- Developer: Fehr & Peers, Measures: VMT and Transportation-related GHG, Year: 2013, Cost: Paid, URL: http://asap.fehrandpeers.com/tools/sustainable-development/plan
- While the trip generation rates are manually adjustable, the MXD+ tool calculates reduced trip generation rates
- The Plan+ tool takes into account built environment and transit characteristics that reduce VMT
- Outputs are VMT (Daily, AM, PM), Trips (Daily, AM, PM), CO_2e (Metric tons per day)

Bay Area Simplified Simulation of Travel, Energy and Greenhouse Gases (BASSTEGG)

- Developed by the Bay Area Metropolitan Transportation Commission
- GIS simulation of Regional VO, VMT, and GHG based on TAZ-level BE and SES
- ftp://ftp.abag.ca.gov/pub/mtc/planning/forecast/BASSTEGG/
- Used in the Bay Area, CA

CalEEMod 2013 & 2016

- Developer: California Air Pollution Control Officers Association (CAPCOA), Measures: GHG and VMT, Year: 2013, Cost: Free, Format: Downloadable program, URL: http://www.caleemod.com Documentation: http://www.aqmd.gov/caleemod/user's-guide
- Adjustment to VMT based on elasticities
- Applicable to commercial (subset), educational, industrial, recreational, residential, retail (subset).
- Any context area
- Measures in CAPCOA Quantifying GHG Mitigations Report
- Uses this method with elasticities taken from the Quantifying GHG Mitigation Measures report published by the California Air Pollution Control Officers Association (CAPCOA)
- Calculates transportation-related VMT using estimates of trips based on the traditional ITE trip generation rates multiplied by trip lengths
- The tool includes default trip lengths based on the 1999 California Household Survey, but it allows users to input other trip lengths

- With its focus on project rather than area characteristics, the tool may not be well suited to the analysis of plans
- VMT projections are made for each land use in a project as well as the entire projects
- It reports household VMT per day, which can be aggregated to the project and year levels within the web interface
- CalEEMod offers a platform for entirely customizable travel parameters such as trip lengths by trip purpose and trip generation rates (new, diverted, pass-by) allowing customization to reflect the local travel patterns in the area of a project.

California SmartGrowth Trip Generation (SGTG) Adjustment Tool

- Developer: UC Davis ULTRANS, Measures: Trips Generated, Year: 2012, Cost: Free, Format: Spreadsheet, URL: http://ultrans.its.ucdavis.edu/projects/smart-growth-trip-generation
- Developed by researchers affiliated with the Institute of Transportation Studies at UC Davis calculates an adjustment factor based on eight variables related to land use characteristics and transit availability
- Adjustment factors are based on data collected at 50 project sites in California and were validated using data from another sample of California sites
- The reduced trip projections from this tool should be used only for projects that meet certain “smart growth” criteria and can be multiplied by trip lengths to calculate VMT

CNT (2015)/Green Trip Connect

- Developer: Center for Neighborhood Technology, Measures: Trip Generation Rate Adjustments, Year: 2016, Cost: Free, Format: Web tool URL: http://connect.greentrip.org/
- Statistically-based reduction in VMT
- Residential applicability using any context area
- Outputs VMT using location (surrounding land use and transportation characteristics, parking spaces/ charges, presence of affordable housing/rents, offers of residential transit passes/carshare/bikeshare
- GreenTrip Connect produces only a partial estimate of VMT impacts for mixed-use projects

Envision Tomorrow

- Developed by Fregonese Associates
- GIS tool that tests financial feasibility of development regulations and their impact on indicators
- Allows planners to model land use scenarios based on aggregate building level data and assess area outcomes such as housing and jobs (mix and density), jobs-housing balance, land consumption (vacant, agricultural, infill), impervious surface, open space, housing affordability, resource usage (energy and water), waste production (water, solid, carbon), transportation (travel mode choice, vehicle miles traveled), fiscal impact (local revenue and infrastructure costs), balanced housing index (how a scenario’s housing mix matches the expected future demographic profile)
- www.frego.com/services/envision-tomorrow/
- Used in various locations, including Mountlake Terrace, WA

Envision Tomorrow + Tool

- Developer: Fregonese Associates / University of Utah, Year: 2013, Cost: Free, Format: Spreadsheet and ArcGIS extension, URL 1: http://www.arch.utah.edu/cgi-bin/wordpress-etplus/ URL 2: http://www.envisionutah.org/wasatch-choice-toolbox/tool-et
- Incorporates two models, one that calculates trip generation reductions for mixed-use project sites and one for mixed-use districts
- Based on the EPA MXD method
- District level model is based on studies by Reid Ewing of the Center for Metropolitan Studies at the University of Utah
- Key variables are project land use characteristics, surrounding land use characteristics, street network, land values, population and economic data
- Outputs are vehicle miles traveled (VMT), vehicle trips, walk trips, bike trips, transit trips, greenhouse gas and pollutant emissions, and many other additional outputs

H+T (Housing and Transportation) Affordability Index

- It uses census and other nationally available datasets to estimate auto ownership, auto use (VMT), and transit use
- From these three estimates, it calculates various downstream outcomes, such as transportation costs and GHG emissions
- Auto ownership data was obtained from the ACS as a ratio of autos and occupied households per block group
- Auto use data came from Massachusetts odometer readings from 2005-2007 at a 250-meter grid cell level
- Transit data were measured from the ACS as the percent of commuters using transit at the block group level
- All three regression models employ 11 explanatory variables derived from readily available national and regional databases: (1) median income, (2) per capita income, (3) average household size, (4) average commuters per household, (5) residential density, (6) gross density, (7) average block size, (8) intersection density, (9) transit connectivity, (10) transit access shed, and (11) employment access
- Its ease of use is limited to displaying current conditions; the underlying regression model coefficients would have to be used to explore how planned changes to the built environment (BE) might affect travel outcomes

Improved Data and Tools for Integrated Land Use-Transportation Planning in California

- Developed by UC Davis
- Uses California-specific relationships of Built Environment (BE) and travel for scenario planning at multiple scales using various tools
- Original research was then conducted on the relationship between BE and travel demand and a suite of software tools was developed for use in local and regional integrated land use-transportation scenario planning processes in California. Three tools were developed: (1) a sketch planning spreadsheet, (2) a GIS-integrated sketch planning tool, and (3) a travel demand forecasting model post-processor

- The suite of tools was based on three statistical models for different regions: (1) small/medium MPOs, (2) large MPOs, and (3) major rail corridors. The models were fitted using GIS and travel survey data (NHTS and regional) from 13 smaller and medium-size MPOs, two major metropolitan areas, and several sub-regions within the two largest MPOs in California
- The models quantified the influence of built environment "D" variables captured within a half-mile buffer around a household and household demographics on three outcomes: vehicle ownership (VO), vehicle trip generation (VT), and vehicle miles travelled (VMT)
- VMT was estimated through multiple steps: a binary logistic regression model to estimate the probability that a household will make a vehicle trip; then either one linear regression model to estimate household VMT or two linear regression models to estimate the number of vehicle trips and the average vehicle trip length, the product of which is VMT
- This tool addressed two of the major limitations of previous sketch planning tools: (1) Travel mode choice differences associated with the BE at workplace and shopping destinations were modeled in addition to those at home locations; and (2) separate models were developed for study regions of varying sizes, which resulted in different relationships between the BE and travel
- http://ultrans.its.ucdavis.edu/projects/improved-data-and-toolsintegrated-land-usetransportation-planning-california
- Used in various locations in California

Local Sustainability Planning Tool

- Developed by Southern California Association of Governments (SCAG)
- GIS tool to model land use scenarios on VO, VMT, mode share, and GHG emissions
- http://rtpscs.scag.ca.gov/Pages/Local-SustainabilityPlanning-Tool.aspx
- Used in various communities in Southern California

Low-carb Land Tool

- Developed by Sonoma Technology, Inc.
- Web tool for examining VMT and GHG under various growth and land use scenarios
- http://www.sonomatech.com/project.cfm?uprojectid=672
- Used by Thurston County, WA and Marin County, CA

MXD

- Developer: Envision Tomorrow, Measures: Trip Generation Rate Adjustments, Year: 2014, Cost: Free, Format: Spreadsheet, URL: http://www.envisiontomorrow.org/district-level-travel-model/
- A spreadsheet-based tool built by the transportation consulting firm Fehr & Peers and hosted by the Environmental Protection Agency
- Statistically-based reduction in trips
- Applicability is residential, retail, office, industrial (subset), commercial (subset), educational, other
- Any context area
- Calculated VMT is a result of MXD's adjusted trip generation rates multiplied by the average trip length by trip purpose

- Trip length input source is important and can drastically influence the results
- Important input data may be difficult to find

Rapid Fire Tool

- Developed by Calthorpe Associates
- Models VMT, GHG emissions, etc. based on land use scenarios
- http://www.calthorpe.com/
- Used in California and Honolulu

Sketch 7

- Developer: Fehr & Peers, Sacramento Area Council of Governments, UC Davis Urban Land Use and Transportation Center (ULTRANS), Measures: Change in VMT, transit trips per capita, bicycle and walk trips per capita, Year: 2012, Cost: Free, Format: Spreadsheet and Web-based GIS Application, URL: http://ultrans.its.ucdavis.edu/projects/improved-data-and-tools-integrated-land-usetransportation-planning-california
- Spreadsheet tool that estimates VMT based on seven land use and transportation characteristics
- Primarily used and maintained in the Sacramento region
- Projects VMT for several situations including a given project, the surrounding area (the context area) in a before-and-after project scenario, and compares the project scenarios to the regional VMT averages
- Key variables are seven D's of land use and transportation (auto/ transit accessibility, jobs/housing balance, residential density/diversity, street pattern, demographics)
- Its use is limited to the Sacramento region without investment from other regional planning agencies to develop the needed inputs
- Is able to estimate transit, bike and walk trips
- The proper functioning of Sketch7 requires development maintenance of a parcel database to use as baseline data
- Regional TAZ data used to calibrate tool may be difficult to obtain

UrbanFootprint

- Developer: Calthorpe Associates/Calthorpe Analytics, Year: 2012, Cost: Free, Format: Browser-based downloadable program, URL: http://www.scag.ca.gov/Documents/UrbanFootprintTechnicalSummary.pdf
- Open-source downloadable software program, analyzes fiscal, environmental, public health, and transportation impacts of plans and policies
- Runs a sketch-level travel model based on land use and transportation system characteristics that outputs VMT
- Uses land use, road network, transit data demographic and economic data for determining rates

VMT Reduction: Phase One

- Developed by WSDOT
- Estimates neighborhood residential VMT and CO_2 based on BE and demographic factors
- Estimates household-level vehicle use (VMT in miles per day, month, year or other unit of time) and related CO_2 emission (grams per unit time) as well as the 95% confidence interval around each estimate
- It can be used for baseline and forecasted estimates based on changes to input variables.
- Estimates are based on the relationships found in two Ordinary Least Squares (OLS) linear regression models of household VMT and CO_2. The OLS linear regression models were fitted using data from 1,929 households that responded to the 2006 PSRC household travel survey and who lived in King County jurisdictions where sidewalk data were available.
- It relies on models of VMT and CO_2 based only on household neighborhood urban form, it does not account for the effect of destination 17 urban form characteristics on VMT. The tool also does not estimate travel for non-residential land uses in the planning area.
- It was developed from a sample of households located in a limited number of jurisdictions in King County, and therefore may not be generalizable to other parts of the state.
- http://www.wsdot.wa.gov/research/
- Used in Rainier Beach and Bitter Lake, Seattle

VMT +

- Developer: Fehr & Peers, Measures: VMT and Transportation-related GHG, Year: 2013, Cost: Free, Format: Calculator on website, URL: http://www.fehrandpeers.com/vmt
- VMT is estimated by a multiplication of trips generated multiplied by trip lengths
- Outputs are VMT (per household per day), CO_2e (MT per day)

Sources:
http://depts.washington.edu/trac/bulkdisk/pdf/806.3.pdf
https://rosap.ntl.bts.gov/view/dot/32750

ATTACHMENT C

Combined Vehicle Miles Traveled Research Annotated Bibliography

This appendix documents existing research on travel behavior and vehicle miles traveled (VMT). The first portion presents research that supports significance assumptions under SB 743. Based on existing research, certain transportation projects are not considered likely to lead to a substantial or measurable increase in VMT. The second portion summarizes the relationship between VMT and density, land use context, and access to parking at home and work.

Contents of this Appendix

1. Projects with assumed less-than-significant VMT impacts under SB 743
2. Parking access, land use context, density, and VMT

1. Projects with assumed less-than-significant VMT impacts under SB 743

In January 2016, the California Office of Planning and Research (OPR) published for public review and comment a *Revised Proposal on Updates to the CEQA Guidelines on Evaluating Transportation Impacts in CEQA*[1]. The document includes a list of transportation project types that would not likely lead to a substantial or measurable increase in vehicle miles traveled (VMT). If a project fits within the general types of projects (including combinations of types) described below, then it is presumed that VMT impacts would be less than significant and a detailed VMT analysis is not required. Some of these types of projects are reducing the number of through lanes, creating new or expanding transit services, adoption of tolls, and removal of on- or off-street parking. Each project type is listed in Table 1; project types have been grouped together by the City and County of San Francisco.

This appendix documents existing research that supports and furthers the substantial evidence in the Technical Advisory document regarding these projects' presumed less-than-significant VMT impacts. Some papers address more than one type of project; Table 1 lists sources that address each project type's VMT contributions. This document is and will continue to be a working draft; new research that advances understanding of these projects' VMT impacts will inform future drafts.

[1] This document is available online at: https://www.opr.ca.gov/s_sb743.php.

Table 1: Transportation projects not likely to lead to a substantial or measurable increase in VMT, and reviewed references that support this conclusion

Project Type	References
Active Transportation, Rightsizing (aka Road Diet), and Transit Projects	
Reduction in number of through lanes	2, 4, 9, 11, 15, 16
Infrastructure projects, including safety and accessibility improvements, for people walking or bicycling	8, 15, 16
Creation of new or expansion of existing transit service	5, 8, 9, 14
Creation of new or conversion of existing general purpose lanes (including vehicle ramps) to transit lanes	9, 14
Other Minor Transportation Projects	
Adoption of or increase in tolls	8
Conversion of streets from one-way to two-way operation with no net increase in number of traffic lanes	1, 3, 7, 10
Removal of off- or on-street parking spaces	6, 12, 13
Adoption, removal, or modification of on-street parking or loading restrictions (including meters, time limits, accessible spaces, and preferential/reserved parking permit programs)	13

1. Goodwin, Phil, Carmen Hass-Klau, and Sally Cairns. "Evidence on the effects of road capacity reduction on traffic levels." Traffic Engineering+ Control 39.6 (1998): 348-54. http://nacto.org/docs/usdg/traffic_impact_highway_capacity_cairns.pdf

Reduction in number of through lanes

This report was a meta-analysis of over 100 studies of projects that reduced vehicular capacity on roadways (popularly termed "road diets"). The overall sample of studies showed an average reduction in traffic in the treatment area by 41%, with *less than half* reappearing on alternative routes or at different times of day. There were 7 cases of overall traffic increase.

The paper does list some potential caveats:

- Drivers could have rerouted to longer diversions that were not captured by the projects' designated "study area." However, most studies were conducted by local professionals who tried to account for reasonable diversion possibilities.
- Partial sampling is also an issue; that is, surveying pre-project road users who stop using the road but not capturing the anyone who began driving on the road after the project.

In spite of possible sources of bias and error in particular cases, the authors conclude that, taken as a whole, the sum of case studies seems to point to a proportion of traffic possibly "disappearing" when capacity is reduced. They conclude: "The balance of evidence is that measures which reduce or reallocate road capacity, when well-designed and favoured by strong reasons of policy, need not automatically be rejected for fear that they will inevitably cause unacceptable congestion." Although the focus of the paper is congestion, it does have findings that support the idea that a reduction in vehicular capacity does not generate additional VMT.

2. Walker, G. Wade, Walter M. Kulash, and Brian T. McHugh. Downtown Streets: Are We Strangling Ourselves in One-Way Networks?. No. E-C019, 2000.

Conversion of streets from one-way to two-way operation with no net increase in number of traffic lanes

The author, a transportation consultant, enumerates the drawbacks of one-way street networks relative to two-way street networks. Although the author presents a cogent argument, it is unclear where exactly he draws his conclusions from – no data is presented when citing "our experience."

> *As stated previously, one of the inherent disadvantages with one-way streets is that they force additional turning movements at the intersections caused by motorists who must travel "out-of-direction" to reach their destination. These additional turning movements increase the chance of a vehicular-pedestrian conflict at any given intersection, and also result in a systemwide increase in VMT over a comparable two-way system due to the amount of recirculating traffic…. Our experience shows that a one-way system usually yields approximately 120 to 160% of the turning movements when compared to a two-way system, and the travel distance between portal and destination is usually 20 to 50 percent greater in a one-way street system.*

3. Meng, Lum Kit, and Soe Thu. "A microscopic simulation study of two-way street network versus one-way street network." Journal of the Institution of Engineers, Singapore 44 (2004): 111-122.

Conversion of streets from one-way to two-way operation with no net increase in number of traffic lanes
The authors conducted CORSIM simulations with a created network and compared one-way coordinated signal timings and two-way. They found a statistically significant difference among the following findings:

Measures of Effectiveness at the systemwide level	**Two-way Results (compared to one-way)**
VMT	Lower
Veh-hr of delay	Higher
Avg speed	Lower
Fuel consumption **rate**	Lower
Emission **rate** (HC, CO, NOx)	Higher
Emissions **amount**	Lower

The table of results shows that the emissions rate is higher in the two-way network. However, because fewer miles are driven, overall emissions are lower. The simulation was conducted using a user equilibrium (rather than a system optimal equilibrium) in which every simulation agent searches for the shortest path between a prescribed origin and destination. However, the paper does not clarify whether a path's cost is measured in purely distance or distance plus delay time due to congestion. Therefore, it is not obvious whether the additional VMT includes route diversions due to congestion or just network circuity.

This simulation supports the idea that one-way to two-way conversion does not substantially increase VMT (and in fact, may decrease it).

4. Cervero, Robert; Junhee Kang & Kevin Shively (2009) "From elevated freeways to surface boulevards: neighborhood and housing price impacts in San Francisco." Journal of Urbanism: International Research on Placemaking and Urban Sustainability, 2:1, 31-50, http://dx.doi.org/10.1080/17549170902833899

Reduction in Number of Through Lanes
The paper details the conversion of the Central Freeway in San Francisco to an arterial street (Octavia Boulevard), contrasting doomsday predictions of perpetual gridlock with what is instead described as a relatively smooth transition.

A study conducted shortly after the Central Freeway's 1996 closure revealed that in the short term, most drivers redistributed onto parallel routes. One year after the closure, surveys mailed to 8,000 drivers formerly identified driving the freeway revealed:

76% used another freeway
11% used city streets entirely
3% used a combination of freeways and transit
3% no longer made the trip that used the freeway.
2% switched to transit
2% used freeways and surface streets instead
1% used freeways still, and took fewer trips.

The paper concludes with the idea of "triple divergence," to explain how travel behavior reacts to the reduction of vehicular capacity:

> *"The survey also found that 19.8% of survey respondents stated they made fewer trips since the freeway closure. Most were discretionary trips, such as for recreation. Also, average one-way trip length increased by 7.7% (from 21.2 to 22.8 miles). . . . This might be thought of as 'triple divergence,' the obverse of Downs's 'triple convergence' explanation as to why freeways remain congested when new capacity is added. Just as adding capacity prompts traffic to redistribute itself to maintain similar levels of service, withdrawing capacity likely unleashes a similar response – motorists shift routes, modes, and times of travel to maintain a homeostasis."*

Although the average one-way trip length increased by 7.7%, that increase was swamped by the 19.8% of people who made fewer trips (given that the average trip length was 21.8 miles). Therefore, these findings and Cervero's theory of triple divergence substantiate the idea of no significant increase in VMT with the reduction of vehicular capacity.

5. Duranton, Gilles, and Matthew A. Turner. "***The fundamental law of road congestion: Evidence from US cities." The American Economic Review 101.6 (2011): 2616-2652. http://www.nber.org/papers/w15376.pdf***

Creation of new or expansion of existing transit service

The authors hypothesize that the addition of public transit service miles, to the extent that it attracts drivers to ride transit instead, will only free up extra lane miles for traffic congestion to revert to equilibrium levels – a corollary to the well-known "fundamental law of traffic congestion" (which offers the same hypothesis for lane-miles rather than transit service miles).

Conducting ordinary least squares (OLS) regressions using number of buses and lane kilometers of service at the metropolitan statistical area (MSA) scale, the authors found inconsistent and mostly statistically insignificant estimates for the coefficient of "number of large buses." In other words, an increased public transit supply (as measured by the count of large buses at the MSA level) was not associated with a reduction or increase in vehicle-kilometers traveled (VKT).

This research supports the idea that an increased the supply of public transit does not contribute to a significant increase in VMT.

6. Weinberger, Rachel. "Death by a thousand curb-cuts: Evidence on the effect of minimum parking requirements on the choice to drive." Transport Policy 20 (2012), doi:10.1016/j.tranpol.2011.08.002

Removal of off- or on-street parking spaces

The author created a data set monitoring home parking provision in three New York City boroughs, combining a tax lot database and aerial images to estimate the presence of off-street parking in a number of census tracts. They used that data to estimate a regression model explaining the percentage of commuters who drive to work in a census tract as a function of the tract's built environment characteristics, socioeconomic and demographic characteristics, and an on-site parking per dwelling unit rate.

They describe their results thusly:

> *"The research shows a clear relationship between guaranteed parking at home and the greater propensity to use the automobile for journey to work trips even between origin and destinations pairs that are reasonably well and very well served by transit. Because journey to work trips to the downtown are typically well served by transit, we infer from this finding that trips for other purposes from these areas of higher on-site, off-street parking are also made disproportionately by car."*

These findings support the conclusion that the provision of off-street parking spaces is associated with additional VMT, implying that the removal of them would not be associated with such.

7. Gayah, Vikash V. "Two-way street networks: More efficient than previously thought?." ACCESS Magazine 1.41 (2012).

Conversion of streets from one-way to two-way operation with no net increase in number of traffic lanes

The author explains that in a downtown, a one-way street network may have higher vehicle-moving capacity (i.e., the ability to move more cars through a point or series of points) than a two-way street network. However, the one-way network will have a lower trip-serving capacity, because trips through and within the network are more circuitous: "Thus, the use of one-way street networks increases the average driving distance between any paired origin-destination points and will result in more vehicle miles traveled (VMT). Increased VMT means increased fuel consumption, emissions, and exposure to accidents."

The author does explain that in a larger downtown or network, the difference in trip lengths between one-way and two-way networks approaches a negligible amount. Even so, the two-way network is always associated with lower VMT.

The paper is a thought experiment, with supporting evidence like what is shown in Figure 3 below. This research supports the idea that converting a street (or couplet, or network of streets) from one-way to two-way would lower VMT.

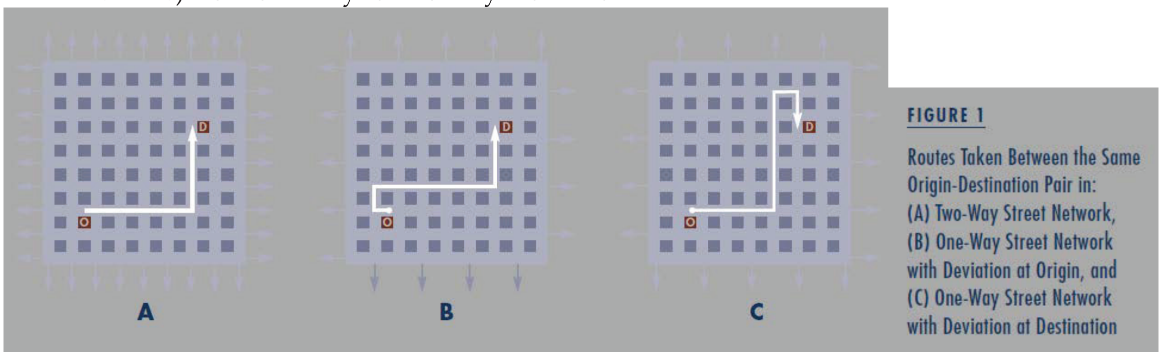

Figure 1: Illustration of the additional circuity of a one-way network compared to a two-way network

8. Salon, D., Boarnet, M. G., Handy, S., Spears, S., & Tal, G. (2012). *How do local actions affect VMT? A critical review of the empirical evidence*. *Transportation Research Part D: Transport and Environment*, *17*(7), 495-508. DOI: 10.1016/j.trd.2012.05.006

This paper provides an assessment of existing research concerning land use, policy, and programmatic decisions that "local-level policymakers can take . . . that are likely to affect vehicle miles traveled." The paper covers research on many topics, pointing out what appears to be known about the effect on VMT and also discussing gaps in the research. Pertinent topics are listed below.

Infrastructure projects, including safety and accessibility improvements, for people walking or bicycling

The authors list the results of various studies on bicycle infrastructure and surrogate measures of such:

Study Authors	Measure Studied	Estimate
Dill and Carr (2003)	Elasticity of bicycle commute mode share with respect to bike lane density *or* per capita bicycle spending	0.32
Parsons Brinckerhoff (1993)	Elasticity of VMT with respect to with respect to a measure of pedestrian quality	-0.19
Kitamura et al (1997)	Number of vehicle trips (person level) given the presence of sidewalks in a neighborhood	-0.14%
Guo and Gandavarapu (2010)	VMT with respect to sidewalk presence	-0.645 VMT per mile of roadway with sidewalks within 1 mile of a person's home

The authors note that a link between increased bicycling and reductions in VMT does not appear to have been established in the literature, in part because bicycle trips are relatively short (i.e., they compete with walking trips rather than driving) and the effects of infrastructure closely concentrated (sub-regional, and perhaps sub-city level).

The authors conclude with the following assessment of the state of research into these two areas:

> *Estimates of the effect on VMT of both pricing strategies and strategies that make alternatives to the auto more attractive (transit and non-motorized transport) are generally lacking. In our estimation, these areas represent the largest gap in the literature.*

However, the survey of research finds evidence that sidewalk presence, bicycle infrastructure, and a positive pedestrian quality are associated with lower VMT and therefore may reduce VMT.

Creation of new or expansion of existing transit service

The authors convey findings that show positive elasticities for transit ridership, but no studied effect on VMT:

- 0.5 ridership elasticity with respect to increased service frequency;
- 0.7 ridership elasticity with respect to increases in service miles or hours; and
- -0.4 ridership elasticity with respect to fare increases.

Regarding the missing link to VMT effects, the authors explain: “We expect that as transit ridership increases, VMT will decrease, but the effect is likely to be less than one-to-one, both because new transit trips do not always replace car trips and because of latent demand for road space.”

Adoption of or increase in tolls

These research findings are based on a per-mile toll, or a VMT charge:

- “Deakin et al (1996) reported a simulated price elasticity of VMT of between -0.2 and -0.25 based on models of the San Francisco and Los Angeles metropolitan areas.”
- “Rodier (2002) found that a simulated 5 cent per mile VMT charge in the Sacramento area would result in a 10% VMT reduction.”
- “Safirova (2007) found that a simulated 10 cent per mile VMT charge in the Washington DC area would result in a 14.5% drop in VMT.”
- “The Oregon pilot program yielded similar-sized VMT reductions from an experimental distance charging scheme that replaced gas tax and therefore was designed to be revenue neutral (Rufolo and Kimpel, 2008).”

The authors highlight that even in the revenue-neutral scheme discussed above, designed not to change the average cost of driving, drivers showed responsiveness to being tolled on a per-mile basis. These findings support the idea that adopting or increasing tolls reduces VMT.

9. Van Ness BRT Final EIS/EIR (Chapter 3). ***http://www.sfcta.org/van-ness-avenue-bus-rapid-transit-planning-and-environmental-studies#DOW***. Accessed 6/27/2016.

Reduction in number of through lanes

Creation of new or expansion of existing transit service

Creation of new or conversion of existing general purpose lanes (including vehicle ramps) to transit lanes

Air Quality analysis displayed that each of the alternatives would result in a net decrease in Citywide VMT. Terry A. Hayes Associates Inc., Air Quality Technical Report and Addendum, 2013.

10. Wang, Jinghui, Lei Yu, and Fengxiang Qiao. "Micro Traffic Simulation Approach to the Evaluation of Vehicle Emissions on One-way vs. Two-way Streets: A Case Study in Houston Downtown." 92nd annual meeting of the Transportation Research Board in Washington DC. 2013.

Conversion of streets from one-way to two-way operation with no net increase in number of traffic lanes

The authors used the street network and real traffic volumes for downtown Houston, Texas, but created an entirely one-way street network and an accompanying two-way street network. They conducted simulations in VISSIM and reported the simulation outputs, for both peak and off-peak travel conditions.

Per-mile emissions in the two-way network were higher across the board, but the reduction in VMT relative to the one-way network generally overwhelms that difference such that overall emissions are lower for the two-way network (with the sole exception of peak condition HC emissions). However, the difference in per mile emissions factors is exacerbated in peak hour conditions (owing to more friction and delay in the two-way network). As such, peak condition emissions for the two-way versus one-way network are much closer.

11. Kattan, Lina, Alexandre G. de Barros, and Hina Saleemi. "Travel behavior changes and responses to advanced traveler information in prolonged and large-scale network disruptions: A case study of west LRT line construction in the city of Calgary." Transportation Research Part F: Traffic Psychology and Behaviour 21 (2013): 90-102.*http://www.sciencedirect.com/science/article/pii/S1369847813000697*

Reduction in Number of Through Lanes

Construction of a light rail transit line in Calgary, Alberta, Canada reduced capacity along an 8.2 kilometer corridor for three years. As a preemptive mitigation measure, the City of Calgary implemented a temporary bus rapid transit (BRT) service along an alignment similar to the future light rail line and also provided up-to-date disruption information through internet, radio, and message display signs. As construction progressed, the capacity interruptions varied. The authors conducted surveys of users of the main road affected by the construction of the West Light Rail Transit (LRT) line in Calgary, Alberta, Canada. Among the findings:

- "Despite the significant increase in self-reported travel time, the total demand for travel in the area did not seem to decrease or result in rescheduled trip departure times. In response to pre-trip information disseminating road closure information, only 1.5% of trips were reported to be cancelled or have rescheduled departure times."
- "A substantial shift towards public transport was reported as a result of pre-trip information. This reported shift towards transit can be attributed to the presence of both incentives for taking transit (i.e., the added high-frequency transit service and the presence of pre-trip information for transit) and disincentives for driving (i.e., the road capacity reduction resulting from road/lane closures)." Note here that the authors are referring to the temporary BRT service implemented along the corridor.
- "…there was a decrease in the percentage of respondents who reported private vehicles as their first choice and an increase in the percentage of respondents who preferred public transit as their first and second choices."

Although this paper does not explicitly mention VMT, it seems that this disruption in the network did not contribute substantial additional VMT. This conclusion can be drawn from two points:

- "The characteristics of the grid network that consists of urban arterials and major collectors giving several alternative route choices to travelers," i.e, diversions were short and plentiful rather than circuitous; and
- The reported mode shifting behavior during the disruption among respondents, with many switching from driving to transit.

The authors did not observe travel behavior once the light rail transit line opened.

12. McCahill, Chris, et al. "Effects of Parking Provision on Automobile Use in Cities: Inferring Causality." (2015).

This study used longitudinal citywide parking supply data from seven US cities from three decades: the 1950s, the 1980s, and the 2000s. In short, they find that "an increase in parking provision from 0.1 to 0.5 parking spaces per resident and employee is associated with an increase in commuter automobile mode share of roughly 30 percentage points . . . **we infer that parking provision in cities is a likely cause of increased driving among residents and employees**." (bold emphasis added).

13. Chatman, Daniel G. "Does Transit-Oriented Development Need the Transit?." ACCESS Magazine 1.47 (2015).

Removal of off- or on-street parking spaces

The author conducted a mail survey of households within two miles of rail stations in New Jersey. The households and neighborhoods varied in design, age, distance to rail, and on- and off-street parking supply (which was collected through observation). The data was regressed thrice, with different dependent variables in each case:

1) **Auto ownership.** When proximity to rail is controlled for with the other factors listed above, its effect was not a significant predictor of auto ownership. Instead, "When the effects of more bus stops and low on- and off-street parking availability were combined, they reduce auto ownership by 44 percent. Most of this effect is due to parking availability."
2) **Commuting to work.** "Scarce off-street parking (having less than one parking space per adult in the household) was associated with a 40 percent reduction in auto commuting . . . "
3) **Grocery store visits.** Scarce on- and off-street parking was associated with a 25 percent reduction in grocery store trips made by driving. The two parking types were not significant independently, as the author explains: "This makes sense, because carrying groceries is inconvenient on foot or via transit, so only significant impediments to auto ownership and use are likely to make a difference."

Although the study uses cross-sectional data and thus cannot make causal claims in a before-and-after manner, the author concludes with the following two conclusions (among others):

- "What does reduce car ownership and use? **Lower parking availability**, better bus service, smaller housing units, more rental housing, more destinations within walking distance, better proximity to downtown, and higher population and employment density all reduce car ownership and use." (emphasis added)
- "At the very least, [transit-oriented developments] should be developed with less parking. If they are not, they will not reduce auto use."

This paper supports the conclusion that the removal of off- and/or on-street parking will reduce VMT.

14. San Francisco County Transportation Authority. Geary Corridor Bus Rapid Transit Project Draft EIS/EIR, Section 4.10 Air Quality and Greenhouse Gases, 2015. http://www.sfcta.org/sites/default/files/content/Planning/GearyCorridorBusRapidTransit/DraftEIR/Geary%20Corridor%20Bus%20Rapid%20Transit%20Project%20Draft%20EIS_EIR.pdf

Creation of new or expansion of existing transit service

Creation of new or conversion of existing general purpose lanes (including vehicle ramps) to transit lanes

Air Quality analysis displayed that each of the alternatives (all of which include bus rapid transit on Geary Blvd.) would result in a net decrease of <1%, or a negligible change, in Regional VMT. Model outputs for VMT are shown in Figure 1 and Figure 2 (split out by travel mode in the latter). This study supports the idea that implementation of bus rapid transit system with dedicated lanes does not contribute to an increase in VMT.

Table 4.10-6 Regional VMT and Traffic Speed Data Under the No Build and Build Alternatives

SCENARIO	REGIONAL VEHICLE MILES TRAVELED (VMT)	AVERAGE SPEED (MILES PER HOUR)
EXISTING CONDITIONS		
2020 No Build Alternative	9,220,000	21
2020 Alternative 2	9,210,000	21
2020 Alternative 3	9,200,000	21
2020 Alternative 3-Consolidated	9,190,000	21
Hybrid Alternative	9,200,000	21
FUTURE YEAR BUILDOUT		
2035 No Build Alternative	11,160,000	17
2035 Alternative 2	11,140,000	17
2035 Alternative 3	11,130,000	17
2035 Alternative 3-Consolidated	11,120,000	17
Hybrid Alternative	11,120,000	17

Source: SFCTA, March 2014

Figure 2: Travel Model output displaying regional VMT levels associated with the proposed Geary Corridor Bus Rapid Transit System

Table 4.12-2 Energy Use - Build and No Build Alternatives; 2020 and 2035

2020	ANNUAL VMT (MILLIONS)			REGIONAL ENERGY EQUIVALENT IN MILLION MBTUS	INCREASE/ DECREASE RELATIVE TO NO BUILD	% CHANGE FROM NO BUILD
	AUTO	BUS	TOTAL			
No Build Alternative	3,186	1.9	3,188	9,291	-	-
Alternative 2 (Side-Lane BRT)	3,184	2.6	3,186	9,298	+7	+0.1%
Alternative 3 (Center-Lane BRT with Dual Medians and Passing Lanes)	3,180	2.6	3,183	9,288	-3	-<0.1%
Alternative 3-Consolidated (Center-Lane with Dual Medians and Passing Lanes)	3,178	2.5	3,180	9,280	-11	-0.1%
Hybrid Alternative	3,181	2.5	3,183	9,289	-3	-<0.1%
2035	**ANNUAL VMT (MILLIONS)**			**ENERGY EQUIVALENT IN MILLION MBTUS**	**INCREASE/ DECREASE RELATIVE TO NO BUILD**	**% CHANGE FROM NO BUILD**
	AUTO	**BUS**	**TOTAL**			
No Build Alternative	3,857	1.9	3,859	8,998	-	-
Alternative 2	3,850	2.6	3,853	8,998	+0	+<0.01%
Alternative 3	3,848	2.6	3,851	8,993	-5	-0.1%
Alternative 3-Consolidated)	3,843	2.5	3,845	8,979	-19	-0.2%
Hybrid Alternative	3,842	2.5	3,845	8,979	-19	-0.2%

Source: Terry A. Hayes Associates Inc., 2014

Figure 3: Travel model output displaying regional VMT levels associated with the proposed Geary Corridor Bus Rapid Transit System (broken out by travel mode)

15. San Jose, California: Lincoln Avenue Road Diet Trial Data Collection Report. 6/1/2015. https://sanjoseca.gov/DocumentCenter/View/44259 . Accessed 6/27/2016.

This is a study conducted for a road diet along Lincoln Avenue in San Jose, California. The project involved the conversion of four travel lanes (two in each direction) to three (one in each direction, with a two-way left turn lane). At the time the road diet was a temporary pilot project, and this study was conducted to inform decision makers whether to make the project permanent.

Reduction in number of through lanes
Infrastructure projects, including safety and accessibility improvements, for people walking or bicycling
The report indicates that traffic volumes were 3 to 13% lower throughout the corridor after project implementation. Neighboring local streets experienced relatively negligible changes (up or down by approximately 50 vehicles, variations that are "within expected daily variations for local streets"). Eight other streets saw meaningful decreases of traffic. These data were collected and averaged over three days (Tuesday, Wednesday, Thursday) of the same week.

The preliminary findings of this report indicate that this road diet project likely reduced VMT.

16. Road Diet Case Studies. Federal Highway Administration. https://safety.fhwa.dot.gov/road_diets/. Modified July 2016. Accessed 6/28/2016.

Reduction in number of through lanes
Infrastructure projects, including safety and accessibility improvements, for people walking or bicycling
The FHWA case study document details several road diet projects and lists outcomes of the projects without much detail. Some highlights are below.

Grand Rapids, Michigan Division Street Road Diet: Grand Rapids Michigan reported increased emissions as a result of road diet project (+19.8% AM, +1.1% off-peak, and -5.3% PM).

Los Angeles Seventh Street Road Diet: "After the completion of the Seventh Street Road Diet, LADOT received positive feedback from users, and a before-and-after bicycle count conducted by the Los Angeles County Bicycle Coalition showed that bicycle use in the corridor tripled once the Road Diet and new bicycle lanes were completed. LADOT also conducted some traffic analyses at several key intersections along the corridor and found that the results were satisfactory." It's unclear (and not explained) if these are **new** bicycle trips—genuine mode shift—or if they are diversions by cyclists to use the new facility. Either way, these results indicate that in response to the project, VMT likely remained the same or decreased (rather than increasing).

Reston, Virginia (Lawyers Road): "47 percent of respondents bicycled on Lawyers Road more often than before, indicating that the Road Diet encourages bicycling as a travel mode." The same logic may be applied here from the Los Angeles Seventh Street Road Diet results regarding a significant increase in VMT.

These case studies do not explicitly address VMT changes, but the evidence provided (with the exception of the Grand Rapids case) indicates that VMT likely did not increase.

2. Parking access, land use context, density, and VMT

The amount of available parking, land use context, and travel mode choice are intricately linked. The research presented below supports the conclusion that more off-street vehicular parking is linked to more driving and that people without dedicated parking spaces are less likely to drive. One article indicates that an area with more available parking in residential areas influences a higher demand for more automobile use. Another study found a direct relationship between the availability of free on-street parking supply and the number of cars per household. The remaining research examines techniques and results of attempting to reduce vehicle miles traveled through transit access, reduced parking availability, and shifting locational context (dense vs. suburban).

1. Weinberger, Rachel. "Death by a thousand curb-cuts: Evidence on the effect of minimum parking requirements on the choice to drive." Transport Policy 20 (2012), doi:10.1016/j.tranpol.2011.08.002

   Weinberger examines the relationship between the availability of residential parking in three New York boroughs and residents' choices to drive their personal vehicles to work in the Manhattan Core. First, the author estimated the amount of parking per dwelling unit for Census tracts in Queens, the Bronx, and Brooklyn; the amount of residential parking per unit was regressed against 'Journey to Work' mode split data, as reported in the Census, using a generalized linear model with a logit link function. The regression was used to explain the factors that increase or decrease the percentage of people driving to transit accessible work destinations.

   The author concludes that Census tracts with higher levels of on-site parking have higher levels of drive mode share to the transit rich Manhattan Core. Thus, guaranteed parking at home is a contributing factor to a worker's decision to drive to work. From this the author infers that driving to other activities is also likely to be higher.

2. California Air Pollution Control Officers Association (CAPCOA), *Quantifying Greenhouse Gas Mitigation Measures: A Resource for Local Government to Assess Emissions Reductions from Greenhouse Gas Mitigation Measures*, August 2010.

   This report focuses on quantifying various strategies for greenhouse gas (GHG) reduction. Below are summaries of policies related to land use context, density, and parking access, with the range of effectiveness equaling both the reduction in the VMT as well as the reduction in GHG emissions.

   Land Use / Location 1 – Increase Density – Range of effectiveness: 0.8– 30%
   The range of effectiveness is derived from looking at the effects of increasing density in urban and suburban contexts. The effectiveness in rural contexts was negligible. The strategy is appropriate for residential, retail, office, industrial, and mixed-use projects. The Transportation Research Board Special Report 298 literature suggests that doubling neighborhood density across a metropolitan area might lower household VMT by about 5

to 12 percent, and perhaps by as much as 25 percent, if coupled with higher employment concentrations, significant public transit improvements, mixed uses, and other supportive demand management measure.

Land Use / Location 2 – Increase location efficiency to reduce VMT – Range of effectiveness: 10–65%

The range of effectiveness is derived from looking at the effects of increasing location efficiency in urban and suburban contexts. The effectiveness in rural contexts was negligible. The strategy is appropriate for residential, retail, office, industrial, and mixed-use projects.

Land Use / Location 3 – Increase density of urban and suburban developments (mixed use) – Range of effectiveness: 9– 30%

The range of effectiveness is derived from looking at the effects of increasing density of urban and suburban developments. The effectiveness in rural contexts was negligible unless the project is a master-planned community. The strategy is appropriate for residential, retail, office, industrial, and mixed-use projects. Project would need to provide the percentage of each land use type in the project to calculate a land use index.

Land Use / Location 4 – Increase destination accessibility – Range of effectiveness: 6.7– 20%

The range of effectiveness is derived from looking at the effects of increasing destination accessibility in the urban and suburban contexts. The effectiveness in rural contexts was negligible. The strategy is appropriate for residential, retail, office, industrial, and mixed-use projects.

Land Use / Location 5 – Increase transit accessibility – Range of effectiveness: 0.5– 24.6%

The range of effectiveness is derived from looking at the effects of increasing transit accessibility in the urban and suburban contexts. The effectiveness in rural contexts was appropriate if development site is adjacent to commuter rail station with convenient rail service to a major employment center. The strategy is appropriate for residential, retail, office, industrial, and mixed-use projects. Project would need to provide the distance to transit station.

Parking Policy / Pricing 1 - Limit Parking Supply – Range of effectiveness: 5 – 12.5%

The range of effectiveness is derived from looking at the effects of limiting parking supply in urban and suburban contexts. The effectiveness in rural contexts was negligible. The strategy is appropriate for residential, retail, office, industrial, and mixed-use projects. The reduction in VMT can only be counted if spillover parking is controlled via residential permits and on-street metering.

Parking Policy / Pricing 2 - Unbundle parking costs from property cost – Range of effectiveness: 2.6 - 13%

The range of effectiveness is derived from looking at the effects of limiting parking supply in urban and suburban contexts. The effectiveness in rural contexts was negligible. The strategy is appropriate for residential, retail, office, industrial, and mixed-use projects. A complimentary strategy is Workplace Parking Pricing. Though not required, implement workplace parking pricing ensures the market signal from unbundling parking is transferred to the employee.

Parking Policy / Pricing 3 - Implement Market Price Public Parking (on-street) – range of effectiveness: 2.8 – 5.5%

The range of effectiveness is derived from looking at the effects of limiting parking supply in urban and suburban contexts. The effectiveness in rural contexts was negligible. The strategy is appropriate for retail, office, and mixed-use projects. The strategy is only applicable in an area or general plan context, usually in downtown areas, and reductions can only be counted if spillover parking is controlled via residential permits in surrounding neighborhoods.

Parking Policy / Pricing 4 - Require Residential Area Parking Permits – range of effectiveness: Grouped strategy, see 1-3.

The range of effectiveness is derived from looking at the effects of limiting parking supply in urban context. The strategy is appropriate for residential, retail, office, industrial, and mixed-use projects.

3. Guo Zhan, Residential Street Parking and Car Ownership. *Journal of the American Planning Association*, 79:1, 32-48, May 9 2013.

Zhan reviews the oversupply of on-street parking and resident travel and parking behavior. Using various aerial and street-level publicly available online mapping programs, the author identified off-street parking supply and on-street parking supply and crowding.

The author found that residential proximity to a train station was associated with a reduction in car ownership at the levels of one or two cars, but not for households with three or more cars. Furthermore, excess off-street parking encourages a higher level of car ownership: the relationship between increased availability of on-street parking (less crowded street parking) and increased car ownership is statistically significant (even when off-street parking is available).

On-street parking increases total parking supply for a household, thus households are able to buy more cars than just the off-street parking would allow. Finally, having on-street parking readily available in front of one's residence may provide some advantages that off-street parking is unable to offer: households use their garages as an extension of their home square footage, for storage or other non-vehicle storage purposes, and use the on-street parking for their vehicle as an additional amenity.

4. Daniel Chatman, Does Transit-Oriented Development Need the Transit?, *Access*, Fall 2015.

Chatman questions whether the transit oriented development (TOD) necessarily requires transit (defined as rail), or whether other variables (such as dense urban form or residential choice) account for lower car ownership. The author conducted a household survey within two mile radius of ten rail stations in New Jersey. Households with less than one off-street parking space per adult had 0.16 fewer vehicles per adults. Households with both low on- and off-street parking availability had 0.29 fewer vehicles per adult. The other significant variable was the number of bus stops within a mile of the home (doubling the number of bus stops within a mile radius around the average home was associated with 0.08 fewer vehicles per adult). When the effects of more bus stops and low on- and off-street parking availability were combined, they reduce auto ownership by 44 percent.

> *If access to rail is not a primary factor in reducing auto use, it could be a blessing, not only because rail infrastructure is expensive, but also because the amount of available land near rail stations is limited. That said, allowing higher housing density and scarce on- and off-street parking everywhere could increase congestion if not carefully managed (Chatman, p. 21).*

5. Chris McCahill, et al., Effects of Parking Provision on Automobile Use in Cities: Inferring Causality, *Transportation Research Board*, November 13, 2015.

McCahill examines whether a causal relationship between parking and driving exists, asking: does the provision of parking over time influence driving to work or are minimum parking requirements an appropriate response to rising auto use for workers? Using Census 'Journey to Work' mode split data and aerial photos of nine cities from 1960 to 2000, McCahill applied the Bradford Hill general theory of causality (a method from the field of epidemiology) to assess changes in parking availability and mode choice over time.

At the city scale, the authors found that an increase in parking provision from 0.1 to 0.5 parking spaces per resident and employee is associated with an increase in commuter automobile mode share of roughly 30 percentage points. The authors conclude that the findings suggest that polices to restrict and reduce parking capacity in cities are warranted.

6. Fehr and Peers, Parking Analysis and Methodology Memo to San Francisco Planning – Final, April 2015.

The relationship between parking availability or automobile orientation and auto mode share was examined for three different land use types in San Francisco: residential, retail, and office. Fehr and Peers utilized survey data collected at three land use types to develop the linear regression statistical model.

- The researchers found that the AM residential model predicts the absence of parking to be associated with a 60% reduction in auto mode share; and the PM residential predicts the absence of parking to be associated with a 50% reduction in auto mode share.
- For office use at a site with moderate auto orientation, the absence of free or subsidized parking is associated with a 65% reduction in auto mode share.
- For the retail use, the AM morning model predicts that for a site with moderate auto orientation, the absence of parking is associated with 12% reduction in auto mode share; the PM evening retail model predicts that for a site with moderate auto orientation, the absence of parking is associated with a 25% reduction in auto mode share.

ATTACHMENT D

Guidance on Quantitative Analysis for Transportation Projects

The following methodology is based on OPR's Technical Advisory and provides an estimate of VMT effects of lane mile additions can be used to estimate the VMT effects of proposed roadway expansions (or other capacity increasing transportation projects)

Projects should first analyze the percent change in lane miles is calculated by dividing project lane miles by the total lane miles of the applicable functional classes to yield a percent change in lane miles (in %). This percentage is multiplied by the baseline VMT on those facilities and elasticity from the academic studies (typically 1.0) to yield the total induced travel.

Formula:

Elasticity = [% change in VMT] / [% change in lane-miles]

or

VMT Impact = [% change in lane-miles] * [baseline VMT on those lane-miles] * [elasticity]

Attachment E

Transportation Demand Management Measures

The following are a list of Transportation Demand Management measures identified by the Planning Department that can be used by projects to meet their Transportation Demand Management target. More information can be found at http://sf-planning.org/transportation-demand-management-program.

- Provide streetscape improvements to encourage walking (ACTIVE-1)
- Provide secure bicycle parking, more spaces given more points (ACTIVE-2)
- Provide on-site showers and lockers (ACTIVE-3)
- Provide a bike share membership to residents and employees for one point, another point given for each project within the bike share network (ACTIVE-4)
- Provide on-site bicycle repair station (ACTIVE-5A)
- Provide on-site bicycle maintenance services (ACTIVE-5B)
- Provide fleet of bicycles (ACTIVE-6)
- Provide bicycle valet parking (ACTIVE-7)
- Offer car-share parking and membership (CSHARE-1)
- Provide delivery supportive amenities (DELIVERY-1)
- Provide delivery services (DELIVERY-2)
- Offer family TDM amenities (FAMILY-1)
- Provide on-site childcare (FAMILY-2)
- Provide Family TDM package (FAMILY-3)
- Provide contributions or incentives for sustainable transportation (HOV-1)
- Provide shuttle bus service (HOV-2)
- Offer vanpool programs (HOV-3)
- Provide multimodal wayfinding signage (INFO-1)
- Provide real time transportation information display (INFO-2)
- Provide tailored transportation marketing services (INFO-3)
- Provide healthy food retail in underserved area (LU-1)
- Provide on-site affordable housing (LU-2)
- Offer unbundled parking (PKG-1)
- Offer short term daily parking provision (PKG-2)
- Offer parking cash out: non-residential tenants (PKG-3)
- Reduce parking supply (PKG-4)

TRANSPORTATION IMPACT ANALYSIS GUIDELINES

APPENDIX M
DRIVING HAZARDS

SEAL OF THE CITY AND COUNTY OF SAN FRANCISCO

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Appendix M
Driving Hazards Memorandum

Date:	February 14, 2019
Case No:	2015-012094GEN
Prepared by:	Rachel Schuett, Colin B. Clarke
Reviewed by:	Wade Wietgrefe, Manoj Madhavan
RE:	**Transportation Impact Analysis Guidelines Update, Driving Hazards**

INTRODUCTION

This memorandum updates the prior guidance provided in the Transportation Impact Analysis Guidelines for the topic of hazards to people driving. The prior guidelines did not identify vehicle-to-vehicle hazards as a separate topic; instead, the prior guidelines included vehicular driveway access impacts as part of the parking topic. The department prepared this memorandum in consultation with stakeholders (e.g., city and county agencies, consultants). The department will issue memoranda that provide updates to other topics (e.g., transit, loading) within the guidelines. When the department issues a memorandum about a topic, it will supersede existing guidance regarding that topic.

This memorandum provides specific guidance on the methodology and impact analysis required for the driving hazards transportation topic. Overall guidance on conducting transportation analysis for environmental review, including developing the project description, how to address the significance criteria, methodology, and impact analysis, is in the Transportation Impact Analysis Guidelines.

The guidance provided herein assumes a land use development project located outside of an area plan that requires a transportation impact study. Guidance on other types of projects, such as projects located in an area plan or infrastructure projects, is included below under the "Other" subsection. The department may use this guidance for multiple projects, but the department has discretion on how to apply the guidance on a project-by-project basis.

The organization of the memorandum is as follows:

1) Project Description
2) Significance Criteria
3) Existing and Existing plus Project
    a) Methodology
    b) Existing Baseline
    c) Impact Analysis
4) Cumulative
    a) Methodology
    b) Impact Analysis
5) Other (covers different types of projects)

Attachments to this memorandum are under separate cover and are attached to the end of this memorandum. The department may update the attachments to the memoranda more frequently than the body of the memoranda.

PROJECT DESCRIPTION

Refer to the Transportation Impact Analysis Guidelines Appendix A, Tables 1-3, for a list of the typical physical, additional physical, and programmatic features for existing and existing plus project conditions, as applicable. The geographic extent of these features must, at a minimum, include the project's frontage and may include the entirety of the project's block. Appendix A, Table 4 of the guidelines provides a non-exhaustive list of approvals from agencies other than the planning department that a project sponsor may need to obtain for the project description features described in the guidelines.

SIGNIFICANCE CRITERION

San Francisco Administrative Code Chapter 31 directs the department to identify environmental effects of a project using as its base the environmental checklist form set forth in Appendix G of the California Environmental Quality Act (CEQA) Guidelines. As it relates to hazards, Appendix G states: "would the project substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?" The department uses the following significance criterion to evaluate that question: A project would have a significant impact if it would create potentially hazardous conditions[1] for people driving.

EXISTING AND EXISTING PLUS PROJECT

Methodology

This section describes the typical methodology required to address the significance criteria. The methodology section identifies the collection, generation, and approach to analyze data. The department will determine whether to adjust the methodology as necessary to inform the analysis.

The guidelines provide direction on the geographical area and period required for analysis. Further guidance on the typical methodology for evaluating existing and existing plus project conditions for this topic, including data collection, is provided below. This section also indicates in bracketed text [ ] whether the presentation of typical methodological elements in other sections of a transportation study (e.g., baseline, impact analysis) could occur in text, a figure, and/or a table (see Appendix A of the guidelines for examples of typical tables).

Existing Conditions

The following identifies the methodology for assessing existing conditions.

<u>Counts</u>

[1]For the purposes of this memorandum, "hazard" refers to a project-generated vehicle potentially colliding with a person driving that could cause serious or fatal physical injury to the person driving, accounting for the aspects described below. Human error or non-compliance with laws, weather conditions, time-of-day, and other factors can affect whether a collision could occur. However, for purposes of CEQA, hazards refer to engineering aspects of a project (e.g., speed, turning movements, complex designs, substantial distance between street crossings, sightlines) that may cause a greater risk of collisions that result in serious or fatal physical injury than a typical project. This significance criterion focuses on hazards that could reasonably stem from the project itself, beyond collisions that may result from aforementioned non-engineering aspects or the transportation system as a whole.

The methodology may include prior counts collected from other studies or sources combined with (e.g., an average of three different dates with counts at the same intersection, global positioning system user data) or in isolation from the counts collected for the project. The use of prior counts must be justified, in consultation with the department. Typically, the use of prior counts may occur if these counts have not changed substantially under existing conditions (e.g., due to lack of new development, circulation changes, or travel patterns). [text, table]

<u>Visual Analysis with Recorded Observations</u>

Data collection for the project should include a site visit for a visual analysis, with recorded observations of slope, topography, physical structures, and other conditions that may affect sightlines for people driving or speeds or turning. In addition, the site visit must record any existing potential or observed hazards at locations in the study area for people driving (e.g., conditions that lead to potentially hazardous speeds or turning movements). [text, figure]

<u>Street Design Characteristics</u>

Obtain the following general characteristics of streets within the study area:

- Location and type of traffic control devices (e.g., stop signs, signals, crosswalks, countdown signals, audible warning devices) and intersections [text, figure]
- Number of travel lanes by type (e.g., mixed flow, parking, bicycle, transit-only, etc.) [text, figure]
- Posted speed limit and recorded speed observations or inferences about observed speeds [text]
- Presence of High-Injury Network [text, figure]
- Locations of nearest driveways (driveways that are the closest to the project driveway on both the same and the opposite side of the street) [text, figure]

Obtain the following additional characteristics of streets within the study area to the extent applicable:

- Signal timing and phasing of traffic control devices [text]
- Width of travel lanes [text, figure]
- Number of travel lanes by type at intersections (if different from midblock) [text, figure]
- Data regarding the location and causes of collisions (e.g., particular turning movements) [text, figure]
- Nearby transit stations/stops amenities (e.g., shelters) and service information (e.g., frequency) [text, figure, table]

Existing plus Project Conditions

The following identifies the typical methodology for assessing existing plus project conditions.

<u>Travel Demand</u>

Estimate the number of people driving to and from the project site. [text, table] In addition, the methodology will distribute and assign the project's vehicle to roadways, intersections, loading zones, and driveways to the extent applicable. [text, figure]

<u>Potentially Hazardous Conditions</u>

Use the travel demand analysis and project elements to determine if the project would cause potentially hazardous conditions. The methodology should assess to the extent applicable:

- The number, movement type, sightlines, and speed of project vehicle trips in and out of project facilities based upon the design of such facilities (e.g., curb cut dimensions, roadway speeds) in relation to the number of people driving at those locations [text, figure]

- The number, type (e.g., left turn, right turn), sightlines, and speed of project vehicle turning movements at intersections, including any changes to the public right-of-way that facilitate vehicular movement (e.g., channelized turns) in relation to the number of people driving at those movement locations [text, figure]

Existing Baseline

Refer to the guidelines for direction on including existing baseline in transportation studies.

Impact Analysis

This section ties the project description, methodology, and existing baseline together to address the significance criteria for existing plus project conditions. This section addresses the typical approach for the impact analysis and provides more details related to hazards for people driving. The impact analysis section should present a format (text, figure, or table) consistent with earlier sections of this memorandum for easy comparison.

The impact analysis must address whether the project would create potentially hazardous conditions for people driving. Too many factors mentioned in the methodology affect the potential for hazardous conditions. Instead, the department will determine significance on a project-by-project basis.

Refer to the guidelines for direction on what to consider when conducting the existing plus project impact analysis and how to present the findings. The subsections below provide specific examples of the types of circumstances that could result in a potentially hazardous condition impact under existing plus project conditions.

Potentially Hazardous Conditions

The following examples are some of the circumstances, which may result in potentially hazardous conditions to people driving. This is not an exhaustive list of circumstances, under which, potentially hazardous impacts would occur:

- A project would construct or be located on a lot with physical obstructions (e.g., trees, utilities, an adjacent curb cut used by a substantial number of people driving, or on-street parking directly adjacent to the curb cut or transit stop) or slopes that would obstruct sightlines between a substantial number of people driving, exiting, or reversing into an off-street facility and a substantial number of people driving at high speeds in travel lane(s) next to the off-street facility
- A project would add a substantial number of vehicle trips to an uncontrolled or stop-sign controlled turning movement (e.g., left-turn) across multiple lanes used by a substantial number of people driving at high speeds
- A project would add a substantial number of trucks (e.g., based on counts or projections) to a turning movement such that those trucks would encroach into oncoming travel lane(s) used by a substantial number of people driving (e.g., based on counts or projections)
- A project would be unable to accommodate[2] vehicle trips, including freight and delivery service vehicle trips into its off-street facilities, thereby blocking a travel lane at a location with inadequate sightlines for a substantial number of people driving (e.g., based on counts or projections) in that blocked travel lane

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[2] "Accommodate" refers to design of the facility (e.g., can vehicles be accommodated without queuing based upon throat length, gate location, etc.) and not the capacity (e.g., does the number of spaces accommodate the demand) of the facility as many variables affect the demand to and from a facility.

- A project would include an off-street loading dock adjacent to a garage driveway entrance/exit that would result in blocking the driveway for ingress vehicles (entering), resulting in queuing within the public right-of-way

CUMULATIVE

Methodology

The guidelines detail the typical methodology for cumulative analysis, including the geographical area, period, cumulative projects, and adjustments (refer to Appendix B) under cumulative conditions. The cumulative section in transportation studies must present (text, figure, or table) the applicable elements included in the methodology. Basics

Impact Analysis

This section ties the methodology and description of cumulative conditions together to address the significance criteria for cumulative conditions. Refer to the guidelines for direction on what to consider when conducting the cumulative impact analysis and how to present the findings. The same examples of the types of circumstances that could result in a potential hazardous condition impact that were provided for existing plus project conditions apply here, except for cumulative conditions.

OTHER

The guidance provided in this memorandum assumes a land use development project located outside of an area plan that requires a transportation impact study. This section describes the type of additional or different information that may be necessary to address driving impacts for the following circumstances: land use development project located within an area plan, an area plan, or infrastructure project (which may be located in a different county than San Francisco).

Land Use Development Project Located within an Area Plan

For projects that are consistent with an area plan for which an environmental impact report (EIR) was certified, pursuant to CEQA guidelines section 15183, the assessment must limit its analysis to such conditions specified in that section. The guidelines provide direction on how to analyze a land use development project in an area plan and a list of area plan EIRs that have been certified as of February 2019.

Attachment A of this memorandum identifies mitigation and improvement measures from area plan EIRs related to people bicycling. The department will list bicycling-related mitigation and improvement measures from future area plan EIRs in Attachment A after the Planning Commission or Board of Supervisors certifies those EIRs.

Area Plans

For area plans, the assessment will typically use the significance criteria identified herein. The following sub-sections describe the type of additional or different information that may be necessary to address driving impacts for project description, methodology, and impact analysis. For area plans that also include infrastructure changes (e.g., street redesigns), please see the Infrastructure Project sub-section for additional or different information that may be necessary.

Project Description

Typically, the department conducts an analysis to estimate the amount of future development that could occur in the plan area as a result of its implementation. The department typically does not have all the project description details described herein. However, the project description may include policies that may relate to the methodology and impact analysis (e.g., curb cut restrictions).

Methodology

The assessment will typically use the same methodology identified herein, except the methodology will use a larger geographical study area and require less site-specific information (e.g., driveway locations at each site) except to document circumstances where vehicles may not be allowed (e.g., curb cut restrictions). While an individual project may not require some elements listed in the Existing and Existing plus Project Methodology subsection, area plans typically will include all of these elements. The department should select sidewalks, streets, and intersections most impacted by the area plan to represent the impacts that may occur at other locations.

Impact Analysis

For analysis of area plans, assess the projected amount of growth and infrastructure changes associated with the rezoning within the area plan boundaries. The analysis of potentially hazardous conditions should be similar to that described under the Existing plus Project and Cumulative Impact Analysis subsections. If the area plan includes infrastructure changes (e.g., street redesigns), given the potential time gap between land use development and completion of infrastructure changes, the analysis should discuss the potential short-term effects of that potential time gap in a lesser level of detail than that provided for overall effects. However, the analysis should assume individual land use development projects within the area plan would be subject to requirements related to property specific infrastructure changes (e.g., Better Streets Plan).

Examples of circumstances that would result in significant impacts are described under Existing plus Project Impact Analysis subsection.

Infrastructure Project

For infrastructure projects (e.g., new roads, bridge repair, sewer line, rail service, roadway modifications, etc.), the assessment of the project description, significance criteria, and impact analysis should be similar to private development projects. The analysis typically does not require trip generation analysis as infrastructure projects usually do not generate trips.[3] However, some infrastructure project may induce trips, such as the addition of through lanes on existing or new highways or streets.[4] In addition, infrastructure projects may generate short-term trips due to construction workers and vehicles accessing the project site.

Project Description

[3] Governor's Office of Planning and Research, *Revised Proposal on Updates to the CEQA Guidelines on Evaluating Transportation Impacts in CEQA,* January 20, 2016.

[4] Generally, minor transportation projects would not result in additional trips. Examples include, but are not limited to, rehabilitation, maintenance, and repair of transportation infrastructure; installation, removal or reconfiguration of non-through traffic lanes and traffic control devices; removal of through lanes; installation of traffic calming measures and wayfinding; removal of on- or off-street parking. Governor's Office of Planning and Research, *Technical Advisory on Evaluating Transportation Impacts in CEQA,* November 2017.

The project description must describe the typical physical, additional physical, and programmatic features for existing and project conditions, as applicable. The project description must provide the geographic boundaries of the project and street cross sections.

Methodology

The assessment will typically use the same methodology identified herein.

Impact Analysis

The analysis of potentially hazardous conditions should be similar to that described under the Existing plus Project Cumulative Impact Analysis subsections. Examples of circumstances that would result in significant impacts are described under the Existing plus Project Impact Analysis subsection.

ATTACHMENT A

Mitigation and Improvement Measure Examples

The following lists the typical types of measures that can mitigate or lessen impacts to people driving, for the significance criterion:

Potentially Hazardous Conditions

» Remove or relocate driveway or physical obstructions (e.g., trees, utilities, bus zone, bus stop shelter, loading, or parking spaces) to increase sightline(s) and visibility;

» Establish safe sight distances[1] (e.g., daylighting, relocation of curb cuts or new structures);

» Relocate or redesign off-street loading facility to allow for front-in maneuvers;

» Restrict turning movements from off-street facilities (e.g., right-in, right-out);

» Relocate off-street loading facilities to avoid turning movements across oncoming travel lanes;

» Manage freight and service deliveries (e.g., active loading management plan, delivery time restrictions);

» Employ queue abatement measures or pursue design modifications to off-street vehicular entrances/exits to accommodate queuing vehicles (see queue abatement language below);

» Provide on-site signs promoting safety for people driving (e.g., signage at the garage exit reminding people driving to slow down and yield to people walking on the sidewalk or stop signs);

» Provide roadway designs that slow vehicle speeds such as traffic calming measures (e.g., bulb-outs, chicanes, speed humps, tighter turning radii).

[1] The analysis can use Figure 3.1 and guidance in Section 3.2.6 "Criteria for Measuring Sight Distance" and Section 9.5 "Intersection Sight Distance," in the American Association of State Highway and Transportation Officials (AASHTO), *A Policy on Geometric Design of Highways and Streets*, 2011 6th Edition.

TRANSPORTATION IMPACT ANALYSIS GUIDELINES

APPENDIX N
CONSTRUCTION

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Appendix N
Construction Memorandum

Date:	February 14, 2019
To:	Record No. 2015-012094GEN
Prepared by:	**Sherie George, Debra Dwyer, and Elizabeth White**
Reviewed by:	Manoj Madhavan and Wade Wietgrefe
RE:	**Transportation Impact Analysis Guidelines Update, Construction**

INTRODUCTION

This memorandum updates the prior guidance provided in the Transportation Impact Analysis Guidelines for the transportation-related construction[1] topic. The department prepared this memorandum in consultation with stakeholders (e.g., city and county agencies, consultants). The department will issue memoranda that provide updates to other topics (e.g., transit, loading) within the guidelines. When the department issues a memorandum about a topic, it will supersede existing guidance regarding that topic.

This memorandum provides specific guidance on the methodology and impact analysis required for the construction transportation topic. Overall guidance on conducting transportation analysis for environmental review, including developing the project description, how to address the significance criteria, methodology, and impact analysis, is in the Transportation Impact Analysis Guidelines.

The guidance provided herein assumes a land use development project located outside of an area plan that requires a transportation study. Guidance on other types of projects, such as projects located in an area plan or infrastructure projects, is discussed below under the "Other" subsection. The department may use this guidance for multiple projects, but the department has discretion on applying the guidance on a project-by-project basis.

The organization of the memorandum is as follows:

1) Project Description
2) Significance Criteria
3) Existing and Existing plus Project
   a) Methodology
   b) Existing Baseline
   c) Impact Analysis
4) Cumulative
   a) Methodology
   b) Impact Analysis
5) Other (covers different types of projects)

[1] This memorandum addresses transportation impacts from project construction activities to people walking, bicycling, taking transit and/or transit operations, or vehicular circulation and accessibility in the public right-of-way and in the study area.

Attachments to this memorandum are under separate cover and are attached to the end of this memorandum. The department may update the attachments to the memoranda more frequently than the body of the memoranda.

PROJECT DESCRIPTION

Refer to the Transportation Impact Analysis Guidelines Appendix A, Tables 1-3, for a list of the typical physical, additional physical, and programmatic features for existing and existing plus project conditions, as applicable. The geographic extent of these features must, at a minimum, include the project's frontage and may include the entirety of the project's block. Appendix A,

Table 4 of the guidelines provides a non-exhaustive list of approvals from agencies other than the planning department that a project sponsor may need to obtain for the project description features described in the guidelines. Construction activities affecting the public right-of-way within San Francisco must comply with the San Francisco Transportation Code, and the San Francisco Public Works Code. The transportation code provides the authority for the San Francisco Municipal Transportation Agency's Regulations for Working in San Francisco Streets, also known as the blue book. The blue book is a manual for city agencies, utility crews, private contractors, and others doing work in San Francisco streets. Among other things, the public works code regulates construction operations (excavation) in public right-of-way such that these actions are carried out while preserving and maintaining the public health, safety, welfare, and convenience. Depending on the type of construction activity (i.e., proposed long-term travel lane and sidewalk closures, additional street space), a permit approval by the San Francisco Municipal Transportation Agency (SFMTA) may first require recommendation for approval from the Transportation Advisory Staff Committee, a multi-agency review body. For most large projects and in certain zoning districts, public works requires a contractor to prepare and submit a contractor parking plan, which requires transportation demand management measures.

Attachment B of this memorandum includes examples of figures that illustrate how to graphically represent construction conditions. Attachment C provides guidance on presenting estimates of various construction details.

SIGNIFICANCE CRITERIA

San Francisco Administrative Code chapter 31 directs the department to identify environmental effects of a project using as its base the environmental checklist form set forth in Appendix G of the California Environmental Quality Act (CEQA) Guidelines. Appendix G states: "would the project conflict with a program plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?" The department uses the following significance criteria to evaluate that question: A project would have a significant impact if in consideration of the project setting the project's temporary construction activities:

> 1A) require a substantially extended duration or intense activity; and
> 1B) the effects would create potentially hazardous conditions for people walking, bicycling, driving, or riding public transit; or
> interfere with emergency access [2] or accessibility for people walking or bicycling; or
> substantially delay public transit.

[2] Emergency service operator facilities include police departments, fire departments, hospitals, or other public safety buildings for emergency vehicle fleets.

Attachment A of this memorandum includes screening criteria to determine whether or not a significant construction-related transportation impact could occur. The screening criteria are a two-step approach. First it considers project context. If project site context includes travel activity that could be substantially disrupted by project construction activities (e.g., location and amount of excavation), then it would consider the duration and magnitude of construction activity to determine if further analysis is warranted.

If a project meets the screening criteria, then further analysis is not required.

EXISTING AND EXISTING PLUS PROJECT CONSTRUCTION

Methodology

This section describes the typical methodology required to address the significance criteria should a detailed construction analysis be required. The methodology section identifies the collection, construction-related travel demand, and approach to analyze data. The department will determine whether to adjust the methodology as necessary to inform the analysis.

The guidelines provide direction on the typical geographical area and period required for analysis. Additional guidance on the appropriate period of study for transportation-related construction trips and the typical methodology for evaluating existing and existing plus project construction conditions for this topic, including data collection, is provided below. This section also indicates in bracketed text [ ] whether the presentation of typical methodological elements in other sections of a transportation study (e.g., baseline, impact analysis) could occur in text, a figure, and/or a table (see Appendix A of the guidelines for examples of typical tables and Attachment B of this memorandum for examples of emergency access-related figures).

Period

In San Francisco, the weekday extended p.m. peak period (Tuesday, Wednesday, or Thursday, 3 p.m. to 7 p.m.) is typically the period when the most overall travel happens.[3] However, the methodology for construction-related transportation analysis should typically focus on an average daily period to determine the intensity of construction transportation activity and then provide an understanding of the extent to which these activities overlap with the typical peak transportation period. In some instances, the most overall travel may occur at different periods (a.m., midday, post p.m. peak, and/or weekend) for smaller geographic areas (e.g., a segment or as a result of project construction activities), including by construction schedule phase. For example, construction activities occur primarily during daytime hours (e.g., 7:00 a.m. to 8:00 p.m.), five days a week, on weekdays and weekends and construction worker trips may occur outside of the peak period (e.g., one shift from 7:00 a.m. to 3:30 p.m.). Thus, the most construction activity may occur in varying periods during different phases of construction. In these instances, the methodology may substantiate the use of periods other than the weekday p.m. peak.

Existing Conditions

The following identifies the typical methodology for projects. The department will determine the appropriate methodology as necessary to inform the impact determination:

[4] For purposes of this memo, "accommodate" refers to design of the facility (e.g., can vehicles be accommodated without queuing based upon throat length, gate location, etc.) and not the capacity (e.g., does the number of spaces accommodate the demand) of the facility as many variables affect the demand to and from a facility.

<u>Counts</u>

The methodology may include prior counts collected from other studies or sources combined with (e.g., an average of three different dates with counts at the same intersection, global positioning system user data) or in isolation of counts collected for the project. The use of prior counts must be justified, in consultation with the department. Typically, the use of prior counts may occur if numbers have not changed substantially (e.g., due to lack of new development, circulation changes, or travel patterns). [text, table]

<u>Visual Analysis with Recorded Observations</u>

Data collection for the project should include a site visit for a visual analysis, with recorded observations of the absence, discontinuity, or presence of the features listed in the project description, a description of the weather conditions, and other relevant features. In addition, the site visit must record any existing potential or observed hazards at locations in the study area that people walk, bicycle, or access transit in the study area. The site visit should be given to project frontages and along routes of travel for people walking, bicycling, or taking transit to and from the study area between the project site and nearby transit stations/stops (e.g., crosswalks, sidewalks), major destinations (e.g., schools, event centers, recreational facilities, tourist activities, shopping districts, high-density residential or office areas, transit stations, and airports), or land uses with particularly vulnerable people (e.g., children, seniors, people with disabilities). [text, figure]

<u>Street Design Characteristics</u>

Obtain the following general characteristics of streets within the study area:

- Location and type of traffic control devices (e.g., stop signs, signals, crosswalk, countdown signals, audible warning devices) and presence of transit infrastructure (e.g., transit overhead wires) [text, figure]
- Number of travel lanes by type (e.g., mixed flow, parking, bicycle, transit-only, etc.) [text, figure]
- Posted speed limit and recorded speed observations or inferences about observed speeds [text]
- Presence of High-Injury Corridor [text, figure]

Obtain the following additional street characteristics within the study area to the extent applicable:

- Width of travel lanes for narrow roads or alleys that may result in tight turning movements by large trucks [text, figure]
- Number of travel lanes by type at intersections (if different from midblock) [text, figure]
- Size and slope of blocks [text, figure]
- Nearby transit stations/stops amenities (e.g., shelters) and service information (e.g., frequency) [text, figure, table]

<u>Emergency Service Operator Facilities</u>

Obtain the following additional information with the study area to the extent applicable:

- Emergency service operator facilities [text, figure]

Existing plus Project Conditions

The following identifies the typical methodology for assessing existing plus project construction conditions.

<u>Construction-Related Travel Demand Analysis</u>

The methodology may require a construction-related travel demand analysis, depending on the context and intensity of the project's construction activities. For instance, a project involving extensive excavation or demolition activities in an area with high volumes of bicycle, pedestrian, or transit activity may require additional construction-related analysis due to the sensitivity of the project setting (e.g. a project on Market or Mission streets). The same level of construction-related analysis may not be needed if the same project is located in an area that does not contain high volumes of bicycle, pedestrian, or transit activity (e.g. a project located on a street that does not provide sidewalks such as Toland Street or Rankin Street).

Project construction activities typically generate the following types of trips: construction workers, haul truck trips, and delivery trips. The magnitude of daily construction activity from the number of trips varies by construction phase. The methodology will estimate the average number of daily construction trips driving to and from the project by phase. [text, table]

For construction worker trips, the methodology should assume a daily trip generation rate of two person trips per worker, one inbound and one outbound.

For haul truck trips, the methodology should account for the amount of excavation and demolition, likely during early construction phases.

For delivery trips, the methodology depends on construction details regarding likely activities during all construction phases.

For all truck trips, the methodology should describe the anticipated routes for truck trips traveling to and from the project site, particularly the relationship between the project site configuration's entrance and exit locations and nearby transit stations/stops and major destinations. Turning templates or diagrams for large construction trucks moving in and out of on-and off-street loading or staging areas, may be requested as applicable. [text, figure]

<u>Potentially Hazardous Conditions</u>

Use the construction travel demand and project construction configuration to determine if the project's construction activities would cause potentially hazardous conditions. The methodology should assess to the extent applicable:

- The amount, movement type, sightlines, duration, and speed of project construction truck trips in and out of project staging area(s) based upon the design of such areas (e.g., curb cut dimensions, roadway speeds) in relation to the volume of vehicle trips on streets adjacent to the entrance to those staging areas and people walking, bicycling, and accessing transit at or near those locations [text, figure]

<u>Accessibility</u>

Use the construction-related travel demand and project construction configuration to determine if the project construction would substantially interfere with emergency access or accessibility for people walking, bicycling, or taking transit to and from the study area and around the site. The methodology should assess to the extent applicable:

- The number of people walking and bicycling, or taking transit to and from the study area and around the project site, taking into account the presence of physical obstructions or detours on sidewalks or travel lanes from project construction activities [text, figure]

- Any changes to the public right-of-way that would alter the ability of emergency service operators to access streets and buildings in the study area from project construction activities [text, figure]

Potential Transit Delays

Use the construction-related travel demand analysis and project construction configuration to determine if the project would cause potential delays to transit. Depending on the scope of the project, the methodology will use a quantitative or qualitative methodology to assess transit delay. The methodology should assess to the extent applicable:

- The number, movement type, sightlines, duration, and speed of project construction truck trips in and out of project staging area(s) based upon the design of such areas (e.g., curb cut dimensions, roadway speeds) in relation to the volume of vehicle trips on streets adjacent to the entrance to those staging areas and people walking, bicycling, and accessing transit at or near those locations [text, figure]
- The location of the project's staging area(s) in relation to the travel lanes where transit vehicles operate, transit stop/station locations, and high-frequency transit routes [text, figure]

Existing Baseline

Refer to the guidelines for direction on including existing baseline in transportation studies..

Impact Analysis

This section ties the project description, methodology, and existing baseline together to address the significance criteria for existing plus project construction conditions. This section addresses the typical approach for the impact analysis and provides more details related to hazards and accessibility impacts for people walking, bicycling, taking transit and/or transit operations, or driving. The impact analysis section should present a format (text, figure, or table) consistent with earlier sections of this memorandum for easy comparison.

If a project does not meet the screening criteria after considering the project site context and construction duration and magnitude, further construction analysis may be required.

If further construction analysis is required, the impact analysis must address whether duration and magnitude of construction activities would create potentially hazardous conditions for people walking, bicycling, riding transit and/or transit operations, or driving, whether the project's construction substantially interferes with emergency access or the accessibility of people walking, bicycling, or taking transit in the study area, and whether the project's construction would create public transit delay.

Potentially Hazardous Conditions

The department provides examples of some circumstances that may result in potentially hazardous conditions associated with the different ways people travel (e.g., people walking, bicycling, or driving) in the applicable transportation topic memorandum of these guidelines. The following examples are some of the additional non-exhaustive list of circumstances related to a project's construction activities that could result in potentially hazardous conditions that the department did not list in the other memoranda:

- A project's construction activities would generally not affect a project's loading operations given that the loading demand would not likely occur until construction completion and building occupancy. However, potential hazards could result if the operator of a commercial and passenger vehicle is loading within and blocking a travel lane, transit, bicycle facilities, and/or sidewalk when the loading space for neighboring uses is removed during project construction.

As a result unaccommodated loading demand occurs in the travel lane, transit, bicycle facilities, and/or sidewalk while the project is under construction.

- A project would be unable to accommodate a substantial number of construction truck trips into its off-street facilities or proposed on-street staging areas, resulting in the operator of a large construction truck within and blocking a travel lane, transit, bicycle facilities, and/or sidewalk used by a substantial number of people walking, bicycling, riding transit, or driving (e.g., based on counts, projections, or Muni service type designation)

Accessibility

The department provides examples of some of the circumstances that may result in interference with accessibility in the applicable transportation topic memorandum of these guidelines. However, the following examples illustrate circumstances in which a project's construction activities may substantially interfere with accessibility. This is not an exhaustive list of circumstances, under which, potential accessibility impacts would occur:

- A project's construction activities would close off or render existing ADA-compliant facilities for a substantial number of people walking challenging to use or inaccessible, without providing replacement facilities, and substantially increase the distance for people walking to safely cross streets or access neighborhoods, nearby transit stations/stops, and major destinations
- A project would be unable to accommodate[4] construction truck trips, in off-street facilities designated as staging areas, thereby blocking access to sidewalks or nearby crosswalks for a substantial number of people walking
- A project would be unable to accommodate construction truck trips, in on-street or off-street facilities designated as staging areas, thereby blocking access to bicycle lanes or travel lanes for a substantial number of people bicycling or taking transit
- A project's temporary construction activities result in the demolition or relocation of a key feature of public transit infrastructure (e.g., a bus stop or boarding island of a Muni Forward Rapid project marked by frequent transit service and high ridership) for a substantial period; requiring a substantial number of people to walk a greater distance and thereby eliminating access to an existing location
- A project's temporary construction activities would close or add a physical barrier[5] to a street restricting all vehicles, including emergency service operators, which would impede access to the surrounding area for a substantial duration of time affecting peak periods.

Potential Public Transit Delay

Below is a non-exhaustive list of circumstances that could result in public transit delay that are not provided in the transit memorandum.

- a project would be unable to accommodate a substantial number of construction truck trips into its off-street facilities or proposed on-street staging areas, resulting in the operator of a large

[4] For purposes of this memo, "accommodate" refers to design of the facility (e.g., can vehicles be accommodated without queuing based upon throat length, gate location, etc.) and not the capacity (e.g., does the number of spaces accommodate the demand) of the facility as many variables affect the demand to and from a facility.

[5] Permeant physical barriers refer to unmovable features that would not allow for emergency service operator vehicle access during an emergency (e.g., walls, inoperable bollards). Permanent physical barriers do not refer to physical features that an emergency service operator vehicle could mount or navigate around during an emergency (e.g., curbs such as raised bicycle facility or bulb out, a parking lane, cones, safe hit posts, operable bollards).

construction truck within and blocking a transit lane used by a substantial number of people riding transit (e.g., based on counts, projections, or Muni service type designation)

- a project's temporary construction activities result in the demolition or relocation of a key feature of public transit infrastructure (e.g., a bus stop or boarding island of a Muni Forward Rapid project marked by frequent transit service and high ridership) for a substantial period resulting in public transit delay

CUMULATIVE

Methodology

The guidelines detail the typical methodology for cumulative analysis, including the geographical area, period, cumulative projects, and adjustments (refer to Appendix B of the guidelines) under cumulative conditions. Additional guidance on the appropriate period of study for project construction under cumulative conditions is provided below. The cumulative section in transportation studies must present (text, figure, or table) the applicable elements included in the methodology.

Period

The period for cumulative construction analysis is typically the same as that used for existing and existing plus project construction conditions taking into account reasonably foreseeable projects with construction schedules that overlap with the project (see below for more details). In some instances, the most overall travel may occur at different periods (a.m., midday, post p.m. peak, and/or weekend) as a result of a cumulative project construction activities or the project's construction may result in substantial disparity in travel demand at different periods. In these instances, and in consultation with the department, the methodology may substantiate the use of periods in addition to or other than the weekday p.m. peak.

Impact Analysis

This section ties the methodology and description of cumulative conditions together to address the significance criteria for cumulative conditions. Refer to the guidelines for direction on what to typically consider when conducting the cumulative impact analysis and how to present the findings. Further guidance on conducting an impact analysis for project construction under cumulative conditions is provided below. The same examples of the types of circumstances that could result in a potential hazardous condition impact, accessibility impact, or public transit delay that were provided for existing plus project construction conditions apply here, except for cumulative conditions.

Project Site Context and Construction Duration and Magnitude

The first step in the cumulative analysis is to determine whether there are reasonably foreseeable cumulative projects in the project study area which have construction timelines that could overlap with project construction. **If the reasonably foreseeable projects' construction timelines do not have the potential to overlap with that of the project, then the analysis is complete.**

If multiple projects within the study area have anticipated construction schedules that would be concurrent, then consider the study area context in terms of geography, level of travel activity and the duration and magnitude of construction for all projects identified. The same screening analysis examples provided for existing plus project construction conditions apply here, however for cumulative conditions the additive amount of construction activities would be of similar or greater intensity to create a localized impact.

Potentially Hazardous Conditions, Accessibility, and Public Transit Delay

If cumulative projects do not meet the screening criteria after considering the project site context and construction duration and magnitude for the cumulative projects identified, further construction analysis may be required. If so, the impact analysis must address whether the cumulative projects' construction activities would create potentially hazardous conditions for people walking, bicycling, taking transit, and/or transit operations, or with other vehicles. The impact analysis must address whether the cumulative projects' construction activities would substantially interfere with emergency access or the accessibility of people walking or bicycling to the study area; or substantially interfere with public transit service such that a substantial transit delays results. The same examples as provided for existing plus project construction conditions apply here, except for cumulative conditions.

OTHER

The guidance provided in this memorandum assumes a land use development project located outside of an area plan that requires a transportation impact study. This section describes the type of additional or different information that may be necessary to address construction-related transportation impacts for the following circumstances: land use development project located within an area plan, an area plan, or infrastructure project (which may be located in a different county than San Francisco).

Land Use Development Project Located within an Area Plan

For projects that are consistent with an area plan, pursuant to CEQA Guidelines section 15183 for which an environmental impact report (EIR) was certified, the assessment must limit its analysis to such conditions specified in that section. The guidelines provide direction on how to analyze a land use development project in an area plan and lists area plan EIRs that have been certified as of February 2019.

Attachment D of this memorandum identifies mitigation and improvement measures from area plan EIRs related to loading.

Area Plans

For area plans, the assessment will typically use the significance criteria identified herein. The following subsections describe the type of additional or different information that may be necessary to address construction-related transportation impacts for project description, methodology, and impact analysis. For area plans that also include infrastructure changes (e.g., street redesigns), please see the Infrastructure Project subsection for additional or different information that may be necessary.

Project Description

Typically, the department conducts an analysis to estimate the amount of future development that could occur in the plan area as a result of its implementation. The department typically does not have all the project description details regarding land use development, including the construction timelines for subsequent development projects. In addition, the project description may include transportation infrastructure provided for the area plan that may relate to the methodology and impact analysis (e.g., location and dimensions of proposed bike lanes, removal of on-street parking, sidewalk widenings or other proposed street network changes).

Methodology

The assessment will typically use the same methodology identified herein, except the methodology will use the plan area and require less site-specific information (e.g., staging locations at each site) An area plan's construction activities may not require some elements listed in the Existing and Existing plus Project Construction Methodology subsection, area plans typically will not include all of these elements.

Impact Analysis

As described above, all project construction activities would be required to meet city rules and guidance (i.e., the blue book and public works code requirements). This would ensure that construction activities are conducted safely and with the least possible interference with people walking, bicycling, or taking transit and/or transit operations, and with other vehicles. Therefore, impact analysis for area plans is more generally addressed as a plan itself would not result in direct physical changes to the environment. However, area plan impact analysis should address the effects of construction activity that could result from specific development that could occur under the Plan. Additionally, the analysis may address project-specific impacts from proposed development or potential infrastructure or open space improvements included as part of the plan. Construction-related impact analysis for these project-specific features of an area plan, should be addressed similar to how projects are analyzed under the Existing plus Project Construction and Cumulative Impact Analysis subsections. If the area plan includes infrastructure changes (e.g., street redesigns), given the potential time gap between land use development and completion of infrastructure changes, the analysis should discuss the potential short-term effects of that potential time gap in a lesser level of detail than that provided for overall effects. However, the analysis should assume individual land use development projects within the area plan would be subject to property specific infrastructure changes (e.g., Better Streets Plan).

Examples of circumstances that would result in significant impacts are described under the Existing plus Project Construction Impact Analysis subsection.

Infrastructure Project

For infrastructure projects (e.g., trails, new roads, bridge repair, sewer line, rail service, roadway modifications, etc.), the assessment of the project description, significance criteria, and impact analysis should be similar to the construction of private development projects. The analysis typically does not require trip generation analysis as infrastructure projects usually do not generate trips.[6] However, infrastructure projects may generate short-term trips due to construction workers and vehicles accessing the project site. As for development projects, the level of detail needed regarding construction workers and vehicles accessing the project site depends upon the project context, magnitude, and duration of the infrastructure project.

Project Description

The project description must describe the typical physical construction configuration and activities as applicable. The project description must provide the geographic boundaries of the project and street cross sections.

Methodology

The assessment will typically use the same methodology identified herein, except the methodology will pay particular attention to proposed right-of-way closures and rerouting of the path of travel for people walking, bicycling, and taking transit and/or transit operations.

Impact Analysis

The analysis of potentially hazardous conditions and accessibility impacts should be similar to that described under the Existing plus Project Construction and Cumulative Impact Analysis subsections. The

[6] Governor's Office of Planning and Research, *Revised Proposal on Updates to the CEQA Guidelines on Evaluating Transportation Impacts in CEQA,* January 20, 2016.

same construction screening criteria regarding project context, magnitude and duration would also apply to infrastructure projects.

Potentially Hazardous Conditions, Accessibility, and Public Transit Delay

If an infrastructure project does not meet the screening criteria after considering the project site context and construction duration and magnitude, further construction analysis may be required. The impact analysis must address whether an infrastructure project's construction activities would create potentially hazardous conditions for people walking, bicycling, taking transit, and/or transit operations, or with other vehicles. The impact analysis must address whether an infrastructure project's construction activities would substantially interfere with emergency access or accessibility of people walking or bicycling to the study area; or substantially interfere with public transit service such that a substantial transit delays results. The department provides examples of some of the circumstances that may result in potentially hazardous conditions substantial interference with accessibility, and substantial delay to public transit under the Existing plus Project Construction and Cumulative Impact Analysis subsections.

Attachment A

Construction Analysis Screening Criteria Checklist

General construction activities result in temporary conditions, and usually do not result in permanent changes to the environment, in particular, changes to the transportation circulation network. Compliance with city codes and regulations typically ensures that construction activities do not result in potentially hazardous conditions to people walking, bicycling, riding transit and/or transit operations. Below are screening criteria for determining whether or not further analysis is needed relating to potential construction impacts.[1] The screening criteria is a two-step approach. First consider project context. If the project context is such that there is relatively little travel activity that could be disrupted by construction activities, then detailed construction analysis is not needed. If, however, the project site context includes travel activity that could be substantially disrupted by project construction activities, then consider the duration and magnitude of construction activity to determine if further analysis is warranted.

PROJECT SITE CONTEXT

☐ 1. The level of travel activity in the project site study area (site context) including volumes of people walking, bicycling, riding transit, and driving, as well as the presence of transit facilities (routes and/or stops) and emergency service operator facilities are such that further construction analysis would not be needed. Describe briefly:

The following are examples of project site context such that further construction analysis would not be needed. This is not an exhaustive list of circumstances and the items listed should be considered comprehensively:

- The site surrounding is not well-served by multiple other ways of travel (e.g., people walking bicycling, riding public transit) and may be characterized by a lack of or substandard sidewalks, bicycle facilities, or transit routes or transit stops in the study area such that there would be little interference with modes of travel due to project construction activities; and
- The amount of excavation is less than two levels below ground surface; and/or
- The amount of demolition would result in less than 20,000 cu yards of material removed from the site.

CONSTRUCTION DURATION AND MAGNITUDE

☐ 2. The level of intensity of project construction activities as well as the anticipated duration for project construction is a circumstance such that further construction analysis would not be needed. Describe briefly:

The following are examples under which the construction magnitude and duration would be such that further construction analysis would not be needed. This is not an exhaustive list of circumstances and the items listed should be considered in conjunction with the project site context:

- Construction is anticipated to be completed in 30 months or less.
- Construction of a project is not multi-phased (e.g., construction and operation of multiple buildings planned over a long time period)

Projects that meet the criteria described above would not result in significant construction-related transportation impacts and do not warrant further analysis.

[1] Compiled background historical review of past projects and impact conclusions related to construction are on file with department.

ATTACHMENT B

Existing and Proposed Project Figures and Table Examples

Introduction

Attachment B represents typical figures necessary to illustrate conditions that could result in transportation impacts from the project construction activities included in a transportation study. All figures should include basic elements (e.g., north arrow, title, legend, references, acronyms, etc.). Symbology should reflect that documents may be printed in black and white. All figures and tables should include all the information the reader would need to understand the information presented. Some of the figures presented below were from previous transportation studies and are illustrative only and may not include all the basic elements.

FIGURE 1

Study Area for Project Construction

Figure 1 is an example of the study area for project construction activities. As shown the study area has frontages on multiple streets. All frontages should be considered for possible construction staging.

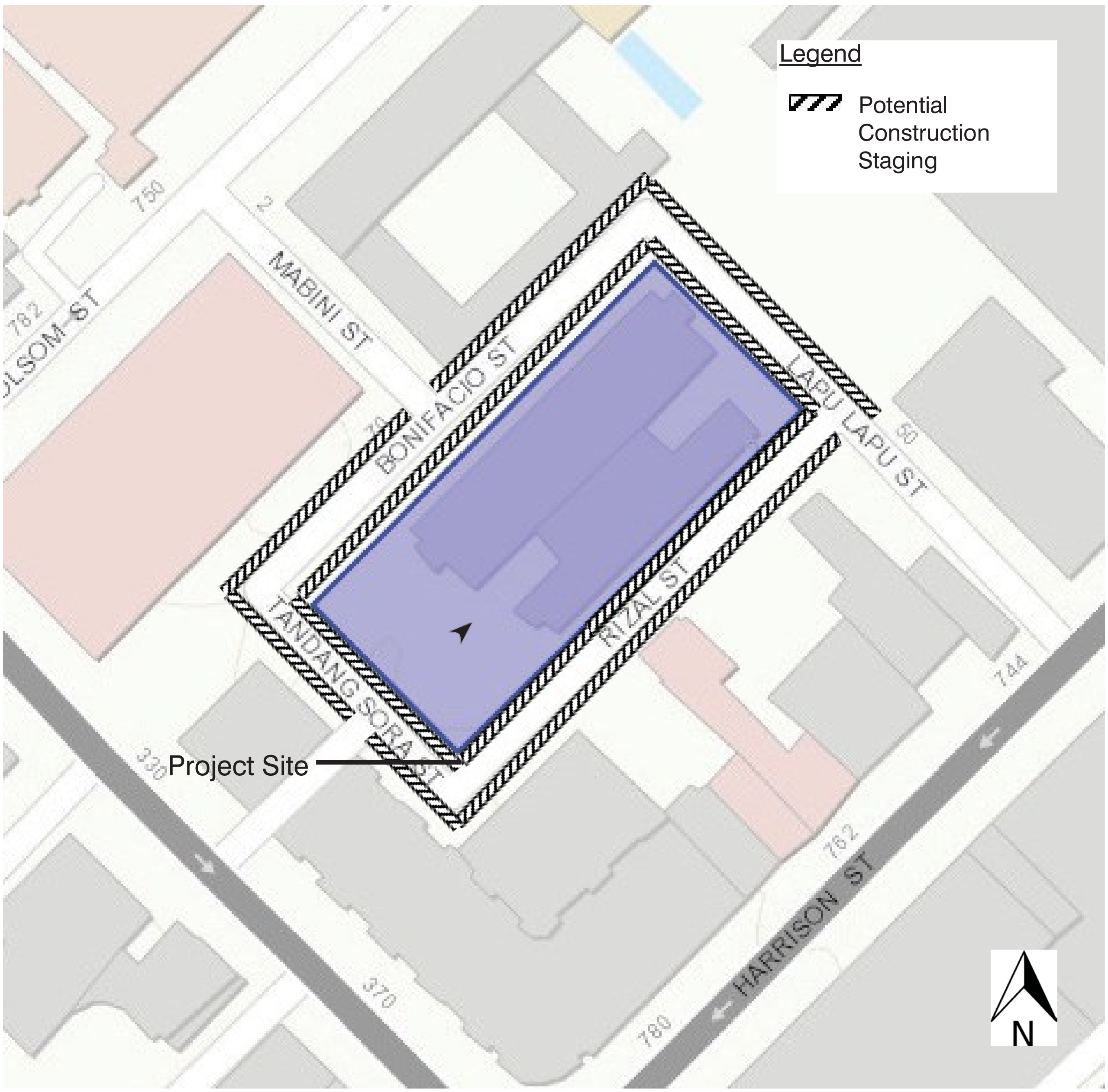

FIGURE 2

Existing On-street Site Plan

Figure 2 below is an example of a site plan that includes a detailed description of existing on-street conditions adjacent to the project site including commercial and passenger loading, and existing parking. When developing a map similar to the one shown, include the linear dimensions of the existing and proposed curb cuts. Loading zones should be dimensioned and match the color of the zones to those used in the SFMTA Color Curb Program. The existing conditions should be explicit to identify potential transportation impacts from the project construction activities.

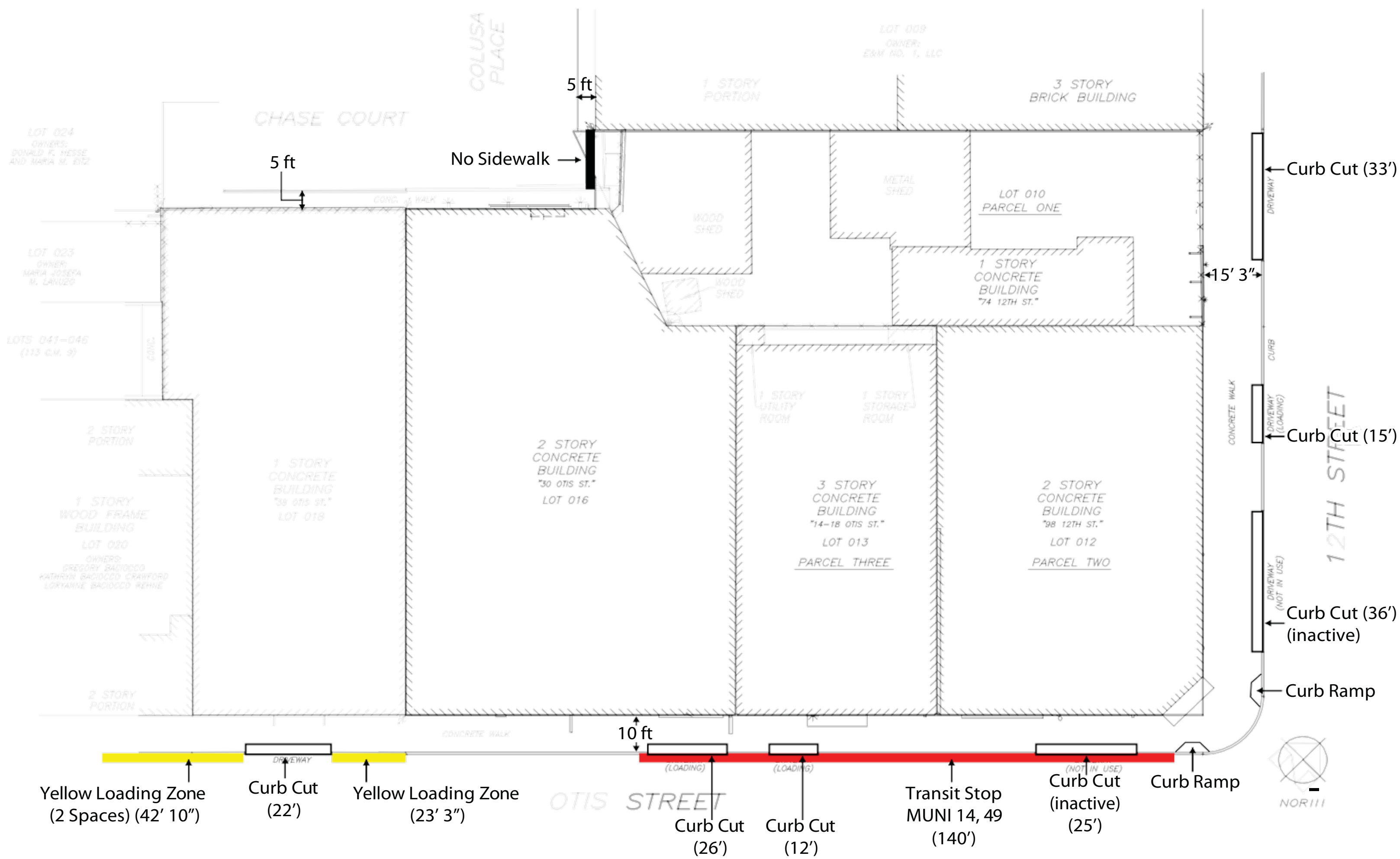

FIGURE 3

Construction Access to Site

Figure 3 below shows the typical format to identify the truck route access to locations where construction staging would occur in the area of the proposed project. The request for a figure that demonstrates construction access to the site would be determined by the department in the project scoping process.

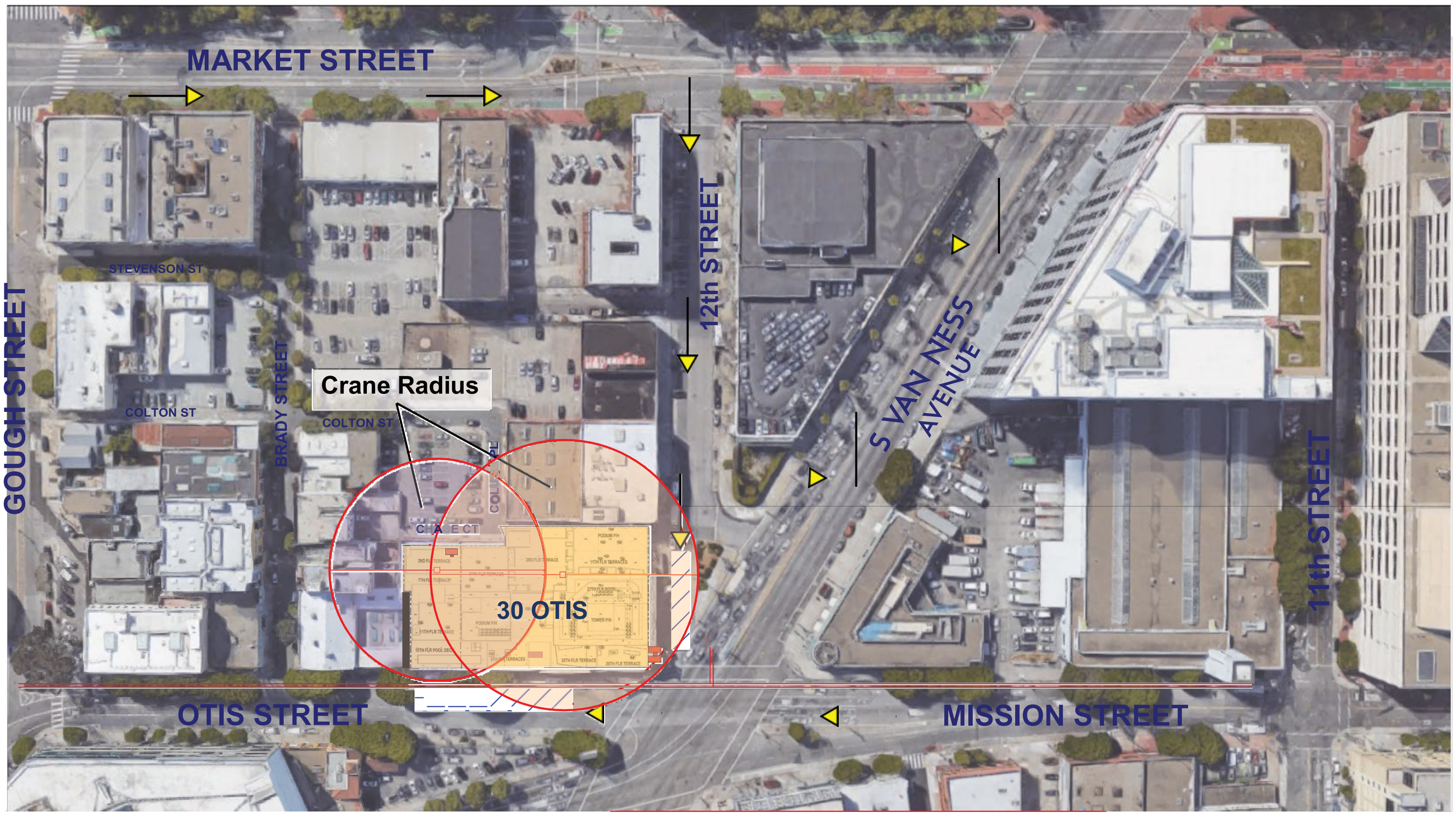

FIGURE 4

Construction Staging Site

Figure 4 below shows the typical format to identify the truck route access to locations where construction staging would occur in the area of the proposed project. The request for a figure that demonstrates construction access and staging to the site would be determined by the department in the project scoping process.

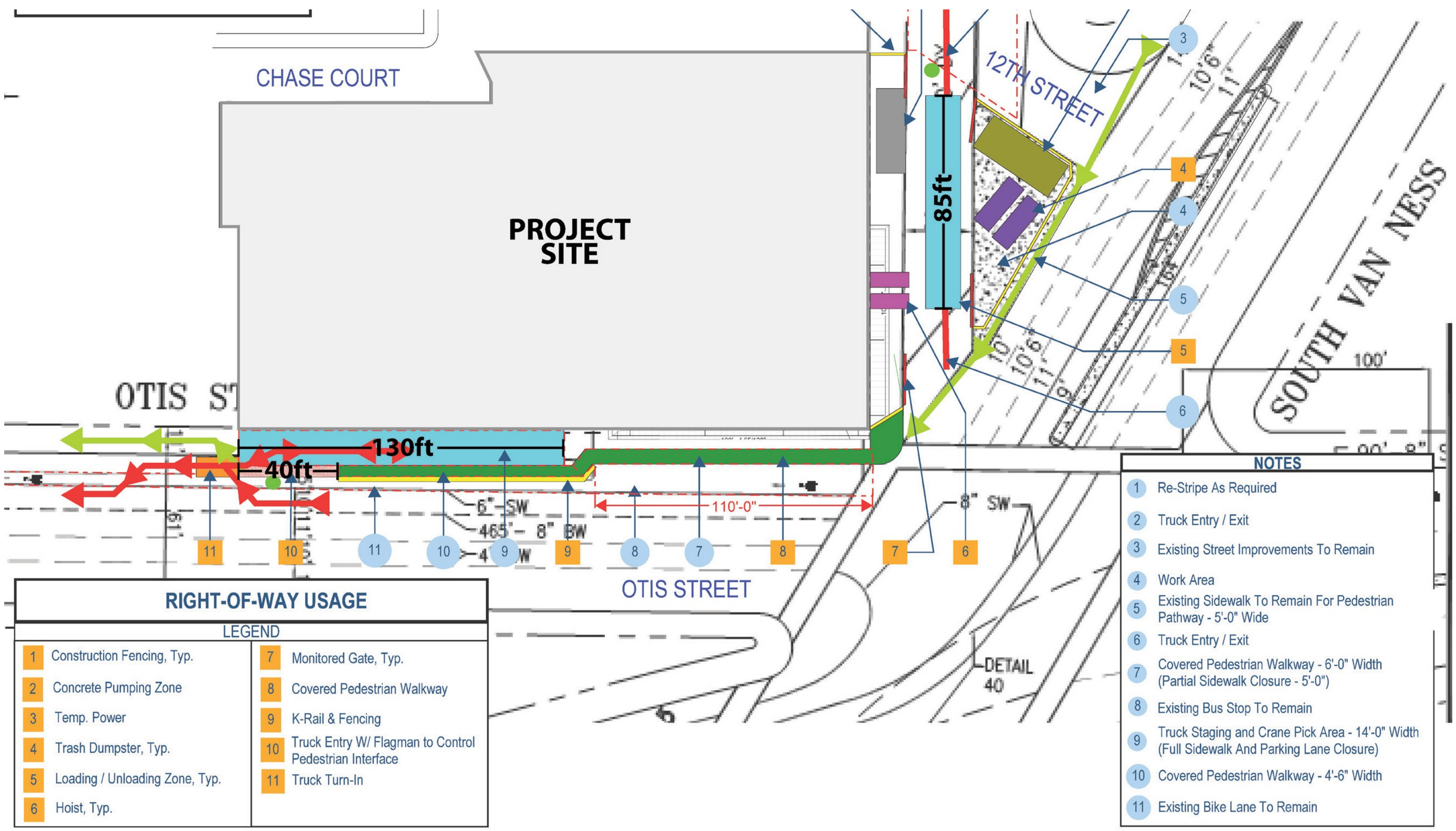

FIGURE 5

Turn Template Into/Out of On-Street Loading Space for Construction Staging

Figure 5 below shows the typical format to present large construction trucks moving in and out of an on-street loading space used for construction staging.

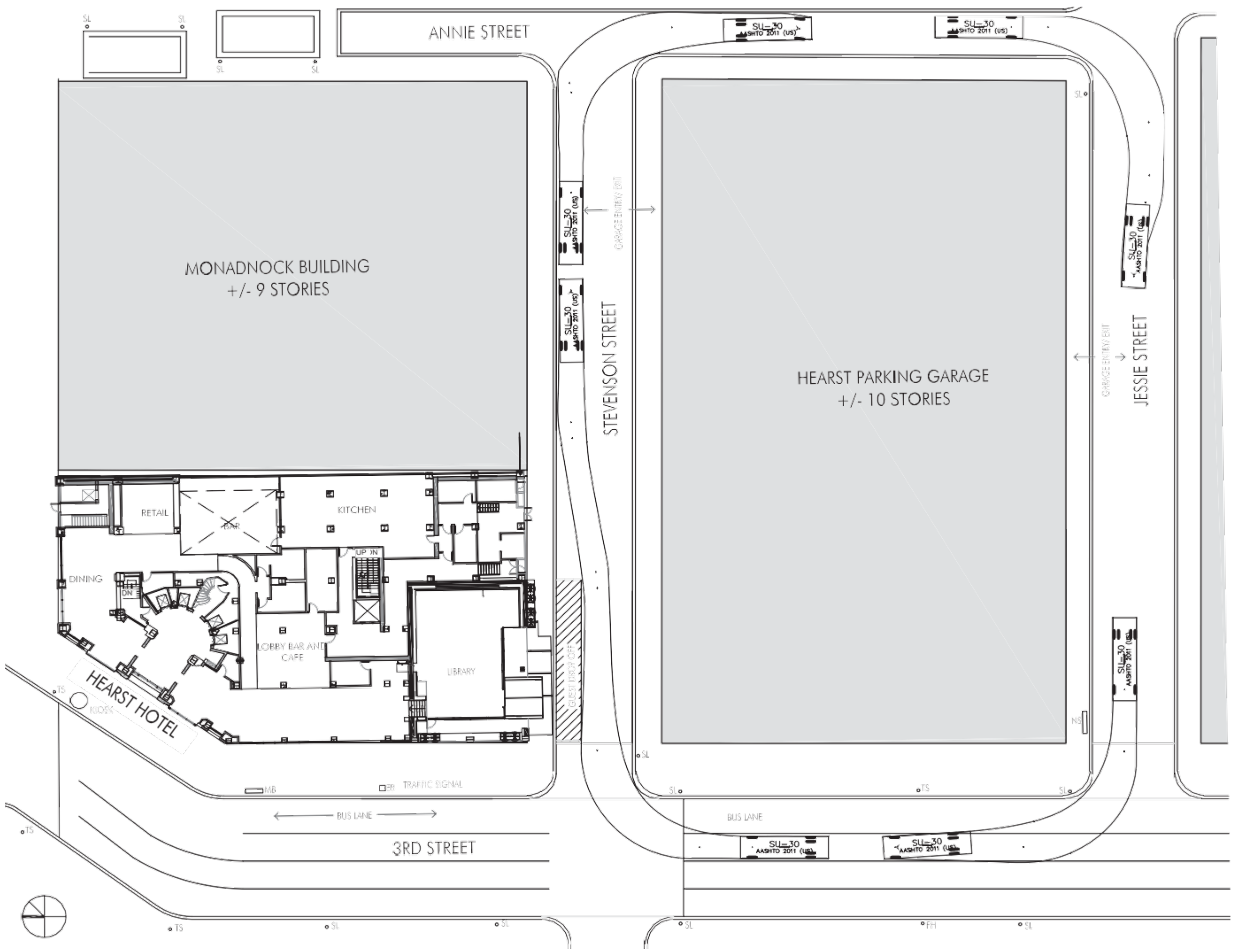

FIGURE 6

Study Area for Project Construction

Figure 6 below shows the typical format to present off street truck turn templates into the loading and construction staging area.

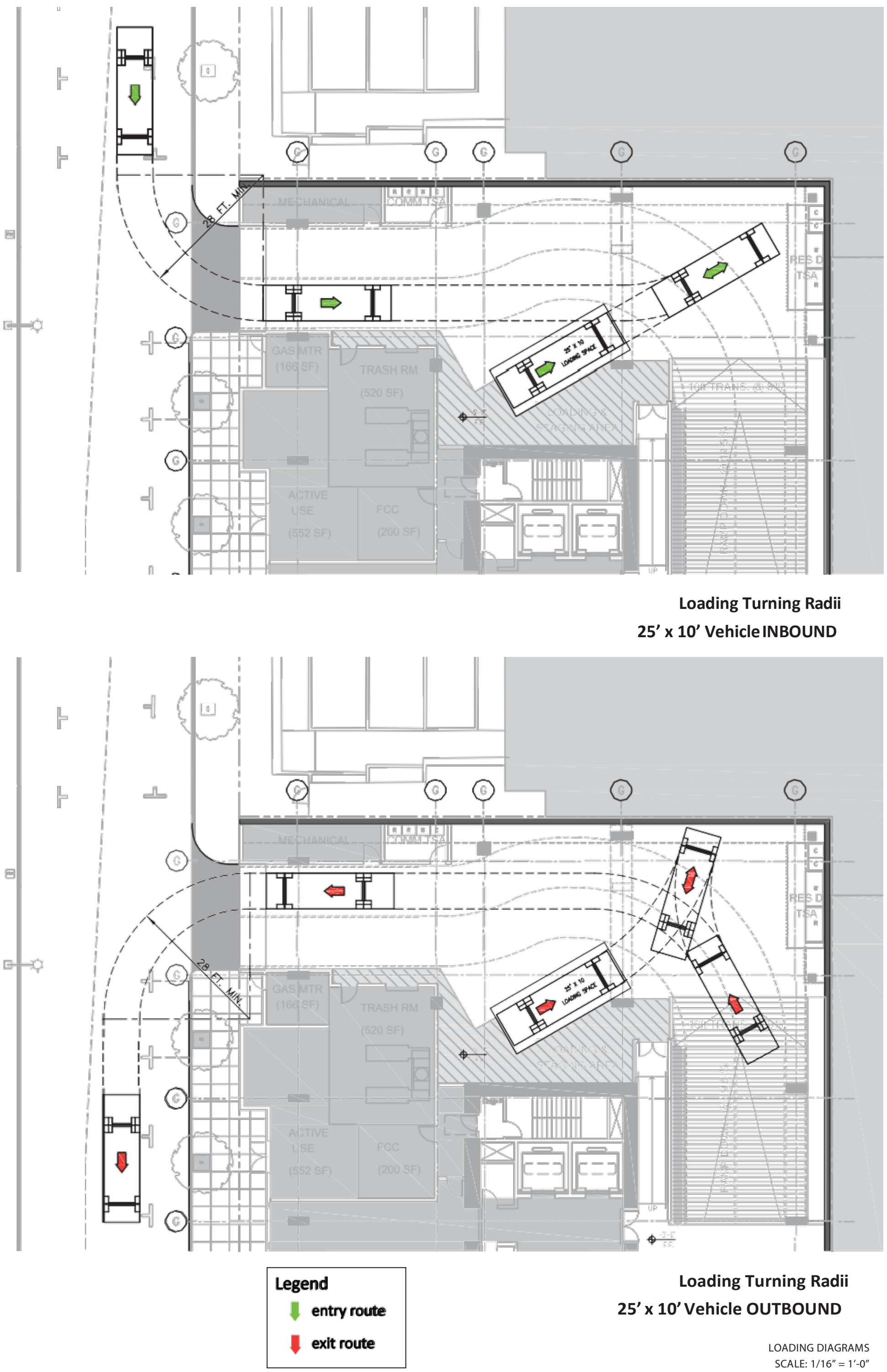

FIGURE 7

Construction Plan and Phasing Template Sample

Figure 7 below shows the typical formats to summarize the construction phases, including daily and average trucks and workers. The figures presented below were from previous transportation studies and are illustrative only and may not include all the basic elements.

Table XX
Proposed Project
Summary of Construction Phases and Duration, and Daily Construction Trucks and Workers by Phase

Phase	Duration (months)[1]	Number of Daily Construction Trucks		Number of Daily Construction Workers	
		Peak	Average	Peak	Average
Demolition and Site Prep	1	10	6	15	10
Excavation and Shoring	0.5	10	5	20	10
Foundation	1	20	5	30	25
Base Building	6.5	20	10	100	75
Exterior and Interior Finishing	4	20	10	75	50
Sidewalks and Landscaping	3	5	3	25	20

Note:
[1] Total proposed project construction duration would be 15 months, and some construction phases would partially overlap (e.g., exterior and interior finishes, and site work).

FIGURE 8

Construction Plan and Phasing Template Sample (continued)

Project Name Summary of Construction Phases and Duration, and Daily Construction Trucks and Workers by Phase														
Phase (revise as appropriate)	**Start Date**	**End Date**	**Duration (months)**	**Number of Daily Construction Trucks (1)**		**Number of Daily Construction Workers**		**Parking for Construction Workers**	**Heavy Duty Construction Equipment**					
				Peak	**Avg.**	**Peak**	**Avg.**		**Type of Equipment**	**Duration on Site (months)**	**Capacity (hp or tons)**	**Fuel Type**	**Quantity**
Demolition	June 11, 2018	July 20, 2018	1	25	15	10	10	Not provided	Excavator	1	242 hp	Diesel	1
Excavation and Shoring	July 20, 2018	Sept 29, 2018	2.0	75	50	20	10	Not provided	Excavator Dozer	2 2	242 hp 205 hp	Diesel Diesel	2 1
Foundation & Below Grade Construction	Sept 29, 2018	May 13, 2019	7.5	15	7	50	30	Not provided	Mobile Crane	1	5 ton	Diesel	1
Base Building (incl int framing/rough-in)	May 14, 2019	June 15, 2020	13	25	12	200	140	Not provided	Mobile Crane Manlift 1 Manlift 2 Forklifts	intermittent 9 8 15	5 ton 3 ton 1.5 ton 20 hp	Diesel Elect from Grid Elect from Grid Diesel	1 1 1 2
Exterior Finishing	July 22, 2019	March 23, 2020	8	17	5	55	35	Not provided	Manlift 1 Manlift 2	In base building	3 ton	Elect from Grid	1
Interior Finishing	June 10, 2019	July 27, 2020	13.5	20	10	120	100	Not provided	Manlift 1 Manlift 2 Forklifts	5 4 8	3 ton 3 ton 1.5 ton	Elect from Grid Elec from Grid Diesel	1 1 2
TCO / Occupancy		Aug 6, 2020		N/A	N/A	N/A	N/A	Not provided					

(1) All trucks arriving at site. Include multiple trips to site by same truck.

ATTACHMENT C

Construction Plan and Phasing

Attachment C provides the CalEEMod[2] default values and rates for daily construction worker trips, vendor trips, and hauling trips per each construction phase to inform a typical project's detailed air quality analysis. The CaleEEMod User's Guide (as of November 9, 2017) and associated Appendix (October 2017) provides the detailed analysis and data supporting these values. The CalEEMod Construction Worker and Vendor Trip Rates are associated with vehicle miles traveled. The department's Project Application requires the project sponsor/contractor to provide project specific construction information, such as the estimated construction schedule, approximate depth, area, and amount of excavation. The project sponsor/ contractor generally provides the estimated amount of material transport and estimated number of deliveries. If details are unknown, the project sponsor/contractor may use default values from CalEEMod, which tend to result in conservative (i.e., greater) estimates than that may occur.

Building Construction Worker and Vendor Trip Rates

Land Use SubType	Rate Metric	Worker Trip Rate	Vendor Trip Rate
Single Family	Daily Trips per DU	0.36	0.1069
Multi-Family	Daily Trips per DU	0.72	0.1069
Commercial/Retail	Daily Trips per 1000 sqft	0.32	0.1639
Office/Industrial	Daily Trips per 1000 sqft	0.42	0.1639
Source: SCAQMD's analysis of SMAQMD Building Construction Worker and Vendor trip rates found in Appendix E.			

CalEEMod separates construction into the following default phases: Demolition, Site Preparation, Grading, Building Construction, Architectural Coatings, and Paving. The above rates are used to determine the number of worker trips and vendor trips for the 'Building Construction' phase only. For the Architectural Coating phase, the number of workers is approximately 20% of the number of workers estimated for the Building Construction phase. For all other phases, CalEEMod quantifies the number of construction workers by multiplying 1.25 times the total number of pieces of equipment. CalEEMod provides default estimates of the total number of pieces of equipment used per phase.

Haul trips are based on the amount of material that is demolished, imported or exported assuming a truck can handle 16 cubic yards (20 tons) of material. For phased trips, the truck is assumed to be full both ways. For non-phased trips, the truck is assumed to be empty one direction and thus results in more haul trips calculated.

2. The California Emissions Estimator Model® (CalEEMod) is a statewide land use emissions computer model used for a variety of purposes and designed to provide a uniform platform for government agencies, land use planners, and environmental professionals to quantify potential criteria pollutant and greenhouse gas (GHG) emissions associated with both construction and operations from a variety of land use projects. The CalEEMod user guide may be accessed at the following web address: http://www.aqmd.gov/caleemod/user's-guide

ATTACHMENT D

Mitigation and Improvement Measures

MITIGATION MEASURES FOR LAND USE DEVELOPMENT PROJECTS LOCATED WITHIN AN AREA PLAN

Ricon Hill Area Plan

No applicable mitigation or improvement measures were identified.

Market and Octavia Neighborhood Plan

No applicable mitigation or improvement measures were identified.

Visitacion Valley Redevelopment Plan

No applicable mitigation or improvement measures were identified.

Balboa Park Station Area Plan

Improvement Measure Balboa Park Station Area Plan: To minimize disruption of the general traffic flow on adjacent streets during the a.m. and p.m. peak periods, limit truck movements to the hours between 9:00 a.m. and 3:30 p.m. (or other times, if approved by MTA). In addition, have all construction contractors meet with representatives of MTA and the Planning Department to determine feasible measures to reduce traffic congestion, including transit disruption and pedestrian and bicycle circulation impacts during construction of individual projects within the Project Area.

Improvement Measure Truck Loading Phelan Loop Site: To minimize disruption of the general traffic flow on adjacent streets during the a.m. and p.m. peak periods, limit truck movements to the hours between 9:00 a.m. and 3:30 p.m. (or other times, if approved by MTA). In addition, have all construction contractors meet with representatives of MTA and the Planning Department to determine feasible measures to reduce traffic congestion, including transit disruption and pedestrian and bicycle circulation impacts during construction of individual projects within the Project Area.

Eastern Neighborhoods Rezoning and Area Plan

No applicable mitigation or improvement measures were identified.

Treasure Island and Yerba Buena Island Redevelopment Plan

Mitigation Measure M-TR-1: Construction Traffic Management Program. The project sponsors shall develop and implement a Construction Traffic Management Plan ("CTMP"), consistent with the standards and objectives stated below and approved by TIDA, designed to anticipate and minimize transportation impacts of various construction activities associated with the Proposed Project.

The Plan shall disseminate appropriate information to contractors and affected agencies with respect to coordinating construction activities to minimize overall disruptions and ensure that overall circulation on the Islands is maintained to the extent possible, with particular focus on ensuring pedestrian, transit, and bicycle connectivity and access to the Bay and to recreational uses to the extent feasible. The CTMP shall supplement and expand, rather than modify or supersede, any manual, regulations, or provisions set forth by SFMTA, Department of Public Works ("DPW"), or other City departments and agencies.

Specifically the plan shall:

- Identify construction traffic management best practices in San Francisco, as well as other jurisdictions that, although not being implemented in the City, could provide valuable information for a project of the size and characteristics of Treasure Island and Yerba Buena Island.

- As applicable, describe procedures required by different departments and/or agencies in the City for implementation of a Construction Traffic Management Plan, such as reviewing agencies, approval processes, and estimated timelines.
    - For example: The construction contractor will need to coordinate temporary and permanent changes to the transportation network on Treasure Island and Yerba Buena Island with TIDA. Once Treasure Island streets are accepted as City streets, temporary traffic and transportation changes must be coordinated through the SFMTA's Interdepartmental Staff Committee on Traffic and Transportation ("ISCOTT") and will require a public meeting. As part of this process, the CTMP may be reviewed by SFMTA's Transportation Advisory Committee ("TASC") to resolve internal differences between different transportation modes.
- For construction activities conducted within Caltrans right-of-way, Caltrans Deputy Directive 60 (DD-60) requires a separate Transportation Management Plan and contingency plans. These plans shall be part of the normal project development process and must be considered during the planning stage to allow for the proper cost, scope and scheduling of the TMP activities on Caltrans right-of-way. These plans should adhere to Caltrans standards and guidelines for stage construction, construction signage, traffic handling, lane and ramp closures and TMP documentation for all work within Caltrans right-of-way.
- Changes to transit lines would be coordinated and approved, as appropriate, by SFMTA, AC Transit, and TITMA. The CTMP would set forth the process by which transit route changes would be requested and approved. Require consultation with other Island users, including the Job Corps and Coast Guard, to assist coordination of construction traffic management strategies. The project sponsors shall proactively coordinate with these groups prior to developing their CTMP to ensure the needs of the other users on the Islands are addressed within the Construction Traffic Management Plan.
- Identify construction traffic management strategies and other elements for the Proposed Project, and present a cohesive program of operational and demand management strategies designed to maintain acceptable levels of traffic flow during periods of construction activities. These include, but are not limited to, construction strategies, demand management activities, alternative route strategies, and public information strategies. For example, the project sponsors may develop a circulation plan for the Island during construction to ensure that existing users can clearly navigate through the construction zones without substantial disruption.
- Require contractors to notify vendors that STAA trucks larger than 65 feet exiting from the eastbound direction of the Bay Bridge may only use the off-ramp on the east side of Yerba Buena Island.

Glen Park Community Plan

Mitigation Measure M-TR-12A: Construction Transportation Management Plan. In the event that two or more major proposed transportation improvements (specifically the bus loop, roundabout, or widening of the northbound approach of Diamond Street) are constructed simultaneously, SFMTA, BART, and any other agency that may have jurisdiction shall develop and implement a Construction Transportation Management Plan (TMP) to anticipate and minimize impacts of potentially overlapping construction activities. The TMP would coordinate construction activities to minimize disruptions and ensure that overall circulation is maintained to the extent possible, with particular focus on ensuring pedestrian, transit, and bicycle connectivity. The TMP would supplement and expand, rather than modify or supersede, any existing regulations and requirements. The TMP shall be submitted to SFMTA Traffic Engineering Division, the Department of Public Works (DPW) and presented as part of review by the Transportation Advisory Staff Committee.

Transit Center District Plan and Transit Tower

M-TR-9: Construction Coordination. To minimize potential disruptions to transit, traffic, and pedestrian and bicyclists, the project sponsor and/or construction contractor for any individual development project in the Plan area shall develop a Construction Management Plan that could include, but not necessarily be limited to, the following:

- Limit construction truck movements to the hours between 9:00 a.m. and 4:00 p.m. (or other times, if approved by the Municipal Transportation Agency) to minimize disruption of traffic, transit, and pedestrian flow on adjacent streets and sidewalks during the weekday a.m. and p.m. peak periods.
- Identify optimal truck routes to and from the site to minimize impacts to traffic, transit, pedestrians, and bicyclists; and,
- Encourage construction workers to use transit when commuting to and from the site, reducing the need for parking.

The sponsor shall also coordinate with the Municipal Transportation Agency/Sustainable Streets Division, the Transbay Joint Powers Authority, and construction manager(s)/contractor(s) for the Transit Center project, and with Muni, AC Transit, Golden Gate Transit, and SamTrans, as applicable, to develop construction phasing and operations plans that would result in the least amount of disruption that is feasible to transit operations, pedestrian and bicycle activity, and vehicular traffic.

Western SoMa Community Plan

No applicable mitigation or improvement

Central SoMa Plan

Mitigation Measure M-TR-9: Construction Management Plan and Construction Coordination.
Construction Management Plan— For projects within the Plan Area, the project sponsor shall develop and, upon review and approval by the SFMTA and Public Works, implement a Construction Management Plan, addressing transportation- related circulation, access, staging and hours of delivery.

The Construction Management Plan would disseminate appropriate information to contractors and affected agencies with respect to coordinating construction activities to minimize overall disruption and ensure that overall circulation in the project area is maintained to the extent possible, with particular focus on ensuring transit, pedestrian, and bicycle connectivity. The Construction Management Plan would supplement and expand, rather than modify or supersede, any manual, regulations, or provisions set forth by the SFMTA, Public Works, or other City departments and agencies, and the California Department of Transportation.

If construction of the proposed project is determined to overlap with nearby adjacent project(s) as to result in transportation-related impacts, the project sponsor or its contractor(s) shall consult with various City departments such as the SFMTA and Public Works, and other interdepartmental meetings as deemed necessary by the SFMTA, Public Works, and the Planning Department, to develop a Coordinated Construction Management Plan. The Coordinated Construction Management Plan, to be prepared by the contractor, would be reviewed by the SFMTA and would address issues of circulation (traffic, pedestrians, and bicycle), safety, parking and other project construction in the area. Based on review of the construction logistics plan, the project may be required to consult with SFMTA Muni Operations prior to construction to review potential effects to nearby transit operations.

The Construction Management Plan and, if required, the Coordinated Construction Management Plan, shall include, but not be limited to, the following:

- Restricted Construction Truck Access Hours — Limit construction truck movements during the hours between 7:00 and 9:00 a.m. and between 4:00 and 7:00 p.m., and other times if required by the SFMTA, to minimize disruption to vehicular traffic, including transit during the a.m. and p.m. peak periods.

- *Construction Truck Routing Plans*—Identify optimal truck routes between the regional facilities and the project site, taking into consideration truck routes of other development projects and any construction activities affecting the roadway network.
- *Coordination of Temporary Lane and Sidewalk Closures*—The project sponsor shall coordinate travel lane closures with other projects requesting concurrent lane and sidewalk closures through interdepartmental meetings, to minimize the extent and duration of requested lane and sidewalk closures. Travel lane closures shall be minimized especially along transit and bicycle routes, so as to limit the impacts to transit service and bicycle circulation and safety.
- *Maintenance of Transit, Vehicle, Bicycle, and Pedestrian Access*—The project sponsor/construction contractor(s) shall meet with Public Works, SFMTA, the Fire Department, Muni Operations and other City agencies to coordinate feasible measures to include in the Coordinated Construction Management Plan to maintain access for transit, vehicles, bicycles and pedestrians. This shall include an assessment of the need for temporary transit stop relocations or other measures to reduce potential traffic, bicycle, and transit disruption and pedestrian circulation effects during construction of the project.
- *Carpool, Bicycle, Walk and Transit Access for Construction Workers*—The construction contractor shall include methods to encourage carpooling, bicycling, walk and transit access to the project site by construction workers (such as providing transit subsidies to construction workers, providing secure bicycle parking spaces, participating in free- to-employee ride matching program from www.511.org, participating in emergency ride home program through the City of San Francisco (www.sferh.org), and providing transit information to construction workers).
- *Construction Worker Parking Plan*—The location of construction worker parking shall be identified as well as the person(s) responsible for monitoring the implementation of the proposed parking plan.

  The use of on-street parking to accommodate construction worker parking shall be discouraged. All construction bid documents shall include a requirement for the construction contractor to identify the proposed location of construction worker parking. If on-site, the location, number of parking spaces, and area where vehicles would enter and exit the site shall be required. If off-site parking is proposed to accommodate construction workers, the location of the off site facility, number of parking spaces retained, and description of how workers would travel between off-site facility and project site shall be required.
- *Project Construction Updates for Adjacent Businesses and Residents*—To minimize construction impacts on access for nearby institutions and businesses, the project sponsor shall provide nearby residences and adjacent businesses with regularly-updated information regarding project construction, including construction activities, peak construction vehicle activities (e.g., concrete pours), travel lane closures, and lane closures. At regular intervals

MITIGATION AND IMPROVEMENT MEASURE EXAMPLES

Please Note: The following mitigation measure applied to a large project in a constrained area with other several large adjacent projects that would also be under construction under cumulative conditions. Conditions should be updated to reflect project-specific circumstances.

The department continues to coordinate with the San Francisco Municipal Transportation Agency on the applicability of some construction traffic management plan conditions post-EIR, given the nature of conditions that change by the time of construction. Mitigation and improvement measures must be be monitored successfully.

The following lists the typical types of measures that can mitigate or lessen transportation impacts from project construction activities:

Potentially Hazardous Conditions, Accessibility, and Public Transit Delay

Coordinated Construction Traffic Management Plan

The project sponsor shall participate in the preparation and implementation of a coordinated construction traffic management plan that includes measures to reduce hazards between construction-related traffic and pedestrians, bicyclists, and transit vehicles. The coordinated construction traffic management plan shall be prepared in coordination with other public and private projects within a one block radius that may have overlapping construction schedules and shall be subject to review and approval by the Transportation Advisory Staff Committee. The plan shall include, but not necessarily be limited to the following measures:

» **Construction Staging**– The project sponsor shall provide a design for the construction staging zone on INSERT NAME OF Street that allows for front-in access with final access to the INSERT NAME OF Street staging area to be determined by the approved construction management plan.

» **Restricted Construction Truck Access Hours** – Limit truck movements and deliveries requiring lane closures to occur between 9 a.m. to 4 p.m., outside of peak morning and evening weekday commute hours.

» **Construction Truck Routing Plans** – Identify optimal truck routes between the regional facilities and the project site, taking into consideration truck routes of other development projects and any construction activities affecting the roadway network.

» **Coordination of Temporary Lane and Sidewalk Closures** – The project sponsor shall coordinate lane closures with other projects requesting concurrent lane and sidewalk closures through the Transportation Advisory Staff Committee and interdepartmental meetings process above, to minimize the extent and duration of requested lane and sidewalk closures. Lane closures shall be minimized especially along transit and bicycle routes, so as to limit the impacts to transit service and bicycle circulation and safety.

» **Proposed Project Construction Updates for Adjacent Businesses and Residents** – Provide regularly updated information regarding project construction, including a construction contact person, construction activities, duration, peak construction activities (e.g., concrete pours), travel lane closures, and lane closures (bicycle and parking) to nearby residences and adjacent businesses through a website, social media, or other effective methods acceptable to the SFMTA.

- **Maintain Local Circulation** – Place signage for all vehicle, bicycle, transit, and pedestrian detours. Reimburse the SFMTA for temporary striping and signage during project construction. Provide a traffic control officer to direct traffic around the project site, if determined necessary by the SFMTA. Preserve pedestrian access during construction detours.

TRANSPORTATION IMPACT ANALYSIS GUIDELINES

APPENDIX O
VEHICULAR PARKING

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Attachment O
Vehicular Parking Memorandum

Date:	February 14, 2019
To:	Record No. 2015-012094GEN
Prepared by:	Colin B. Clarke, Jenny Delumo, Chris Espiritu
Reviewed by:	Wade Wietgrefe
RE:	**Transportation Impact Analysis Guidelines, Vehicular Parking**

INTRODUCTION

This memorandum updates the prior guidance provided in the Transportation Impact Analysis Guidelines for the topic of vehicular parking. The department prepared this memorandum in consultation with stakeholders (e.g., city and county agencies, consultants). The department will issue memoranda that provide updates to other topics (e.g., transit, loading) within the guidelines. When the department issues a memorandum about a topic, it will supersede existing guidance regarding that topic.

This memorandum provides specific guidance on the methodology and impact analysis required for the vehicular parking transportation topic. Overall guidance on conducting transportation analysis for environmental review, including developing the project description, how to address the significance criteria, methodology, and impact analysis, is in the Transportation Impact Analysis Guidelines.

The guidance provided herein assumes a land use development project located outside of an area plan that requires a transportation study. Guidance on other types of projects, such as projects located in an area plan or infrastructure projects, is discussed below under the "Other" subsection. The department may use this guidance for multiple projects, but the department has discretion on how to apply the guidance on a project-by-project basis.

The organization of the memorandum is as follows:

1) Project Description
2) Significance Criteria
3) Existing and Existing plus Project
   a) Methodology
   b) Existing Baseline
   c) Impact Analysis
4) Cumulative
   a) Methodology
   b) Impact Analysis
5) Other (covers different types of projects)

Below the significance criterion includes a screening criteria checklist. If a project meets the screening criteria, then a substantial parking deficit would not occur and the project would not be subject to the contents within this memorandum. Almost all projects located within San Francisco are also located within transit priority areas and would not require parking analysis under the California Environmental Quality Act (CEQA).

Attachments to this memorandum are under separate cover and are attached to the end of this memorandum. The department may update the attachments to the memoranda more frequently than the body of the memoranda.

PROJECT DESCRIPTION

Refer to the Transportation Impact Analysis Guidelines Appendix A, Tables 1-3, for a list of the typical physical, additional physical, and programmatic features for existing and existing plus project conditions, as applicable. The geographic extent of these features must, at a minimum, include the project's frontage and may include the entirety of the project's block. Appendix A, Table 4 of the guidelines provides a non-exhaustive list of approvals from agencies other than the planning department that a project sponsor may need to obtain for the project description features described in the guidelines. Attachment A of this memorandum includes examples of figures that illustrate how to graphically represent vehicular parking conditions.

SIGNIFICANCE CRITERION

San Francisco Administrative Code chapter 31 directs the department to identify environmental effects of a project using as its base the environmental checklist form set forth in Appendix G of the CEQA Guidelines. In 2009, Appendix G of the CEQA Guidelines removed parking in and by itself as a checklist question. As it relates to parking, Appendix G states: "would the project conflict with a program plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?" The department uses the following significance criterion to evaluate the secondary effects from vehicular parking as it relates to that question. A project would have a significant impact if:

1A) it would result in a substantial[1] vehicular parking deficit, and

1B) the secondary effects would:
create potentially hazardous conditions[2] for people walking, bicycling, or driving; or
interfere with accessibility for people walking or bicycling or inadequate access for emergency vehicles; or
substantially delay public transit.

The following provides the screening criteria to determine if a substantial parking deficit could occur.

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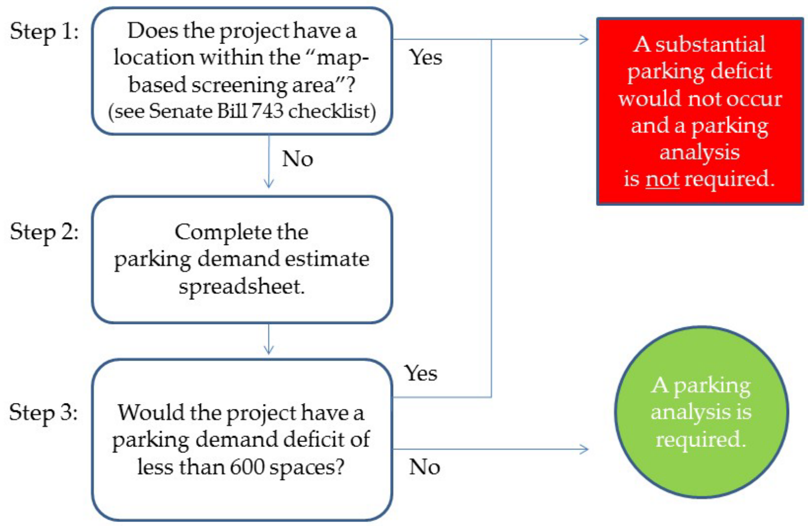
[1] Throughout this memo, the term "substantial amount" is used but not defined. This is because what constitutes a substantial amount of people, vehicles, etc., depends on the context in which the project is being evaluated (e.g., existing conditions, proposed land uses, and other variables).

[2] For the purposes of this memorandum, "hazard" refers to a project generated vehicle potentially colliding with people walking that could cause serious or fatal physical injury, accounting for the aspects described below. Human error or non-compliance with laws, weather conditions, time-of-day, and other factors can affect whether a collision could occur. However, for purposes of CEQA, hazards refer to engineering aspects of a project (e.g., speed, turning movements, complex designs, substantial distance between street crossings, sight lines) that may cause a greater risk of collisions that result in serious or fatal physical injury than a typical project. This significance criterion focuses on hazards that could reasonably stem from the project itself, beyond collisions that may result from aforementioned non-engineering aspects or the transportation system as a whole.

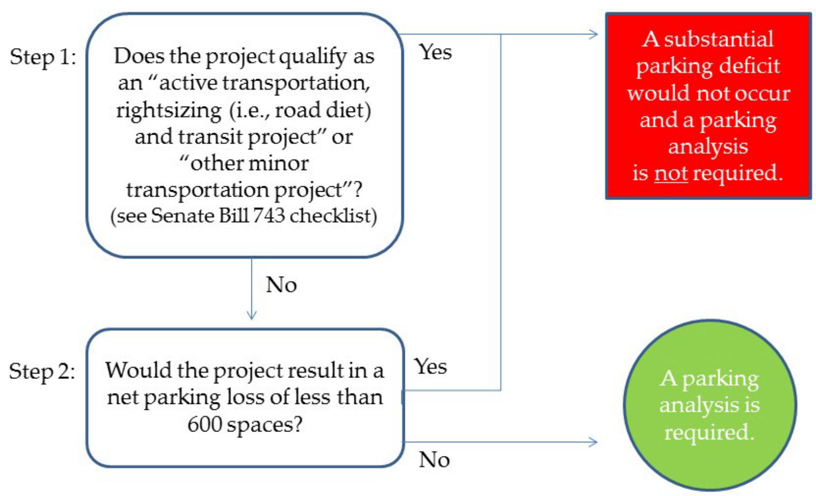
PARKING ANALYSIS SCREENING CRITERIA CHECKLIST

If the answer is "yes" after completing the numbered steps in the applicable flowchart below, then a substantial parking deficit would not occur and a parking analysis is not required (see next page for exceptions).[3]

Screening Criteria Checklist: **Land Use Project or Area Plan Project**



Screening Criteria Checklist: **Infrastructure Project**



[3] The department based the number of 600 vehicular parking spaces on the parking impact analysis of the changes to the Muni Route 14 in the Transit Effectiveness Project (TEP / Muni Forward) Final Environmental Impact Report, March 27, 2014, Planning Case No. 2011.0558E, and used a lower criteria of 600 based on professional judgement, to acknowledge that projects with parking analysis will most likely be located outside of map-based screening areas, unlike TEP / Muni Forward. TEP Impact Statement TR-57 (existing plus project) provided the following analysis: TTRP.14 Moderate Alternative Variant 1 included a permanent loss of 370 vehicular parking spaces (360 of them: part-time loss) north of 13th Street, a permanent loss of 430 spaces (415 of them: part-time loss) on Mission Street between 13th Street and Cesar Chavez Street, and a permanent loss of 360 spaces (355 of them: part-time loss) south of Cesar Chavez Street, which results in a total net loss of 1,160 spaces (1,130 of them: part-time loss). TTRP.14 Moderate Alternative Variant 2 included a permanent loss of 370 vehicular parking spaces (360 of them: part-time loss) north of 13th Street, a permanent loss of 230 spaces (zero of them: part-time loss) on Mission Street between 13th Street and Cesar Chavez Street, and a permanent loss of 360 spaces (355 of them: part-time loss) south of Cesar Chavez Street, which results in a total net loss of 955 spaces (715 of them: part-time loss). The EIR considered the parking loss from each variant substantial for certain segments.

The department may still require a parking analysis for the following project types:

- Large entertainment center outside of "map-based screening" area (greater than 300-person capacity)
- Large retail use primarily for the sale or provision of heavy or bulk goods
- Large institutional use such as a hospital

EXISTING AND EXISTING PLUS PROJECT

Methodology

This section is only applicable if the project does not meet the above screening criteria.

This section describes the typical methodology required to address the significance criterion. The methodology section identifies the collection, generation, and approach to analyze data. The department will determine whether to adjust the methodology as necessary to inform the analysis. The guidelines provide direction on the typical geographical area and period required for analysis. Additional guidance on the appropriate period of study for parking demand and the typical methodology for evaluating existing and existing plus project conditions for this topic, including data collection, is provided below.

This section also indicates in bracketed text [ ] whether the presentation of typical methodological elements in other sections of a transportation study (e.g., baseline, impact analysis) could occur in text, a figure, and/or a table. Appendix A provides examples of figures and tables.

Period

For parking demand, for land uses that typically generate daily long-term parking, the methodology should typically use the weekday mid-day average peak period (Tuesday, Wednesday, or Thursday from 11 a.m. to 2 p.m.). These land uses include, but are not limited to, residential, offices, schools, public parking facilities, medical facilities, and hotels. In addition, for residential uses, the methodology should typically use the weekday average evening and early morning peak period (Tuesday, Wednesday, or Thursday from 2 a.m. to 4 a.m.). For land uses that typically generate short-term demand, such as visitors at non-residential uses, the methodology should typically use the weekday average pm peak period (3 p.m. to 7 p.m.).

Other land uses, such as event centers may generate a peak parking demand on evenings or weekends, depending on the type of events that would occur. The department will determine the period for these types of land uses on a case-by-case basis.

Existing Conditions

The following identifies the typical methodology for projects. The department will determine the appropriate methodology as necessary to inform the impact determination:

<u>Counts</u>

The methodology may include prior counts collected from other studies or sources combined with (e.g., an average of three different dates with counts at the same intersection, global positioning system user data) or in isolation from the counts collected for the project. The use of prior counts must be justified, in consultation with the department. Typically, the use of prior counts may occur if these counts have not changed substantially under existing conditions (e.g., due to lack of new development, circulation changes, or travel patterns). [text, table]

<u>Visual Analysis with Recorded Observations</u>

Data collection for the project should include a site visit for a visual analysis, with recorded observations of the absence, discontinuity, or presence of the features listed in the project description, other relevant features (e.g., type of parking space, on-street parking regulation [e.g., cleaning, tow away zones, residential permit parking] and parking pricing rates [e.g., hourly, daily, weekly, monthly, including ranges]), and a description of the weather conditions. In addition, a site visit must record any existing potential or observed hazards or delays to public transit at locations in the study area where people park vehicles, especially at locations where people parking may interact with people walking, bicycling, or could affect transit. For example, describe whether people parked vehicles in travel lanes, sidewalks, or red color curb zones or observations of people regularly driving their vehicles looking for parking for extended periods of time on streets with transit.

<u>Parking Surveys</u>

The methodology should include a parking survey. The parking survey typically includes the following:

- Parking supply: number of parking spaces available in parking facilities during the period
- Parking utilization: a percentage consisting of the number of parking spaces occupied divided by number of parking spaces available [text, figure, table]
- Generation: the number of parked vehicles associated with a specific land use, building, or geography [text]
- Duration: the length of stay of a parked vehicle in a space [text]
- Turnover: the number of different vehicles that park in a particular space during a period, if not derived from aforementioned data (e.g., turnover rate for commercial short-term parking) [text]
- The parking survey may use video or in-person observations, information requests from parking facility operators, intercept surveys of users, and/or other survey methodologies to obtain information

<u>Street Design Characteristics</u>

Obtain the following general characteristics of streets within the study area:

- Number of travel lanes by type (e.g., mixed-flow, parking, bicycle, transit-only, etc.) [text, figure]
- Presence of public transit stops
- Presence of public transit service
- Location and number of on-street parking spaces [text, figure, table]

Obtain the following additional characteristics of streets within the study area to the extent applicable:

- Number of travel lanes by type at intersections (if different from midblock) [text, figure]

<u>Other Characteristics</u>

- Publicly accessible parking facilities [text, figure]
- Emergency service operator facilities [text, figure]

Existing plus Project Conditions

The following identifies the typical methodology for assessing existing plus project conditions.

Parking Demand and Travel Demand Analysis

The methodology to estimate parking demand[4] will vary depending upon the land use. The following is the typical methodology for different land uses: [text, table]

To estimate the long-term parking demand at residential uses, the methodology will use the private residential neighborhood parking supply[5] and survey data for the analysis period of on- and off-street publicly accessible parking spaces divided by number of dwelling units in the neighborhood to determine a parking demand rate per unit (refer to formula below). Alternatively, the methodology could use neighborhood specific total numbers of available vehicles divided by number of units in the neighborhood to determine a parking demand rate per unit.[6] For both methodologies, the methodology will multiply the parking demand rate by the total number of units in the project.

$$\textit{residential long-term parking demand rate per unit} = \frac{\text{(private residential neighborhood parking supply) +} \atop \text{(on- and off-street publicly accessible parking spaces)}}{\text{number of dwelling units in the neighborhood}}$$

To estimate the long-term parking demand for employees at non-residential uses, the methodology will multiply the total number of employees (based on employee density estimates) by work-related, non-for-hire vehicle automobile modal split and divide by vehicle occupancy estimates.

$$\textit{long-term parking demand for employees} = \frac{\text{(total number of employees) (work automobile modal split)}}{\text{vehicle occupancy estimate}}$$

To estimate the long-term parking demand for visitors at hotels, the methodology will multiply the total number of rooms by non-work, non-for-hire vehicle automobile modal split.

$$\textit{long-term parking demand for visitors} = \text{(total number of rooms) (non-work automobile modal split)}$$

To estimate the short-term parking demand for visitors at non-residential uses, the methodology will multiply the peak hour inbound, non-work person trips by non-for-hire vehicle automobile modal split and divide by vehicle occupancy estimates. To extent possible, the methodology should account for turnover rates.

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[4] People demand access to destinations. There is no inherent parking demand. While this memo includes estimates of parking demand, based on available data, it acknowledges many variables that could affect travel behavior.

[5] This data is available as part of the neighborhood parking rate for the TDM Program. The methodology should use the neighborhood parking supply most appropriate for the project proposed (i.e., single-family plus multi-family buildings versus multi-family buildings only).

[6] If the margin of error is limited, the methodology can use U.S. Census American Community Survey data regarding answers to the question, "How many automobiles, vans, and trucks of one-ton capacity or less are kept at home for use by members of this household?". The department will determine adequate margin of error on a case-by-case basis.

$$\textit{short-term parking demand for visitors} = \frac{\text{(peak hour inbound person trips) (non-work automobile modal split)}}{\text{vehicle occupancy estimate}}$$

To estimate parking demand for other types of land uses, the methodology can use different sources. These sources, in order of preference, include recent observed data at sites with uses and area characteristics like the project in San Francisco, the Bay Area, or California or nationally recognized transportation engineering materials.

To estimate the parking demand of a mixed-use project, use a combination of the methodologies outlined above, as appropriate. For example, to estimate the parking demand of a project that includes residential and office uses, the methodology will combine the residential parking demand with that of the office uses, if the demand occurs during the same time periods.

Many of the above methodologies rely on travel demand data. Typical site-specific travel demand methodologies account for multiple variables that affect travel to and from a site and whether people choose to drive and park at a site.[7] However, four variables often not accounted for in determining the parking demand in site-specific travel demand methodologies (non-residential) nor the neighborhood parking rate/availability methodology (residential) are the availability and pricing of parking, size of dwelling units (number of bedrooms), and demographics. Therefore, the methodology should, to the extent substantial evidence is available, account for these variables for revising the parking demand estimates derived using the above methodologies.

After determining the parking demand, distribute and assign the project's vehicle trips to the project's parking facility. For any unmet on-site parking demand, assign estimated vehicle trip routing to the project site prior to distributing to nearby on-street or off-street publicly accessible parking facility(ies).[8] [text, figure]

<u>Demand versus Supply</u>

Assess to the extent applicable, including accounting for time-of-day restrictions, demand-responsive pricing, and overlap of demand for mixed uses:

- The ability of on-site parking facilities to accommodate the parking demand [text, table]
- The location of the project in relation to on-street and off-street publicly accessible parking facilities [text, figure]

For unmet on-site parking demand, the ability of on-street or off-street publicly accessible parking facility(ies)[9] in the study area to conveniently accommodate the parking demand [text, figure, table]

---

[7] Variables that affect travel behavior include density, diversity of land uses, design of the transportation network, access to regional destinations, distance to high-quality transit, development scale, demographics, and transportation demand management. Source: Institute of Transportation Studies, *California Smart-Growth Trip Generation Rates Study*, Appendix A, March 2013.

[8] If the project proposes valet operations to an off-site private parking facility, then the methodology should account for that facility, too.

[9] *Ibid*. The department will only use the off-site parking facility as it relates to vehicle trip assignment and for parking demand versus supply analysis. The department will not evaluate impacts of an existing principally permitted parking facility because the department does not have discretion to affect the environmental outcomes of that existing condition. The department also does not require documentation of private agreements between the project and the off-site parking facility.

<u>Potentially Hazardous Conditions</u>

Use the existing conditions, including of geographic areas with similar characteristics, as that would exist with implementation of the project, travel demand analysis, and demand versus supply analysis to determine if the project would potentially cause secondary parking impacts. The methodology should assess to the extent applicable:

- The potential for unmet parking demand to occur within sidewalks or crosswalks, bicycle facilities, or travel lanes [text]
- The number of people walking, bicycling, or driving in the respective facilities [text, figure]
- The sightlines and speed of vehicle trips in relation to the travel lanes [text]

<u>Accessibility</u>

Use the existing conditions, including of geographic areas with similar characteristics as that would exist with implementation of the project, travel demand analysis, and demand versus supply analysis to determine if the project would potentially cause secondary parking impacts. The methodology should assess to the extent applicable

- The potential for unmet parking demand to occur within sidewalks or crosswalks, bicycle facilities, red color curb zones, or travel lanes [text]
- The number of people walking, bicycling, or driving in the respective facilities [text, figure]
- The ability of emergency service operator facilities near the project site to conduct operations that could interact with unmet parking demand [text]

<u>Public Transit Delay</u>

Use the existing conditions, including of geographic areas with similar characteristics as that would exist with implementation of the project, demand versus supply analysis, and project elements to determine if the project would potentially cause secondary parking impacts. The department provides examples of some of the circumstances that may result in potential delays to public transit in the public transit memorandum of these guidelines. The methodology should assess to the extent applicable:

- The potential for unmet parking demand to occur within travel lanes used by public transit [text]
- The potential, as a result of unmet parking demand, for people regularly driving their vehicles for extended periods of time looking for parking
- The location of the project in relation to public transit facilities and amount of public transit service at those facilities [text, figure]

Existing Baseline

Refer to the guidelines for direction on including existing baseline in transportation studies.

Impact Analysis

This section ties the project description, methodology, and existing baseline together to address the significance criteria for existing plus project conditions. This section addresses the typical approach for the impact analysis and provides more details related to parking impacts. The impact analysis section should present a format (text, figure, or table) consistent with earlier sections of this memorandum for easy comparison. Refer to the guidelines for direction on what to typically consider when conducting the existing plus project impact analysis and how to present the findings.

Demand versus Supply

The first step in the analysis is to determine whether the project would accommodate the anticipated parking demand during the peak periods and, if not, whether study area parking facilities can accommodate the anticipated parking demand. Calculate parking demand throughout the average peak period. If the project does not meet the demand at the project site or study area parking facilities, then determine if the parking deficit is substantial. The following examples are some of the circumstances that may result in a substantial parking deficit. These circumstances also depend on the context of the project's size, location, and other site-specific considerations. This is not an exhaustive list of circumstances, under which, a project would result in a substantial parking deficit:

- The site is not well-served by multiple other ways of travel (e.g., bicycle, public transit, for-hire vehicles)
- The site itself or surrounding area is not dense enough to support neighborhood-serving uses that people walking can access (e.g., lack of sidewalks; large blocks; wide, high-speed roadways)
- The site or surrounding does not use demand-responsive pricing to manage demand

If the project would not result in a substantial parking deficit, then the analysis is complete.

If the project does result in a substantial parking deficit, then the impact analysis must address whether the project would create secondary effects from parking, such as potentially hazardous conditions for people walking, bicycling, or driving (e.g., as a result of vehicles blocking facilities used by people), whether the project would interfere with accessibility (e.g., as a result of vehicles blocking facilities used by people walking and bicycling), and the project would result in public transit delay. The subsections below provide specific examples of the types of circumstances that could potentially result in a hazardous condition impact or accessibility impact under existing plus project conditions.

Potentially Hazardous Conditions

The department provides examples of some of the circumstances that may result in potentially hazardous conditions associated with different ways people travel (e.g., people walking, bicycling or driving) in the applicable transportation topic memorandum of these guidelines. The following examples are some of the additional non-exhaustive list of circumstances that could result in potentially hazardous conditions that the department did not list in the other memorandums:

- A project would result in a substantial amount of parking in sidewalks or crosswalks, or bicycle facilities used by a substantial number of people walking or bicycling (e.g., based on counts or projections), respectively;
- A project would result in a substantial amount of parking in travel lanes on a slope that may obstruct sightlines used by a substantial number of people driving (e.g., based on counts or projections.

Accessibility

The department provides examples of some of the circumstances that may result in interference with accessibility in the applicable transportation topic memorandum of these guidelines. The following examples are some of the additional non-exhaustive list of circumstances that could result in potentially hazardous conditions that the department did not list in the other memorandums:

- A project would result in a substantial amount of parking in sidewalks or crosswalks, or bicycle facilities used by a substantial number of people walking or bicycling (e.g., based on counts or projections), respectively
- A project would result in a substantial amount of parking in red color curb zones that are designated for emergency service vehicle access
- A project would result in a substantial amount of parking in travel lanes without adequate space for emergency service vehicles to pass the parked vehicles as a result of street width or a substantial number of people driving in the oncoming travel lane (e.g., based on counts or projections)

Public Transit Delay

Below is a non-exhaustive list of circumstances that could result in public transit delay that are not provided in the transit memorandum.

- A project would result in a substantial amount of parking in travel lanes used by a substantial number of people taking public transit (e.g., based on Muni service type designation)
- A project would result in in a substantial number of people regularly driving their vehicles looking for parking for extended periods of time on streets with a substantial number of people taking public transit (e.g., based on Muni service type designation)

CUMULATIVE

Methodology

The guidelines detail the typical methodology for cumulative analysis, including the geographical area, period, cumulative projects, and adjustments (refer to Appendix B) The cumulative section in transportation studies must present (text, figure, or table) the applicable elements included in the methodology.

Impact analysis

This section ties the methodology and description of cumulative conditions together to address the significance criteria for cumulative conditions. Refer to the guidelines for direction on what to consider when conducting the cumulative impact analysis and how to present the findings. The same examples of the types of circumstances that could result in a potential hazardous condition impact or public transit delay that were provided for existing plus project conditions apply here, except for cumulative conditions.

Demand versus Supply

The first step in the cumulative analysis is to determine whether the project, in combination with reasonably foreseeable cumulative projects, would accommodate the anticipated parking demand during the peak periods and, if not, whether study area parking facilities can accommodate the anticipated parking demand. If the projects do not meet the demand at the project sites or study area parking facilities, then determine if the parking deficit is substantial. The same examples as provided for existing plus project conditions apply here, except for cumulative conditions.

If the cumulative projects would not result in a substantial parking deficit, then the analysis is complete.

Potentially Hazardous Conditions, Accessibility and Public Transit Delay

If the project does result in a substantial parking deficit, then the impact analysis must address whether the project would create secondary effects from parking. The department provides examples of some of the circumstances that may result in potentially hazardous conditions associated with different ways people travel (e.g., people walking, bicycling, driving, or riding transit) in the applicable transportation topic memorandum of these guidelines and under the Existing plus Project and Cumulative Impact Analysis subsections.

OTHER

The guidance provided in this memorandum assumes a land use development project located outside of an area plan that requires a transportation study. This section describes the type of additional or different information that may be necessary to address vehicular parking impacts for the following circumstances: land use development project located within an area plan, an area plan, or infrastructure project (which may be located in a different county than San Francisco). In addition, this section describes the extent to which a code compliance analysis and/or a discussion of policy inconsistencies may be necessary.

Land Use Development Project Located within an Area Plan

For projects that are consistent with an area plan for which an environmental impact report (EIR) was certified, pursuant to CEQA Guidelines section 15183, the assessment must limit its analysis to such conditions specified in that section. The guidelines provide direction on how to analyze a land use development project in an area plan and lists area plan EIRs that have been certified as of February 2019. The department will list parking-related mitigation and improvement measures from future area plan EIRs in Vehicular Parking Memorandum Attachment B after the Planning Commission or Board of Supervisors certifies those EIRs.

Area Plans

For area plans, the assessment will typically use the significance criteria and screening criteria identified herein. The following subsections describe the type of additional or different information that may be necessary to address parking impacts for project description, methodology, and impact analysis. For area plans that also include infrastructure changes (e.g., street redesigns), please see the Infrastructure Project subsection for additional or different information that may be necessary.

Project Description

Typically, the department conducts an analysis to estimate the amount of future development that could occur in the plan area as a result of its implementation. The department typically does not have all the project description details described herein. However, the project description may include policies that may relate to the methodology and impact analysis (e.g., parking maximum limits, transportation demand management).

Methodology

The assessment will typically use the same methodology identified herein and in the guidelines, except the methodology will use a larger geographical study area and require less site-specific information (e.g., parking spaces at each site) except to document circumstances where vehicles may not be allowed (e.g., no parking). While an individual project may not require some elements listed in the Existing and Existing plus Project Methodology subsection, area plans typically will include all of these elements.

Impact Analysis

For analysis of area plans, assess the projected amount of growth and infrastructure changes associated with the rezoning within the area plan boundaries. The analysis of demand versus supply and the secondary impacts of potentially hazardous conditions, accessibility, and public transit delay should be similar to that described under the Existing plus Project and Cumulative Impact Analysis subsections. Examples of circumstances that would result in significant impacts are described under the Existing plus Project Impact Analysis subsection.

Infrastructure Project

For infrastructure projects (e.g., new roads, bridge repair, sewer line, rail service, roadway modifications, etc.), the assessment of the project description, significance criteria, and impact analysis should be similar to private development projects. The analysis typically does not require parking demand analysis as infrastructure projects usually do not generate trips.[10] However, some infrastructure projects may induce parking demand, such as the new public building or public transit facility not located within a transit priority area.[11] In addition, infrastructure projects may generate short-term trips due to construction workers and vehicles accessing the project site.

Project Description

The project description must describe the typical physical, additional physical, and programmatic features for existing and project conditions, as applicable. The project description must provide the geographic boundaries of the project and street cross sections.

Methodology

The assessment will typically use the same methodology identified herein and in the guidelines, except the methodology will pay particular attention to proposed closures and rerouting.

Impact Analysis

The analysis of potentially hazardous conditions should be similar to that described under the Existing plus Project and Cumulative Impact Analysis subsections.

<u>Demand versus Supply</u>

Infrastructure projects are unlikely to generate a parking demand, as they typically are not associated with a land use change or growth inducement and would not generate trips. However, should the infrastructure project generate trips or remove parking, the first step in the analysis is to determine whether the infrastructure project would accommodate the anticipated parking demand and, if not, whether the study area on or off-street parking can accommodate the anticipated parking demand. If the project does not meet the demand at the project sites or study area parking facilities, then determine if the parking deficit is substantial. The same examples as provided for under the Existing plus Project Impact

[10] Governor's Office of Planning and Research, *Revised Proposal on Updates to the CEQA Guidelines on Evaluating Transportation Impacts in CEQA*, January 20, 2016.

[11] Generally, minor transportation projects would not result in additional parking demand. Examples include, but are not limited to, rehabilitation, maintenance, and repair of transportation infrastructure; installation, removal or reconfiguration of non-through traffic lanes and traffic control devices; removal of through lanes; installation of traffic calming measures and wayfinding; removal of on- or off-street parking. Governor's Office of Planning and Research, *Technical Advisory on Evaluating Transportation Impacts in CEQA*, November 2017.

Analysis subsection apply here. The following example is an additional circumstance that could result in a substantial parking deficit that the department did not list above:

- a project would permanently remove a substantial number of parking spaces in a location without convenient parking facilities and multiple ways for people to travel to and from the study area (e.g., public transit, walking, bicycling, for-hire vehicles).

If the project would not result in a substantial parking deficit, then the analysis is complete.

Potentially Hazardous Conditions, Accessibility and Public Transit Delay

If the project does result in a substantial parking deficit, then the impact analysis must address whether the project would create secondary effects from parking. The department provides examples of some of the circumstances that may result in potentially hazardous conditions, interfere with accessibility, or result in public transit delay associated with different ways people travel (e.g., people walking, bicycling, driving, or riding transit) in the applicable transportation topic memorandum of these guidelines and under the Existing plus Project and Cumulative Impact Analysis subsections.

ATTACHMENT A

Mitigation and Improvement Measure Examples

The following list includes the typical types of measures that can mitigate or lessen parking impacts:

Reduction in Existing Parking Supply (Demand Versus Supply)

» Contribute equipment or funds to SFpark program to implement systems at parking facilities for entire study area that include the use of parking meter technology (e.g., demand-based pricing), vehicle sensors, dynamic signs (e.g., denoting available supply of parking), a central management system, and a real-time parking guidance system.

» Implement transportation demand management measures not already required by the Planning Code but listed in the Transportation Demand Management Program Standards such as:

a. Parking pricing, particularly demand-based pricing
b. Unbundle parking spaces in non-residential development
c. Parking cash-out
d. Delivery services
e. Delivery amenities

» Increase density at the project site so that it is more feasible for San Francisco or other service entities to provide more ways of travel (e.g., increased public transit service)

» Provide neighborhood-serving uses (e.g., retail) and amenities that people walking can access (e.g., by providing sidewalks; reducing block length; reducing intersection crossing distances)

» Establish or become part of an existing shared parking agreement. For example, multiple land uses would share parking at existing facilities through an agreement among private lot and property owners (e.g., users from other uses and buildings would park off-site).

Potentially Hazardous Conditions, Accessibility, and Public Transit Delay

» See demand versus supply measures above

» Add physically separated bicycle or transit facilities

» Add passenger loading zones

» Fund increased parking control officers (on-going)

» Refer to other memos for additional measures

Street widening and new on-street parking spaces are mitigation measures that may be technically feasible, but are generally considered undesirable.

The department may consider the creation of new parking spaces only after investigating the aforementioned measures that more effectively manage parking demand.

TRANSPORTATION IMPACT ANALYSIS GUIDELINES

APPENDIX P
SUPPLEMENTARY GUIDANCE

SEAL OF THE CITY AND COUNTY OF SAN FRANCISCO

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Appendix P
Supplementary Guidance Memorandum

Date:	February 14, 2019
To:	Record No. 2015-012094GEN
Prepared by:	Elizabeth White
Reviewed by:	Wade Wietgrefe
RE:	**Transportation Impact Analysis Guidelines Update, Supplementary Guidance**

INTRODUCTION

This memorandum provides supplementary guidance for situations that may occur during the development of a project's transportation analysis. The memorandum is intended as supplementary guidance already provided in the California Environmental Quality Act (CEQA) and the San Francisco Planning Department's Transportation Impact Analysis Guidelines and Environmental Review Guidelines. Situations are provided below along with information for how to address.

The organization of the memorandum is as follows:

1) Existing Land Use/Trip Credits
2) Near-term Baseline
3) Cumulative
4) Identification of Mitigation Measures
5) Alternatives
6) Variants
7) Compliance/Informational Analysis
8) Changes to Guidelines
9) Uncertainties

1. EXISTING LAND USE/TRIP CREDITS

Pursuant to the guidance outlined below, it is sometimes appropriate to use trip credits in a transportation analysis. Trip credits should generally be based on actual observed data (e.g. counts and intercept surveys), not on guidelines rates and mode splits. The department should confirm all trip credits prior to collection of data. Net new trips would be derived as follows:

Calculate additional trips for the project (for daily and p.m. peak hour)
– existing observed trips (from actual counts)
= net new trips

Some cases may warrant taking trip creates for historic conditions. Pursuant to CEQA Guidelines section 15125, the lead agency may define existing conditions by referencing historic conditions or conditions expected when the project becomes operational, or both, that are supported with substantial evidence. The intent is to provide the most accurate picture possible of the project's impacts when it becomes operational.

Use of trip credits for historic conditions must be developed and documented in consultation with the department.

The following general categories are intended to provide guidance regarding trip credit application:

> *Commercial:* For project sites that are not vacant or were occupied until recently, adjustments to calculated daily and p.m. peak hour project-generated additional person trips may be made to account for the existing activities on the project site. Whenever feasible, any such adjustment should be based on conducting counts of actual existing commercial trip-making at the project site per specific direction from department staff. Unless surveys of existing modal splits and distributions are available or conducted, appropriate modal splits and distributions should be applied for the geographic area in which the project site is located in order to estimate net changes for each mode (e.g. vehicles, transit, walking, or other). Whenever it would be impractical to conduct actual counts of existing commercial trip making activity at a project site, procedures for estimating and netting out existing trips shall be developed in consultation with department staff.
>
> Note that that any net new expansion of the existing commercial use under a project shall not be given trip credit.
>
> *Residential*: Applying trip credits for residential uses may be appropriate if a project proposes to remove existing residential uses. In cases of existing or recently discontinued residential uses proposed to be replaced by any type of new project, department residential trip rates and appropriate modal split/distribution census tract data based should be applied to estimate existing trips. Net new trips should, in turn be derived by subtracting existing trips from new trips estimated to be generated by the project.
>
> Note that any net new expansion of the existing residential use (measured in terms of bedrooms per dwelling units) shall not be given trip credit.
>
> *Parking*: If a project proposes to replace an existing or recently discontinued parking facility, netting out existing trips linked to the parking facility is generally not appropriate. Some exceptions to this rule may be in circumstances when a project would replace the underlying land use which accounts for users of the associated parking facility, or for the situations described in the vehicular parking and vehicle miles traveled memoranda related to accounting for variables such as site-specific transportation demand management measures.

The department acknowledges that circumstances may arise that do not fit into one of the aforementioned categories; in these cases, you should consult early with the department. Refer to Attachment A for examples of project analyses which have applied trip credits.

2. NEAR-TERM BASELINE

In some circumstances, it may be appropriate to analyze a near-term (also known as adjusted, future, or modified) baseline[1] as the existing plus proposed project impact analysis may not accurately reflect the conditions that will exist at the time the project's impacts actually occur. Therefore, an existing plus project analysis could be misleading or without informative value to the public and decision makers and analyzing a future baseline is warranted to clearly facilitate understanding of the project's impacts.

At the time analysis commences, near-term baseline conditions shall only include development or infrastructure projects that are under construction; or infrastructure projects that are approved (defined as obtaining all relevant approvals by governing entities/bodies) <u>AND</u> funded. For cases where projects are approved <u>AND</u> partially funded, the planning department will determine on case-by-case basis if analysis of a near-term baseline is appropriate. Examples of circumstances for applying a near-term baseline include projects that need to reflect designs of roadway restriping and curb modification projects or under construction development driveway locations. As a point of clarification, analysis of a near-term baseline is a different than cumulative scenario. A cumulative scenario analyzes a combination of the proposed project and the impacts of other projects. A near-term baseline analysis addresses the project's operational impacts alone, assuming the completion of another project.

If using a near-term baseline, the transportation analysis requires a description of existing conditions. The near-term baseline conditions section must list the development projects and infrastructure projects included in the near-term baseline conditions and explain the rationale for using the near-term baseline condition. The section then must describe the anticipated near-term baseline conditions by transportation topic (e.g., walking, bicycling, public transit[2]), using reliable projections to the extent applicable, if the conditions will change between existing and near-term baseline conditions. The impact analysis will then use the near-term baseline conditions for a comparison of project impacts, as opposed to existing conditions. Refer to Attachment B for examples of project analyses which used a near-term baseline condition.

3. CUMULATIVE

Refer to methodology – cumulative in the transportation impact analysis guidelines for a discussion regarding the typical cumulative methodology. As described there, for future year VMT estimates, traffic volumes, and transit service and ridership, the methodology typically relies on projections of travel demand model outputs, such as the San Francisco County Transportation Authority San Francisco chained activity modeling process. Attachment C of this memorandum includes the documentation (e.g., model inputs) for prior modeling versions. The department will update the attachment as new documentation becomes available for future modeling versions, typically every one to four years (i.e., frequency of major new area plans or projects). For those topics that rely on modeling outputs, the cumulative methodology should cite to the relevant prior modeling version instead of describing inputs in detail.

---

[1] Projects currently undergoing construction at the start of environmental analysis are considered part of the project's existing condition and full buildout of the project should be assumed as part of the near-term baseline condition.

[2] The near-term baseline condition should use the latest SFMTA fleet plan for assumptions regarding transit service by applicable near-term baseline year.

Also described in the methodology – cumulative in the transportation impact analysis guidelines, the cumulative methodology must still adjust future year projections, street conditions, or volumes based on reasonably foreseeable projects, typically using a list-based approach, to the extent applicable. The methodology must document rationale for adjustments and describe changed conditions, in consultation with the department.

4. IDENTIFICATION OF MITIGATION MEASURES

If a project results in a significant impact, the analysis must identify if feasible[3] mitigation measures exist to reduce impacts. The identification of transportation mitigation measures may involve several steps. The steps must follow CEQA Guidelines section 15126.4(a) and explore, in order, the various types of mitigation defined in CEQA Guidelines section 15370 to the extent applicable. As avoidance and minimization mitigation measures are the most common types of mitigation measures, the following is limited to those types.

The analysis must determine if the project can avoid the impact altogether (e.g., by relocating a driveway). If the impact can be avoided and if the feature is inherent to the project for which the sponsor agrees to implement, the sponsor can update the project description to include this feature. The impact analysis will then reflect the revised project and the analysis will not require mitigation measures.

If the project cannot avoid the impact through implementation of a feature[4] or the avoidance does not reduce the impact to less-than-significant levels, then the analysis must identify mitigation measures that minimize impacts. Sometimes implementation of mitigation measures falls under the jurisdiction or purview of governmental agencies other than the department (e.g., San Francisco Municipal Transportation Agency (SFMTA) or California Department of Transportation (Caltrans)), requires the approval of private stakeholders, or requires more detailed design/engineering that may come at a later phase. Examples of such measures include the design and construction of crosswalk signals to mitigate a potentially hazardous condition for people walking, or funding of transit enhancements to mitigate substantial delays to public transit.

Feasible mitigation measures only reduce significant impacts if all parties responsible for the mitigation measure can commit to the implementation of the measure. If the analysis shows that for some reason the implementation of the mitigation measure is uncertain or some of the parties cannot commit to their implementation (e.g., another government entity cannot commit funding), then the impact must remain significant.

As it relates to mitigation measures, the analysis must follow steps 2 through 4 described under impact analysis – existing plus project, construction in the transportation impact analysis guidelines.

If a measure(s) cannot reduce impacts to less-than-significant levels, describe the extent to which the measure does minimize the impacts. In addition, identify other mitigation measures, if available, summarize the process for evaluating those other measures and the reasons for adopting or rejecting them.[5]

---

[3] Pursuant to CEQA Guidelines section 15364, "feasible" means capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social and technological factors.
[4] To the extent applicable, the alternatives chapter in an environmental impact report should include this feature or document the reasons for its rejection in the alternatives considered but rejected section.
[5] *Ibid.*

In some instances, the department may request a standalone transportation mitigation measures memorandum. That memorandum will include the same information as included in the analysis, but with more detail. The department may require another government agency to review or prepare the memorandum. Preparation and review of this memorandum may lengthen the transportation review process. Circumstances where the department may request a memorandum include, but are not limited to:

- A mitigation measure could reduce significant transportation impacts, but it is rejected by the city or sponsor as infeasible. The department may request a memorandum if the rejection requires extensive documentation that the analysis can summarize.
- A mitigation measures requires substantial quantitative analysis that the analysis can summarize (e.g., to show whether the measure reduces impacts or has impacts of its own).

Refer to Attachment D for an example of a sample transportation mitigation measures memorandum.

Upon adoption of mitigation measures, the department will forward final applicable measures to the SFMTA and maintain a database of adopted mitigation measures. Refer to changes to guidelines below regarding the process for removing adopted mitigation measures.

5. ALTERNATIVES

CEQA only requires alternatives in environmental impact reports (EIRs). Alternatives to the project must feasibly attain most of the basic objectives of the project, but would avoid or lessen the project's potentially significant physical environmental impacts (CEQA Guidelines section 15126.6). In some circumstances, an EIR may analyze alternatives at equal level of detail (e.g., joint CEQA/National Environmental Policy Act document). In most circumstances, EIRs include an alternatives chapter. The chapter shall describe the approach to developing and conducting an initial assessment of the potential feasibility of alternatives, including those considered but rejected, and enough information about each alternative to allow meaningful evaluation, analysis, and comparison with the project.

For projects with significant and unavoidable transportation impacts, the department may request a standalone transportation alternatives memorandum. That memorandum will include the same information as included in the alternatives chapter, but with more detail. The department may require another government agency to review the memorandum. Preparation and review of this memorandum may lengthen the transportation review process. Circumstances where the department may request a memorandum include, but are not limited to:

- An alternative could reduce significant transportation impacts, but it does not meet most of the basic project objectives or is rejected by the city or sponsor as infeasible. The department may request a memorandum if the rejection requires extensive documentation that the EIR chapter can summarize.
- An alternative requires substantial quantitative analysis that the EIR chapter can summarize.
- Several potentially feasible alternatives, including alternatives prepared to reduce other environmental topics, require analysis.

The format of the alternatives analysis can vary[6], but should primarily focus on significant transportation impacts caused by the project. If the project did not result in a significant transportation impact for a topic, then the alternatives analysis should be limited for that topic. If an alternative has the potential to result in a significant transportation impact for a topic that the project did not have a significant impact, then the alternatives analysis will require a robust discussion.

Example 1

Follow this example when impact determinations are the same across a transportation topic:

> *VMT Impacts*
> Impact TR-5: Operation of both alternatives would not cause substantial additional VMT or substantially induce automobile travel. (*Less than Significant)*
>
>> Alternative 1: Describe the impacts of alternative 1 and how it is similar as the project.
>>
>> Alternative 2: Describe how the impacts of alternative 2 would be similar as alternative 1 and the project.

Example 2

Follow this example when impact determinations are not the same for a transportation topic:

> *Loading*
> Impact TR-6 (Alternative 1): Operation of alternative 1 would result in a loading deficit and the secondary effects would create potentially hazardous conditions for people bicycling. *(Significant and Unavoidable with Mitigation)*
>
>> Alternative 1: Explain why alternative 1 would result in a significant loading impact, whereas the project would not.
>
> Impact TR-6 (Alternative 2): Operation of alternative 2 would not result in a loading deficit. *(Less than Significant)*
>
>> Alternative 2: Describe the impacts of alternative 2 and how it is similar as the project.

6. VARIANTS

A variant modifies limited features or aspects of a project. Examples of variants include different driveway locations, different commercial loading locations (e.g., off-street vs on-street), or a change in the number of vehicular parking spaces. The intent of a variant is to vary a project design feature or aspect and typically not to reduce a significant impact under CEQA. Circumstances where studying a variant may occur include, but are not limited to:

- uncertainty regarding City approvals (e.g., on-street loading)
- requests from neighborhood groups/organizations
- a need to inform project circulation impacts (e.g., noise impacts related to vehicles)
- uncertainty regarding construction methods or phasing

[6] Some alternatives chapters may group impact analysis by alternative or by impact topic. The examples shown below assume the latter format.

The project description must describe the differences between a variant and the project. If there is no difference in the impacts between the variant and the project, the transportation analysis should note this. If there are differences in impacts between the variant and the project, the transportation analysis must disclose these differences.

Example 1

Follow this example for each topic area when there are no differences in the analysis between the project and variant:

VMT Impacts

> Impact TR-5: Operation of the project and variant would not cause substantial additional VMT or substantially induce automobile travel. *(Less than Significant)*
>
> Both the proposed project and variant would not cause substantial VMT because….

Example 2

Follow this example for each topic area when there is a difference in the analysis between the project and variant:

Loading Impacts

> Impact TR-6: Operation of the project and variant would not result in a loading deficit. *(Less than Significant)*
>
> Both the project and variant would not result in a loading deficit. However, due to the difference in the loading locations between the two proposals, the following presents project and variant impacts separately.
>
> > Project
> >
> > Variant

Instead of the above format, a separate section or chapter in the analysis could describe in more detail than that in the project description and analyze the impacts of the variant(s) in one location.

7. COMPLIANCE/INFORMATIONAL ANALYSIS

Transportation studies should not include topics unrelated to a project's CEQA analysis (refer to Attachment E for further guidance on compliance/informational topics). The following provides guidance for the appropriate location and if applicable, reviewing entities besides Planning Department staff, for non-CEQA related transportation topics:

> *SFMTA and other agencies coordination:* In some cases, SFMTA or other agencies may request and review non-CEQA related transportation analyses (developed by transportation consultants and paid for by the project sponsor). Examples of non-CEQA related transportation analyses include capacity utilization, station capacity constraints, automobile delay analysis, and parking surveys. Prior to undertaking the study, the project sponsor must provide a scope of work defining the purpose and parameters of the informational analyses to SFMTA and/or other relevant agencies. The transportation impact study should not include such analyses/supplemental reports as appendices/attachments to the transportation impact study, but instead such analyses/supplemental reports should become part of a project's file. Upon completion, these studies can be posted publicly or provided to interested parties (e.g., neighborhood groups).

Compliance with the Planning Code: The transportation impact study or CEQA document may include compliance with the San Francisco Planning Code as an appendix.

Summary of policies (belongs in CEQA chapter of Plans and Policies): The transportation impact study may summarize relevant local, state, and federal transportation plans and policies as an appendix and/or within the Plans and Policies section of an environmental impact report to the extent applicable.

Street Design Consistency: The transportation impact study may describe the project's design for the public right-of-way would be inconsistent with a reasonably foreseeable street design project or plan (e.g., driveway across a proposed bus stop or bicycle facility) as an appendix.

8. CHANGES TO GUIDELINES

This section describes the approach for determining applicability of revisions between the prior guidelines and this update for projects tiering off previous environmental determinations. Refer to the summary of changes memorandum for more details regarding changes between the prior guidelines and this update. Refer to the update process and style guide memorandum for determining applicability of revisions for ongoing transportation reviews.

Overall

If the revised project result in changes to the original project that would obviously not meet CEQA Guidelines criteria for additional environmental review (for example, under sections 15162 and 15183), then the analysis does not need to address the guidelines update changes. For example, if the revised project would result in the same or less vehicle or public transit trips than the original project, then the analysis does not need to address revised public transit delay threshold of significance.

Topics Removed

For this guidelines update, the department removed overcrowding on public sidewalks, public transit capacity utilization, and automobile delay as considerations for determining environmental impacts. For those removed topics, the transportation analysis should note that the topic is no longer discussed under the CEQA framework and cite the relevant decision or guidance document (e.g., state level legislation, Planning Commission Resolution, guidelines update), including the summary of changes memorandum. The transportation analysis should not discuss impacts associated with these removed topics. Separately, if the previous environmental determination included mitigation measures related to the now removed topic and those mitigation measures were included as conditions of project approval, the project sponsor should work with implementing agencies to determine mitigation measure applicability.[7]

Revisions and Additions

For this guidelines update, the department slightly revised significance criteria for several topics and the threshold of significance for public transit delay. In addition, the department added significance criteria for potentially hazardous conditions for public transit operations and vehicle miles traveled. For those topics, the analysis should follow the following steps:

1) note the revisions and additions and cite the relevant decision or guidance document, including the summary of changes memorandum
2) explain the revisions and additions
3) conduct a revised project specific analysis using the revisions and additions in comparison to the original project

[7] For example, the project sponsor may request a letter from the SFMTA to the Planning Department requesting releasing the sponsor from past, no longer applicable mitigation measure requirements.

4) explain whether the revised project (or proposed project change) would meet CEQA Guidelines criteria for additional environmental review

9. UNCERTAINTIES

The department acknowledges the dynamic nature of the transportation network and the variety of transportation modes that have emerged in recent years. The department consulted with other transportation agencies and expert transportation analysts to ensure the sufficiency, adequacy, and accuracy of the information, methodology, and data collection efforts used to develop this guidelines update. While future technological changes, socioeconomic forces, etc. may change travel demand estimates, the department relied on the best available information to inform the guidelines at the time of preparation.

Pursuant to CEQA Guidelines section 15144, preparation of environmental analysis involves some degree of forecasting. While foreseeing the unforeseeable is not possible, the department did for this update and will in its future make its best efforts to find out and disclose all that it reasonably can regarding uncertainties that may affect transportation analysis.

This may be qualitatively accomplished by describing the existing documentation and information available about a specific topic area (e.g. Transportation Network Companies, etc.) as it relates to a specific project. The department may request the transportation analysis to provide a summary of the key findings from recent literature or studies in the transportation analysis. Pursuant to CEQA Guidelines section 15145, if a lead agency finds that a particular impact is too speculative for evaluation, the agency should note its conclusion and terminate discussion of the impact.

ATTACHMENT A

Existing Land Use Trip Credits

Relevant excerpts from the following project are included in this attachment.

Commercial Land Use Trip Credit Example:
San Francisco Planning Department. 30 Otis Transportation Impact Study. Case No. 2015-010013ENV.

3.1.2 Ballet School

City Ballet School travel demand was based on observations of existing peak hour travel pattern. Person count data was collected at the main entrance of the Ballet School at the rear of the building on Chase Court and the secondary entrance located at 32 Otis Street. There were a total of 63 person trips recorded at the main entrance and zero trips recorded at the 32 Otis Street doorway during the PM peak hour between 5:00 PM and 6:00 PM. Subsequent discussion with the Ballet School manager confirmed that the doorway on 32 Otis Street is seldom used. The observed person count data is summarized in **Table 3-3**.

Table 3-3: Ballet School Existing and Future Person Trip Generation – PM Peak Hour

Doorway Location	In	Out	Total
Chase Court (Main Entrance)	26	37	63
32 Otis Street (Secondary Entrance)	0	0	0
Existing Total	**26**	**37**	**63**
Future Total[1]	**39**	**56**	**95**
Net New Trips	**13**	**19**	**32**

Notes:
1. Assumes that a 50 percent increase in enrollment capacity would result in a 50 percent increase in PM peak hour trips.

Source: Fehr & Peers, 2017

The Proposed Project expands the existing Ballet School from four to six studios, theoretically increasing enrollment capacity by 50 percent. Through discussion with the Ballet School manager (documented in **Appendix Q)**, current enrollment does not reach the existing capacity of the school, indicating there is not latent demand for ballet class that is currently unmet. Since it is unknown what future enrollment would be, it would be reasonable to assume that future enrollment would scale up proportionally with studio capacity. Therefore, travel demand for the Ballet School portion of the Proposed Project during the PM peak hour is approximated to be a 50 percent increase over the existing travel demand, resulting in 95 trips generated by the Ballet School during the PM peak hour. The net new person trips generated by the expanded Ballet School would be 32 person trips, as shown in **Table 3-3**. A peak hour-to-daily factor was developed from ITE Code 520 (Elementary School), a land use that has similar trip generating characteristics to the Ballet School. Using this factor (daily trips = 4.6 * PM peak hour trips), the Ballet School would generate an estimated 147 net new person trips on a daily basis.

3.1.3 Trip Credit for Existing Land Uses

The Proposed Project would replace a mix of retail and commercial existing land uses, as detailed in **Table 1-1**, and therefore a trip credit was applied for these existing land uses. The trip credit was derived using observed data collected at the land uses on a typical weekday, combining auto driveway counts and person doorway counts. All the driveways are used to access auto-repair related services; therefore, a conservative average vehicle occupancy of one was used to convert auto trips to person trips. Person trip generation for existing land uses for the PM peak hour is presented in **Table 3-4**. During the PM peak hour, 20 person trips were generated by the existing land uses. The peak hour-to-daily factor for retail person trips from Table C-1 of the *SF Guidelines* (daily trips = 11 * PM peak hour trips) was used to estimate daily person trips. Using this factor, the existing land uses currently generate an estimated 200 person trips on a daily basis.

Table 3-4: Existing Land Use Trip Credit - PM Peak Hour			
Mode	**In**	**Out**	**Total**
Person Trips	2	10	12
Vehicle Trips[1]	3	5	8
Total Person Trips	**5**	**15**	**20**

Notes:

1. Average vehicle occupancy for predominant auto service uses was conservatively assumed to be one.

Source: Fehr & Peers, 2017

ATTACHMENT B

Near-Term Baseline

San Francisco Planning Department. 1500 Mission Street. Case No. 2014-000362ENV.

ATTACHMENT C

Cumulative (2040)

The following are example memorandums to document input assumptions for modeling 2040 conditions:

Better Market Street

The Hub and Civic Center

Better Market Street Example

San Francisco County Transportation Authority

1455 Market Street, 22nd Floor
San Francisco, California 94103
415.522.4800 FAX 415.522.4829
info@sfcta.org www.sfcta.org

Memorandum

DATE: 07.17.2015

TO: Better Market Street Team

FROM: Dan Tischler, Senior Transportation Planner, Technology, Data & Analysis, SFCTA

SUBJECT: DRAFT Input Assumptions for Better Market Street 2040 Baseline SF-CHAMP Model Run

Summary and Context

The purpose of this memo is to document inputs used in the SF-CHAMP 5.1 regional travel demand model for the purpose of modeling a 2040 Baseline Scenario to be used to evaluate the feasibility of implementing the Better Market Street project.

STUDY OVERVIEW

Market Street is a primary multi-modal corridor in San Francisco. The current design accommodates the demands of various modes of travel such as walking, bicycling, transit, and driving, but it falls well short of the potential of the street.

The Better Market Street project offers a special opportunity to envision a new Market Street. The goal of the project is to revitalize Market Street from Octavia Boulevard to The Embarcadero and reestablish the street as the premier cultural, civic and economic center of San Francisco and the Bay Area. The transportation system analysis will include blocks south and north of Market and Mission streets. The new design should create a comfortable, universally accessible, sustainable, and enjoyable place that attracts more people on foot, bicycle and public transit to visit shops, adjacent neighborhoods and area attractions.

This memo describes the 2040 Baseline Scenario. For brevity, this memo summarizes differences between the 2040 Baseline Scenario and the 2020 Baseline Scenario. See the memo titled "Input Assumptions for Better Market Street 2020 Baseline SF-CHAMP Model Run" (2020 Baseline Input Memo) for additional detail on the 2020 Baseline Scenario.

SCENARIO DESCRIPTION

The 2040 Baseline Scenario is designed to reflect projected baseline conditions in the San Francisco Bay Area in the year 2040. More detail is provided within the City of San Francisco than elsewhere in the San Francisco Bay Area and the scenario will be used for focused analysis of travel in the Better Market Street corridor.

LAND USE

2040 land use assumptions are derived from the Jobs-Housing-Connections projections developed by ABAG and MTC. While ABAG/MTC Jobs-Housing Connections Strategy Land Use numbers for population, employment, employed residents and jobs are used at a TAZ (close to Census Tract size) level of geographic granularity outside San Francisco, the San Francisco Planning Department (SF Planning) uses the ABAG/MTC Jobs-Housing Connections Strategy control totals to allocate base year land use data within San Francisco. SF Planning makes use of numerous commercial datasets to refine initial ABAG distribution within San Francisco.

The land use inputs are saved on a server at SFCTA at:

Y:\champ\landuse\p2011\SCS.JobsHousingConnection.Spring2014update\2040\runinputs_champ5parkingUpdate

TRANSPORTATION NETWORKS

This section discusses 2040 Baseline assumptions for transit, and assumptions for other San Francisco and regional road, and toll policy projects. The 2040 Baseline Scenario includes all transportation projects assumed in the 2020 Baseline Scenario, plus additional transportation projects expected to be implemented between 2020 and 2040.

ROAD NETWORK

Table 1 presents San Francisco street and road projects anticipated for completion between 2020 and 2040. SF-CHAMP also assumes regional roadway project implementation in accordance with the most recent Regional Transportation Plan.

Table 1: Roadway Projects in San Francisco Completed Between 2020 and 2040

Project	Description
Safer Market Street	• No turns allowed onto Market Street between 8th and 3rd Streets with the exception of southbound Jones Street onto westbound Market Street. • Streets, such as Mason or O'Farrell, will have required turns onto Turk and Grant respectively. • No left turn onto Market Street from southbound Hyde Street. • Commercial vehicles, transit, bicycles, and taxis would be exempt from these proposed turn restrictions. • The following turn restriction would apply to all vehicles: No right turn onto Grant Ave from Market Street.
Sixth Street	Between Market Street and Howard Street, convert four travel lanes to two travel lanes; add a new bicycle lane in each direction with sidewalks widened by 3 to 6 feet (3 to 4 feet at block corners and 6 feet along the block). Traffic signal cycle lengths would be increased from 60 to 90 seconds, and the offsets would be adjusted.

Polk Street	Between McAllister Street and Union Street, various changes will happen depending on location, including road diets, turn restrictions, and bicycle facilities.
Annie Street	• The existing mini-plaza at the intersection of Annie St and Market St will be expanded to Stevenson Street • Between Mission Street and Ambrose Bierce Alley, Annie Street would be closed to vehicular traffic and transformed into a new pedestrian plaza • The remainder of Annie St between the two plazas would retain vehicular traffic but be redesigned as a single-surface shared street
Treasure Island	Reconstruct Treasure Island street network per full build-out plan for Treasure Island
Transit Center District Plan	Road diets, transit facilities, and bike facilities consistent with the Transit Center District Plan
2nd Street Bike Lanes (Bike Plan) *BikePlan\2ndStreet*	Bike lanes on 2nd Street between Market and Townsend
5th Street Bike Lanes (Bike Plan) *BikePlan\5thStreet*	Bike lanes on 5th Street between Market and Townsend
16th Street	• Between Church and Bryant streets, create a side running transit-only lane in the westbound direction through lane conversion. • Between Bryant and Mississippi streets, create center-lane transit only lanes in both directions through lane conversion. • Between 7th/Mississippi and Third streets, create side running transit-only lane in both directions through lane conversion. • Along the length of the corridor, add traffic signals, add left turn restrictions, and add some left turn pockets.
Move Bike Lane from 16th to 17th (Bike Plan) *MoveBikeLaneFrom16thTo17th*	Move Bike Lane from 16th Street to 17th Street between Kansas and Mississippi
Brannan (Central SoMa) *CentralCorridor\Brannan*	Brannan St between 2nd and 6th, 1 auto lane and 1 protected cycletrack for each direction
Harrison/Bryant (Central SoMa) *CentralCorridor\Harrison_Bryant*	Harrison between 3rd and 6th, Bryant between 2nd and 6th, 4 travel lanes and 1 transit lane during Peak hours, 3 travel lanes and 2 parking lanes off-peak
Howard/Folsom One-Way (Central SoMa) *CentralCorridor\Howard_Folsom_OneWay*	Howard Lane reduction to 2 travel lanes(3 during peak), and protected bidirectional cycletrack; Folsom 2 travel lanes, 1 bus lane during peak and protected bidirectional cycletrack

3rd / 4th (Central SoMa) *CentralCorridor\Third_4th_st*	3rd St from King St to Market St, 4th from Market St to Harrison St, 3 auto lanes, 1 bike lane, 1 bus lane
Treasure Island Ramps *TI_Ramps*	Reconstruction and realignment of Treasure Island freeway ramps according to TI-TIP.
Masonic Boulevard Option *Fix_Masonic*	The Boulevard Option on Masonic between Geary and Fell, reducing travel lanes to 2 in both directions and eliminating additional peak-period lanes.
19th Avenue Corridor	Tier 4C projects from the 19th Avenue Corridor Study: • 19th Ave / Holloway Ave – add a fourth southbound lane • 19th Ave / Crespi Dr – fourth southbound lane will be extended and converted into a through-right into Crespi • 19th Ave / Junipero Serra Blvd – add a fourth lane for southbound right-turn onto Junipero Serra
Harney Way Rebuild *HarneyRebuild*	Harney expansion to 3-lanes WB, 2-lanes EB for 4 links north of the 101 interchange, plus BRT lanes & TSP North/East of Alana
Palou Transit Lane and Transit Signal Priority *TransitLaneTSP_Palou*	Transit Signal Priority and transit-only lane on Palou between Phelps and Fitch.
Geneva Transit Preferential Treatment	This section is the Geneva Four-Lane Option: two general-purpose lanes and one transit lane in each direction. (TEP transit treatment west of Santos: one general-purpose lane and one side-running transit lane.)
Geneva Extension	• Geneva will be extended over Tunnel Ave and the Recology site, with connections to US 101 ramps. • Two general-purpose lanes in each direction; three during the PM peak period. • Transit-only lanes • Class II bicycle facility • Two pedestrian bridges will connect Bayshore/Sunnydale and Bayshore/MacDonald with Tunnel Ave
Mission Transit Lane (TEP)	Side-running transit lanes on Mission between 11th to 16th St. Note: this project is included as a subset within the MUNI Travel Time Reduction Program (Project-level Expanded) project
Candlestick Point / Hunters Point Shipyard Street Grid Rebuild *Candlestick_HuntersPoint*	Rebuild of the street grid per the Candlestick Point / Hunters Point Shipyard Transportation Plan using the no-stadium variant. Includes separated transitways or center-running transit lane corridor for the 28L.
Candlestick Interchange Rebuild	• Geneva will extend under the US 101 to Harney Way • Between the Geneva Extension and Alana, two general-purpose lanes and one transit-only lane in each direction. • Between Alana and Harney, three general-purpose travel lanes in each direction • Alana becomes transit-only between Harney and Geneva • On/off ramps will be single-lane with no transit treatment
Yosemite Slough Bridge *Yosemite_Slough*	Transit, bike, and pedestrian bridge connecting Candlestick Point and Hunters Point Shipyard

REGIONAL TRANSIT NETWORK

Between 2020 and 2040, Caltrain, SMART, BART and WETA will each provide expanded services to new stations and terminals. Table 2 lists these projects.

Table 2: Regional Transit Agency Projects Completed Between 2020 and 2040

Project	Description
Caltrain DTX	Caltrain Electrification and Downtown Extension
Caltrain Electrification *Caltrain_Electrification*	Service increase resulting from Caltrain Electrification project.
SamTrans Caltrain Shuttle Frequency *Samtrans_ShuttleFreq*	Double the frequency of Samtrans' Caltrain shuttle.
WETA Expansion Phase 2 *WETA_Expansion_Phase2*	New ferry lines: Berkeley-SF, Hercules-SF, Redwood City-SF, Richmond-SF.
BART: Silicon Valley Phase 2	BART extended from Berryessa to Alum Rock, Downtown San Jose, Diridon, and Santa Clara
SMART: Larkspur to San Rafael	SMART - Extend SMART from San Rafael to Larkspur
SMART: Santa Rosa to Cloverdale	SMART - Extend SMART from Santa Rosa to Cloverdale

MUNI NETWORK

The MUNI transit network has several planned service expansions and improvements scheduled for the period between 2020 and 2040. Table 3 summarizes projects assumed in the SF-CHAMP 2040 Baseline Scenario.

Table 3: MUNI Transit Projects to be Completed Between 2020 and 2040

Project	Description
19th Avenue Corridor (M Ocean View split service)	Tier 4C Transit projects from the 19th Avenue Corridor Study: • M Ocean View realignment o Diverts into Parkmerced at 19th Ave / Holloway Ave o Relocate SFSU station into Parkmerced o Two new Parkmerced stations o Split tracks in Parkmerced and split end-of-line service between Parkmerced and Balboa Park BART
Travel Time Reduction Program (Programmatic Expanded) *Muni_TTRP\ProgrammaticExpanded*	Muni TEP: Travel Time Reduction Program, Expanded level (programmatic)
Travel Time Reduction Program (Project-level Expanded)	Muni TEP: Travel Time Reduction Program, Expanded level (project-level)

Muni_TTRP\ProjectLevelExpanded	
Treasure Island	Increased line 25 service, new line 109, and ferry service to the Ferry Building
AC Transit Treasure Island Service *AC_TI*	AC Transit Service to Treasure Island
Geary Bus Rapid Transit *Muni_GearyBRT\LPA*	Geary Side-Running BRT west of 25th Avenue and east of Stanyan, and Center-Running BRT between 25th and Stanyan.
Candlestick Point Express *Muni_CPX*	Express bus service between Downtown/SoMa and Candlestick Point
Hunters Point Express *Muni_HPX*	Express bus service between Downtown/SoMa and Hunters Point.
Candlestick Point/Hunters Point Shipyard Muni Extensions *Muni_CSP_HP_LineExtensions*	Extensions of 24-Divisadero, 23-Monterey, 44-O'Shaughnessy, 48-Quintara, and 29-Sunset into Candlestick Point and Hunters Point Shipyard neighborhoods
Parkmerced Shuttles *Parkmerced_Shuttle*	Free shuttle service between Parkmerced and Daly City BART, and between Parkmerced and nearby shopping centers.
Muni F to Fort Mason	Extend F Line to Fort Mason
T-Third Extension to Caltrain	The T-Third will be extended from Sunnydale to Bayshore Caltrain Station
16th St BRT	Realignment of the 22-Fillmore along 16th St to 3rd St

TOLLS

SF-CHAMP assumes that Bay Area bridge tolls increase in line with inflation over the long term. For future year scenarios, SF-CHAMP tolls are assessed at values that are constant in real terms. 2040 toll assumptions are the same in real terms as 2020 toll assumptions.

Hub and Civic Center Scenarios Example

San Francisco County Transportation Authority
1455 Market Street, 22nd Floor
San Francisco, California 94103
415.522.4800 FAX 415.522.4829
info@sfcta.org www.sfcta.org

Memorandum

DATE: 12.26.2018

TO: San Francisco Planning Department, Hub Project and Civic Center Public Realm Plan Team

FROM: Yiming Cai, Intern, Technology, Data & Analysis, SFCTA

SUBJECT: Input Assumptions for Hub and Civic Center Scenarios (3) 2020 Baseline with Land Use, (4) 2020 Hub with Land Use, (5) 2020 Civic Center with Land Use SF-CHAMP Model Run, and Transit Service Headways

Summary and Context

The purpose of this memo is to document inputs used in the SF-CHAMP 5.2 regional travel demand model for modeling three year 2020 project scenarios. These scenarios are: Scenario 3 - 2020 Baseline with Land Use Scenario, Scenario 4 - 2020 Hub with Land Use, and Scenario 5 - 2020 Civic Center with Land Use. These scenarios are designed to explore the marginal impacts of land use changes (Scenario 3) relative to the 2020 Baseline Scenario (Scenario 2) and transportation network changes (scenarios 4 and 5) relative to Scenario 3.

SCENARIO 3 - 2020 BASELINE WITH LAND USE SCENARIO

Scenario 3, the 2020 Baseline with Land Use Scenario pivots from Scenario 2 the 2020 Baseline Scenario. This scenario maintains Scenario 3 transportation network inputs, but uses different land use assumptions in the Hub and Civic Center study areas. The purpose of this scenario is to explore the marginal impacts associated with the land use changes in the Hub and Civic Center areas.

Scenario 3 land use differs from Scenario 2 land use in six TAZs. In this scenario five of the study area TAZs have more households and one TAZ has more jobs. Total land use change amounts to an increase in households of 1,754 and an increase in jobs of 257 relative to Scenario 2.

Total households and jobs in Hub and Civic Center area TAZs:

Source	Scenario	HH	CIE	MED	MIPS	RETAIL	PDR	VISITOR
SF Planning	Scenario 2 - 2020 Baseline	14,276	4,407	1,485	23,161	4,393	1,533	271
SF Planning	Scenario 3 - 2020 Baseline with Land Use	16,030	4,407	1,485	23,161	4,650	1533	271
Difference		1,754	0	0	0	257	0	0

Also, we can locate the TAZs whose land use have changed by comparing to 2020 Baseline Scenario. The TAZs with changes are listed below.

Allocations for Hub and Civic Center area TAZs, Scenario 2 - 2020 Baseline:

Geography	HH	CIE	MED	MIPS	RETAIL	PDR	VISITOR
242	603	58	22	534	221	96	-
259	629	404	278	1,367	355	38	7
286	323	688	26	1,134	228	13	4
296	1,381	208	52	565	142	27	54
578	986	249	40	659	229	37	20
579	589	172	78	740	161	193	-
587	579	137	39	391	230	10	-
588	745	185	90	477	213	18	17
589	207	26	9	369	240	242	-
591	746	-	-	2,499	252	85	4
595	366	52	9	106	109	226	-
608	2,039	277	-	1,574	130	-	-
609	361	134	99	830	251	142	-
618	24	283	-	212	306	15	4
619	673	272	127	709	413	68	24
620	375	94	6	84	48	-	113
621	1,055	93	127	1,310	173	-	-
622	276	45	53	298	118	123	4
646	-	4	25	1,557	-	15	-
647	1,129	342	119	2,469	226	12	4
648	48	345	48	2,801	154	4	-
683	1,142	340	236	2,474	191	169	17

Allocations for Hub and Civic Center area TAZs 2020, Scenario 3 - Baseline with Land Use:

Geography	HH	CIE	MED	MIPS	RETAIL	PDR	VISITOR
242	603	58	22	534	221	96	-
259	629	404	278	1,367	355	38	7
286	323	688	26	1,134	228	13	4
296	1,381	208	52	565	142	27	54
578	1,570	249	40	659	229	37	20
579	1,044	172	78	740	161	193	-
587	579	137	39	391	230	10	-
588	1,040	185	90	477	213	18	17
589	207	26	9	369	240	242	-
591	746	-	-	2,499	252	85	4
595	366	52	9	106	109	226	-
608	2,039	277	-	1,574	130	-	-
609	361	134	99	830	251	142	-
618	24	283	-	212	306	15	4
619	673	272	127	709	413	68	24
620	375	94	6	84	48	-	113
621	1,055	93	127	1,310	173	-	-
622	276	45	53	298	118	123	4
646	-	4	25	1,557	257	15	-
647	1,365	342	119	2,469	226	12	4
648	48	345	48	2,801	154	4	-
683	1,142	340	236	2,474	191	169	17

Land use inputs are saved on a server at SFCTA at:

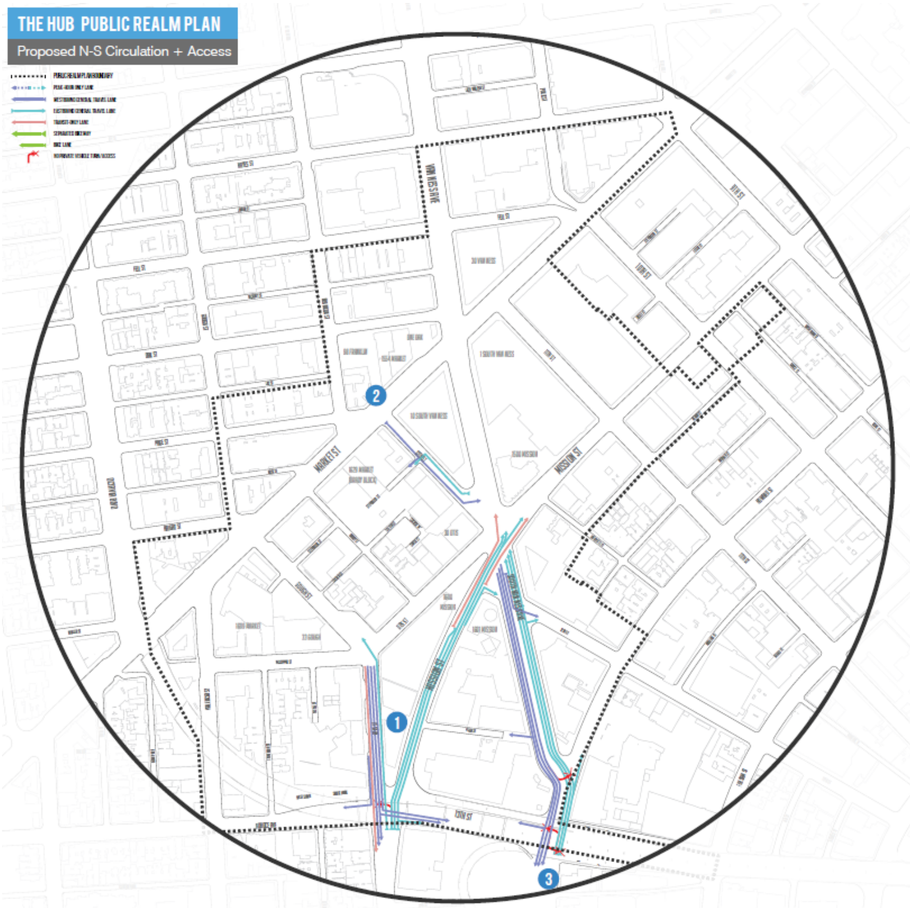
Y:\champ\landuse\p2011\SCS.JobsHousingConnection.Winter2017update\hub_land_use

SCENARIO 4 - 2020 HUB WITH LAND USE SCENARIO

Scenario 4 - 2020 Hub with Land Use Scenario pivots from Scenario 3. Scenario 4 uses the same land use assumptions as Scenario 3, but features a modified transportation network in the Hub area. The scenario reflects the impacts of roadway networks changes proposed by the Hub Public Realm Plan.

Local street network assumptions in the Hub and Civic Center areas are reflected in Figure 1 and Figure 2. Note that changes on Market Street were not included in network coding. Scenario 4 conditions on Market Street match those of scenarios 2 and 3.

Figure 1: Hub Area Streets, North-South, Scenario 4 - 2020 Hub with Land Use



HUB PROPOSED NORTH-SOUTH CIRCULATION AND ACCESS

1 OTIS STREET + MISSION STREET (COUPLET)

- Otis, Gough to Duboce/13th: 3 lanes SB + 1 right-turn only lane at Duboce; 1 SB side-running transit-only lane; 1 NB travel lane
- Mission, South Van Ness to Duboce/13th: 3 lanes NB. At South Van Ness, 1 RT lane to SB South Van Ness, 1 LT (to NB South Van Ness) and through lane (to NB Mission St), and 1 LT lane to NB South Van Ness; 2 transit-only lanes approaching South Van Ness (1 to NB S Van Ness, 1 to NB Mission)

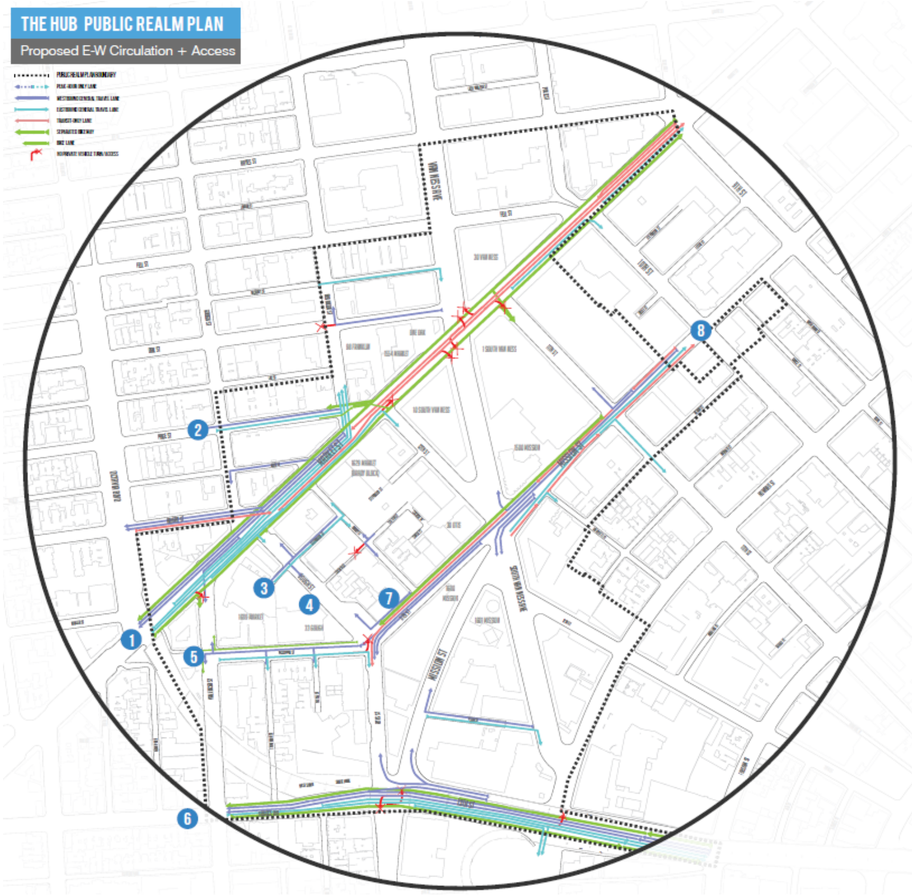
2 12TH STREET

- Market to Stevenson: 1 SB travel lane (No northbound access to Market Street, or to Franklin, or Page Streets)
- Stevenson to S Van Ness, S Van Ness to Howard: 1 NB + 1 SB travel lanes
- At South Van Ness, SB lane right-turn to South Van Ness only

3 SOUTH VAN NESS AVENUE

- Market to 13th St: Boulevard Design with 2 SB through-travel lanes + 1 SB local travel lane and left-turn pocket to SB 12th St, 2 NB through-travel lanes+ 1 NB local lane; Side and center medians
- No turns from SB SVN to Howard; No left turns to 13th Street

Figure 2: Hub Area Streets, East-West, Scenario 4 - 2020 Hub with Land Use



PROPOSED EAST-WEST CIRCULATION AND ACCESS

1 MARKET STREET
- Octavia to Valencia: 2 WB travel lanes, 2 EB travel lanes; No right-turn to SB Valencia from EB Market, consistent with Better Market Street; 1 EB + 1 WB separated bikeway, with left-turn pocket to SB Valencia St
- Valencia to Franklin/12th St: 2 WB travel lanes, with a 3rd, left-turn-only lane to Valencia between Gough and Valencia; 4 EB travel lanes, including 2 left-turn-only lanes to Franklin and 2 through lanes, one becoming an EB transit-only lane at Gough; 1 WB + 1 EB separated bikeways
- Franklin/12th St to 11th St: 1 WB + 1 EB transit-only lane; 1 WB+ 1 EB separated bikeway
- 11th St to 10th St: 1 EB travel lane with a forced right turn at 10th St; 1 WB + EB transit-only lane; 1 WB+ 1 EB separated bikeway
- 10th St to 9th St: 1 EB travel lane; 2 WB + 1 EB transit-only lanes; 1 WB + 1 EB separated bikeways

2 PAGE STREET
- Gough to Franklin: 1 WB + 1 EB travel lane; WB + EB bike sharrows;
- No access to Market from EB Page or from Market to WB Page

3 STEVENSON STREET
- 1699 Market St dead-end to Gough: Unmarked, narrow two-way travel
- Gough to Brady: 1 WB + 1 EB travel lane
- 1601 Market St dead-end to 12th St: Unmarked, narrow two-way travel

4 COLTON STREET
- Gough to Brady: Pedestrians only, no vehicular access
- Brady to Colusa Place: Unmarked, narrow two-way travel

5 MCCOPPIN STREET
- Valencia to Otis: 1 WB + 1 EB travel lanes, 1 WB bike lane
- At Otis, right -turn-only to Otis (no left-turn allowed to Gough)

6 DUBOCE &13TH STREETS
- Duboce, Valencia to Mission: 2 WB travel lanes (right-most lane fed from Duboce Street Central Freeway off-ramp), 1-2 EB travel lanes; WB + EB Separated Bikeways
- 13th St, Mission to Howard St: 2 WB travel lanes, 3 EB travel lanes, including 1 right-turn-only lane to Central Freeway on-ramp at S Van Ness, 1 through and right-turn-only lane, and 1 through lane; WB + EB Separated Bikeways

7 OTIS ST
- South Van Ness to Brady: 2 WB travel lanes; 1 WB transit-only lane; 1 WB separated bikeway
- Brady to Gough: 3 WB travel lanes, including 1 right-turn-only to Gough, and 2 through lanes to SB Otis;1 WB transit-only lane; 1 WB separated bikeway

8 MISSION ST
- 10th to 11th St: 1 WB through lane +1 WB right-turn lane + 1 EB travel lanes; 1 WB + 1 EB transit-only lane
- 11th St to South Van Ness: 1 WB travel lanes, expanding at South Van Ness to 4 WB lanes with 2 left-turn-only lanes to South Van Ness, 1 right-turn-only lane, and 1 WB through lane to Otis; 1 EB travel lane; 1 WB + 1 EB transit-only lane; 1 WB separated bikeway

This scenario does not include Scenario 4 network change sin the Hub area. This scenario's purpose is to reflect the marginal impacts of roadway changes proposed by Civic Center Public Realm Plan.

Figure 3 and 4 show the roadway assumptions included in Scenario 5. All other transportation network assumptions match those of scenarios 2 and 3.

Figure 3: Civic Center Area Streets, East-West, Scenario 5 - 2020 Civic Center with Land Use

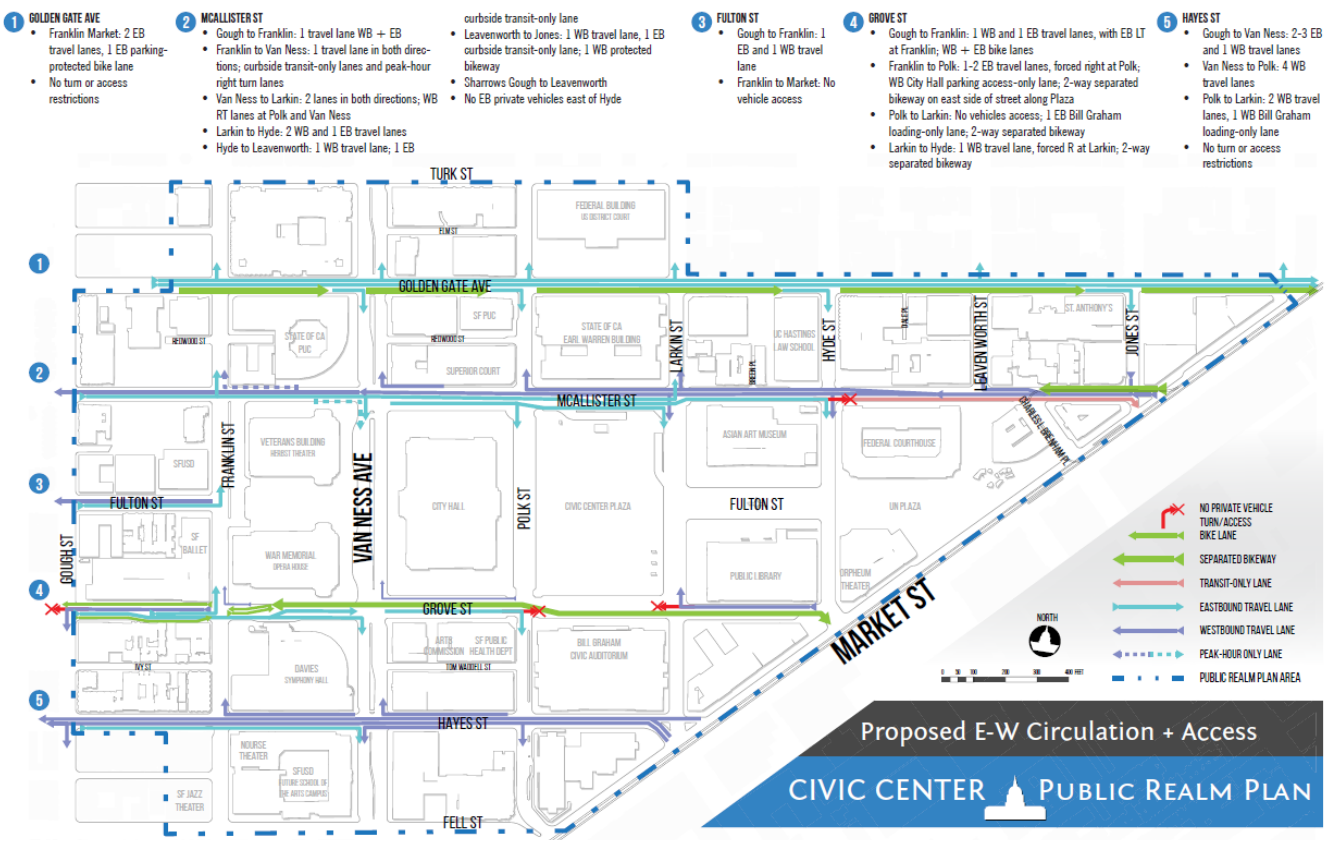
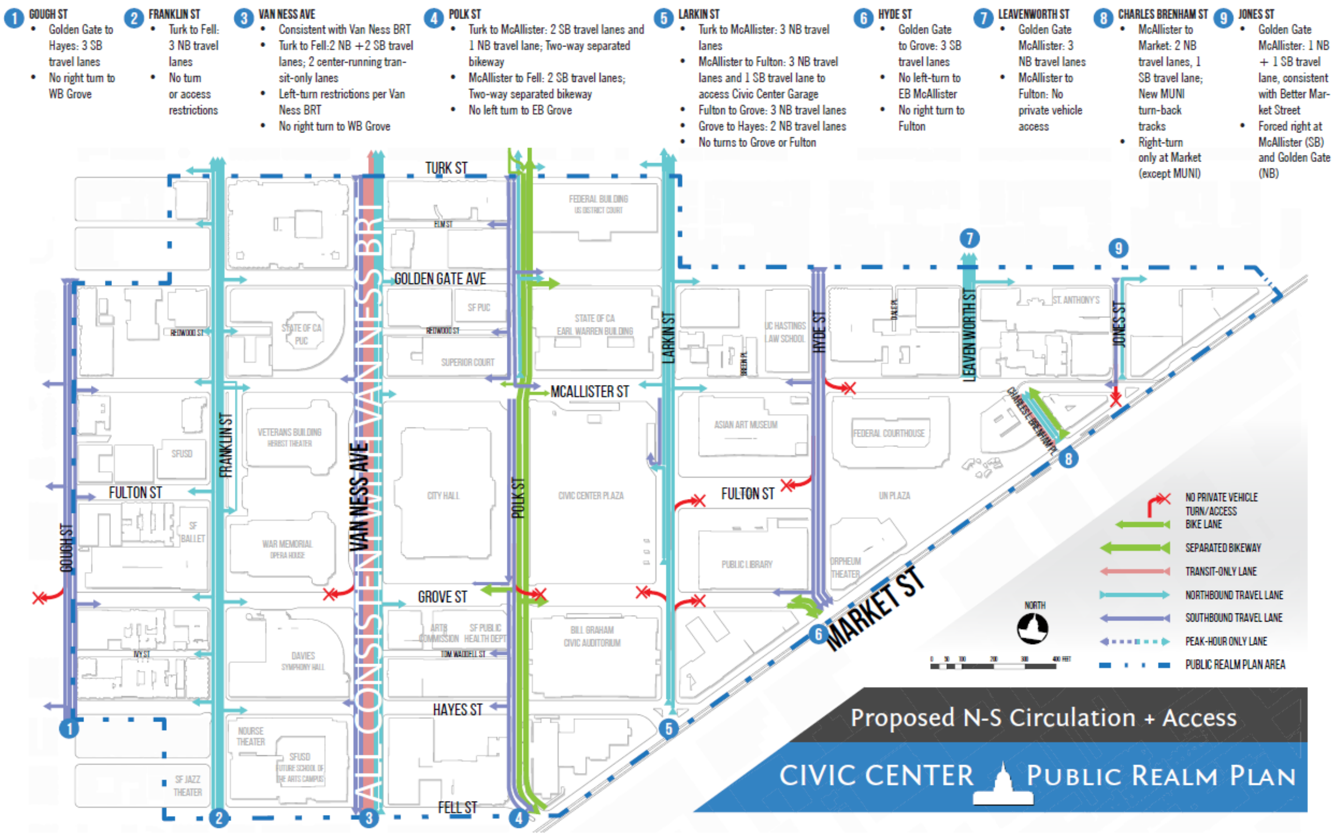


Figure 4: Civic Center Area Streets, East-West, Scenario 5 - 2020 Civic Center with Land Use



TRANSIT SERVICE HEADWAY ASSUMPTIONS

All 2020 scenarios assume transit headways consistent with MuniForward for 2020 (updated with the SF-CHAMP 5.2 regional travel demand model which the SFCTA used to model the three aforementioned 2020 scenarios in July 2018). Since then, the SFCTA has incorporated 2020 transit headways from Muni's Bus Fleet Management Plan[1] in its latest travel demand model. The table below compares headways between the Muni's Bus Fleet Plan and the SF-CHAMP 5.2 regional travel demand model for routes in the Plan areas.

Route	2020 PM Headway (min)	
	Bus Fleet Plan	SF-CHAMP 5.2
5 Fulton	9	8
5R Fulton Rapid	6	8
9 San Bruno	12	10
9R San Bruno Rapid	8	10
14 Mission	15	15
14R Mission Rapid	8	8
19 Polk	15	15
21 Hayes	9	9

ATTACHMENT D

Indentification of Mitigation Measures

The attached Findings of Feasbility of Traffic Mitigation Measures Proposed for 901 16th Street/1200 17th Street Memorandum (San Francisco Planning Department, Case No. 2011.1300E) is an example for how to document the feasibility of mitigation measures.

SAN FRANCISCO
PLANNING DEPARTMENT

MEMO

DATE: **June 4, 2015**

TO: **Project File 2011.1300E**

FROM: **Wade Wietgrefe, San Francisco Planning Department**

RE: **Findings of Feasibility of Traffic Mitigation Measures Proposed for 901 16th Street/1200 17th Street (Case No. 2011.1300E)**

The following documents the feasibility of mitigation measures proposed to mitigate significant level of service (LOS) impacts from the Proposed 901 16th Street/1200 17th Street Project (Proposed Project) at four intersections. The memo is structured in the following manner: Intersection Title; Impact Analysis; Mitigation Measure; Mitigation Measure Feasibility, including input provided by San Francisco Municipal Transportation Agency (SFMTA) staff (see Attachment A); and After Mitigation Analysis.

17TH STREET AND MISSISIPPI STREET

Existing plus Project Conditions

Impact Analysis

Under Existing Conditions, the unsignalized intersection of 17th Street and Mississippi Street operates at LOS C. The Proposed Project would add 146 vehicle trips to the worst (southbound) approach during the PM peak hour, representing 34.1 percent of the total PM peak hour southbound approach volume. The Proposed Project would also add 303 vehicle trips to all approaches, representing 21.8 percent of the total PM Peak hour volumes for this intersection. The LOS at this intersection under Existing Plus Project conditions would degrade to LOS F, and the Caltrans signal warrants would be met. The Proposed Project's contribution to this approach would represent a substantial contribution, and therefore, the Proposed Project would be considered to have a significant impact to the operating conditions at the intersection of 17th Street and Mississippi Street.

Potential Mitigation Measure TR-1

To mitigate poor operating conditions at the intersection of 17th Street and Mississippi Street, the project sponsor shall pay their fair share for the cost of design and implementation of signalization or other similar mitigation to improve automobile delay at this intersection, as determined by the San Francisco Municipal Transportation Agency (SFMTA). With signalization, the intersection would operate at LOS A during the Existing Plus Project weekday PM peak hour conditions.

As a different option to signalization, with the installation of a 75-foot-long[1] southbound right-turn pocket and 135-foot-long[2] northbound left-turn pocket at the intersection, the intersection would then operate at LOS D during the Existing Plus Project weekday PM peak hour conditions. If this option were to be selected, the installation of the turn-pockets shall not remove or reduce the width of the existing Class 2 bicycle lanes, and treatments, such as those described in the NACTO Urban Bikeway Design Guide, shall be included to these bicycle lanes to ensure the safety of bicyclists.

Mitigation Feasibility

SFMTA believes that signalization is feasible and preferable to mere restriping. Although this is an Existing plus Project impact, the SFMTA calculates that the project sponsor's fair share contribution as the development's share of future (2025) PM peak hour traffic (including existing traffic) entering the southbound approach, which is estimated as 146 trips or 36.7 percent. The SFMTA cannot commit that sufficient funding is available to ensure that this measure will be implemented, although we can potentially pursue additional funds from Prop K sales tax as needed to fill a funding gap, depending on other signalization needs.

After Mitigation Analysis

Given that SFMTA cannot commit that sufficient funding is available to ensure that this measure would be implemented; the Proposed Project's impact would be significant and unavoidable.

Cumulative Conditions

Analysis

Under 2025 Cumulative Conditions with the Proposed Project, the southbound approach of the unsignalized intersection of 17th Street and Mississippi Street would improve from Existing Plus Project conditions to LOS D during the PM peak hour based on diversion of traffic due to the Owens Street extension, and Caltrans signal warrants would continue to be met. Due to diversion, the impact at the southbound approach under Existing Plus Project Conditions would no longer be present. However, under 2025 Cumulative Conditions, the westbound approach would degrade to LOS E, resulting in a significant impact.

Potential Mitigation Measure TR-1

Refer to above for language.

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[1] Length required to accommodate right-turning traffic plus required taper length per Highway Design Manual Sections 405.3

[2] Length required to accommodate left-turning traffic plus required taper length per Highway Design Manual Sections 405.2

Mitigation Feasibility
Refer to response above for Existing plus Project Conditions.

After Mitigation Analysis
Refer to response above for Existing plus Project Conditions.

MARIPOSA STREET AND PENNSYLVANIA STREET

Existing plus Project Conditions

Analysis
Under Existing Conditions, the southbound approach of the unsignalized intersection of Mariposa Street and Pennsylvania Street operates at LOS F during the PM peak hour and Caltrans signal warrants are not met, as shown in Appendix H. The Proposed Project would add 12 vehicle trips to worst approach (southbound) during the PM peak hour, representing 19.7 percent of the total PM peak hour southbound approach volume. The Proposed Project would also add 139 vehicle trips to all approaches, representing 8.4 percent of the total PM Peak hour volumes for this intersection. Under Existing Plus Project conditions, the LOS would remain at F, and Caltrans signal warrants would be met. Therefore, the Proposed Project would be considered to have a significant impact to the operating conditions at the intersection of Mariposa Street and Pennsylvania Street.

Potential Mitigation Measure TR-3
To mitigate poor operating conditions at the intersection of Mariposa Street and Pennsylvania Street, the project sponsor shall pay their fair share for the cost of design and implementation of signalization or other similar mitigation to improve automobile delay at this intersection, as determined by the San Francisco Municipal Transportation Agency (SFMTA). With signalization, the intersection would operate at LOS A during the Existing Plus Project weekday PM peak hour conditions.

Mitigation Feasibility
The SFMTA believes this mitigation measure is feasible and desirable. Although this is an Existing plus Project impact, the SFMTA calculates the fair share contribution as the development's share of future (2025) PM peak hour traffic (including existing traffic) entering the southbound approach, which is estimated at 12 trips or 17.4 percent. The SFMTA cannot commit that sufficient funding is available to ensure that this measure will be implemented, although we can potentially pursue additional funds from Prop K sales tax as needed to fill a funding gap, depending on other signalization needs.

After Mitigation Analysis
Given that SFMTA cannot commit that sufficient funding is available to ensure that this measure would be implemented; the Proposed Project's impact would be significant and unavoidable.

Cumulative Conditions

Analysis

Under 2025 Cumulative Conditions with the Proposed Project, the southbound approach of the unsignalized intersection of Mariposa Street and Pennsylvania Street would, similar to Existing Plus Project conditions, continue to operate at LOS F during the PM peak hour and Caltrans signal warrants would continue to be met. Since the Proposed Project would have a significant Existing Plus Project impact on the operation of this intersection, it would similarly have a significant impact under 2025 Cumulative Conditions.

Potential Mitigation Measure TR-3

Refer to above for language.

Mitigation Feasibility

Refer to response above for Existing plus Project Conditions.

After Mitigation Analysis

Refer to response above for Existing plus Project Conditions.

MARIPOSA STREET AND MISSISIPPI STREET

Existing plus Project Conditions

Analysis

Under Existing Conditions, the unsignalized intersection of Mariposa Street and Mississippi Street operates at LOS F at the worst approach (westbound) for the PM peak hour and Caltrans signal warrants are met. The Proposed Project would add 58 vehicle trips to the worst (westbound) approach during the PM peak hour, representing 10.2 percent of the total PM peak hour westbound approach volume. The Proposed Project would also add 152 vehicle trips to all approaches, representing 10.4 percent of the total PM Peak hour volumes for this intersection. The LOS at this intersection under Existing Plus Project conditions would remain at LOS F, and the Caltrans signal warrants would continue to be met. The Proposed Project's contribution to this approach would represent a substantial contribution, and therefore, the Proposed Project would be considered to have a significant impact to the operating conditions at the intersection of Mariposa Street and the Mississippi Street.

Potential Mitigation Measure TR-4

To mitigate poor operating conditions at the intersection of Mariposa Street and Mississippi Street intersection, the project sponsor shall pay their fair share for the cost of design and implementation of signalization or other similar improvement for automobile delay at this intersection, as determined by the San Francisco Municipal Transportation Agency (SFMTA). With signalization, the intersection would operate at LOS C during the Existing Plus Project weekday PM peak hour conditions.

Mitigation Feasibility

The existing all-way STOP sign-controlled intersection of Mariposa and Mississippi streets is not a desirable candidate for traffic signalization because the traffic patterns at this particular intersection are more effectively served by an all-way STOP control than by a traffic signal. The existing STOP sign on westbound Mariposa Street slows traffic on westbound Mariposa Street as it approaches Mississippi Street, where the land uses change from generally commercial to mostly residential. SFMTA does not want to encourage a substantial amount of through westbound movements on Mariposa Street west of Mississippi Street, which a traffic signal could encourage.

After Mitigation Analysis

Given the no feasible mitigation is identified; the Proposed Project's impact would be significant and unavoidable.

Cumulative Conditions

Analysis

Under 2025 Cumulative Conditions, the westbound approach of the unsignalized intersection of Mariposa Street and Mississippi Street would operate at LOS E during the PM peak hour and Caltrans signal warrants would continue to be met. Since the Proposed Project would have a significant and unavoidable Existing Plus Project impact on the operation of this intersection, it would similarly have a significant impact under 2025 Cumulative Conditions.

Potential Mitigation Measure TR-4

Refer to above for language.

Mitigation Feasibility

Refer to response above for Existing plus Project Conditions.

After Mitigation Analysis

Refer to response above for Existing plus Project Conditions.

7TH STREET/16TH STREET/MISSISIPPI STREET

Cumulative Conditions

Analysis

At the signalized intersection of 7th/16th/Mississippi Street, during the PM peak hour the intersection would operate at LOS F under 2025 Cumulative Conditions. The Proposed Project would add no vehicles to the critical westbound through-right movements, and 65 vehicles to the critical northbound approach, which would both operate at LOS F. This project-related contribution to the critical northbound shared through/right-turn movement would represent 19.7 percent of the total PM peak hour volumes under 2025 Cumulative Conditions. The Proposed Project's contributions to the critical northbound movement would be considerable (greater than 5 percent), and therefore, the Proposed

Project would result in a significant cumulative impact at the intersection of 7th/16th/Mississippi Street.

Potential Mitigation Measure
None identified.

Mitigation Feasibility
The intersection is already signalized, and providing additional new through or turn lanes would require substantial reduction in sidewalk widths, which would be inconsistent with the pedestrian environment encouraged by the City of San Francisco. Furthermore, providing additional new through or turn lanes would be in conflict with future modifications to lane geometry per those described in the Transit Effectiveness Project and associated EIR, which would seek to convert existing lanes to transit-only lanes along 16th Street. SFMTA may pursue traffic signal timing and coordination for this intersection, as well as any future traffic signal at the nearby southbound on-ramp; however, this would not improve the poor operating conditions at this intersection to an acceptable level (LOS D or better).

After Mitigation Analysis
Given the no feasible mitigation is identified; the Proposed Project's impact would remain significant and unavoidable.

ATTACHMENT A: SFMTA, FAIR-SHARE MITIGATION MEASURE FOR 901 16TH STREET (CASE NO. 2011.1300E!)

SFMTA
Municipal
Transportation
Agency

MEMORANDUM

DATE: June 4, 2015

TO: Wade Wietgrefe, San Francisco Planning Department

FROM: Frank Markowitz, Senior Transportation Planner, Sustainable Streets Division F. Markowitz

SUBJECT: Fair-Share Mitigation Measure for 901 16th Street (Case No. 2011.1300E!)

This memo responds to your request for SFMTA review of the proposed fair-share traffic signal mitigation measures for the 901 16th Street development project. In your memo of April 2, 2015, you requested that we edit your memo to the project file, which we have also done (attached). As you noted, we may need a meeting with the developer.

Issue 1. Does the SFMTA Support the Fair Share Mitigation Measures and Can We Implement?

The SFMTA supports signalizing the Mariposa/Pennsylvania and 17th/Mississippi intersections and believes this would be feasible. Mariposa/Pennsylvania is higher priority than 17th/Mississippi because (1) the former is a two-way STOP, which raises more safety concerns than the all-way STOP at 17th/Mississippi and (2) requests from Board of Supervisors and others focus more on Mariposa/Pennsylvania. The 901 16th Street TIS proposes mitigation measures that would signalize these two intersections, with fair share payments by that developer, but also proposes fair share support for signal at Mariposa/Mississippi, which Jerry Robbins indicated in January 2015 is not desirable for signalization because the existing all-way STOP slows and discourages westbound Mariposa traffic from unnecessary travel through the residential neighborhood to the west.

The TIS also has a mitigation measure for a signal at Mariposa/I-280 southbound. There is a Mission Bay mitigation measure to signalize the Mariposa/I-280 southbound on-ramp and add a westbound exclusive left turn lane. Although this is listed as a mitigation measure in the 901 16th Street TIS, it has already been advertised for construction (bids due May 14, 2015), with funding provided by a federal TIGER grant.

The SFMTA cannot commit to filling any funding gap to ensure design and construction of the Mariposa/Pennsylvania and 17th/Mississippi signals. However, the SFMTA has capacity and the potential for limited supplemental funding to design and construct the Mariposa/Pennsylvania signalization in 2016-2018 if sufficient funding were to be provided by project sponsors. The SFMTA typically batches signal design and then continues the batches through to construction contract, as this is much more efficient than handling signals on a stand-alone basis.

Issue 2. How Should the Fair Share Be Calculated?

Based on discussions with the Planning Department, we concur that fair share should be calculated in proportion to each development project's share of the forecast future traffic volume for the worst approach for the worst (AM or PM) peak hour, including existing traffic.

For Mariposa/Pennsylvania, 12 trips or 17.4 percent of future cumulative traffic for the worst (southbound) approach for the PM peak (through 2025) is forecast to be generated by the 901 16th Street project. Thus, this proportion should be the fair share contribution.

For 17th/Mississippi , although forecast project trips are a very substantial percentage of all new traffic, the project sponsor should only be responsible for the project's share of all future cumulative traffic (including existing traffic). The Proposed Project would add 146 vehicle trips to the worst (southbound) approach during the PM peak hour, representing 36.7 percent of the total future (2025) PM peak hour southbound approach volume. Thus, this proportion should be the fair share contribution. Signalization is more desirable than restriping due in part to potential conflicts with the existing bike lanes. Also, the safety and effectiveness of the STOP controls will be compromised by adding additional lanes.

Issue 3. What Other Development Projects Will Contribute toward Signalization?

The 1000 16th Street (Daggett) project, now under construction, is on the hook to contribute fair shares to signalize Mariposa/Pennsylvania and Mariposa/Mississippi. We have not identified other projects responsible for contributing.

Issue 4. What Is the Availability of Other Non-Development Funding?

Manito Velasco, the SFMTA signal design manager, confirmed that some Prop K funding could be available in 2016 to start design at least of Mariposa/Pennsylvania. According to the 5 Year Prioritization Program for Traffic Signals and Signs, there will be $375,000 for design of this package of signals, split between Fiscal Year 2016-17 and 2017-18.

Again, the available funding expected from development projects and Prop K does not appear to be sufficient to allow the SFMTA to commit to signalization at the 17th/Mississippi and Mariposa/Pennsylvania intersections.

ATTACHMENT E

Compliance/ Informational Analysis

Below is an example planning code compliance table. Using this as a template, the transportation impact study or CEQA document may include San Francisco Planning Code complaince as an appendix.

Project Description: **[Briefly describe the proposed project]**

Use District: **[Include the use district(s)]**

Topic	Planning Code Reference	Planning Code Requirement	Proposed Project	Existing Conditions
Pedestrian Improvments	§ 138.1 Streetscape and Pedestrian Improvements	[Add applicable information]	[Add applicable information]	[Add applicable information]
Off-Street Parking and Loading Requirements	§ 150 Required	[Add applicable information]	[Add applicable information]	[Add applicable information]
Vehicle Parking (Off-Street)	§ 151 Required	[Add applicable information]	[Add applicable information]	[Add applicable information]
Freight Loading (Off-Street)	§ 152 Required	[Add applicable information]	[Add applicable information]	[Add applicable information]
Rules for Calculation of Required Spaces	§ 153 Required	[Add applicable information]	[Add applicable information]	[Add applicable information]
Dimensions for Off-Street Parking, Freight Loading and Service Vehicle Spaces	§ 154 Required	[Add applicable information]	[Add applicable information]	[Add applicable information]
Parking Pricing Requirements	§ 155(g) Required	[Add applicable information]	[Add applicable information]	n/a
Bicycle Parking	§ 155.2 Required	[Add applicable information]	[Add applicable information]	[Add applicable information]
Shower Facilities and Lockers	§ 155.4 Required	[Add applicable information]	[Add applicable information]	[Add applicable information]
Exemptions and Exceptions from Off-Street Parking, Freight Loading, and Service Vehicle Requirements	§ 161 Required	[Add applicable information]	[Add applicable information]	[Add applicable information]
Tour Bus Loading Spaces in C-3 Districts	§ 162 Required	[Add applicable information]	[Add applicable information]	[Add applicable information]
Transportation Management Programs and Transportation Brokerage Services	§ 163 Required	[Add applicable information]	[Add applicable information]	[Add applicable information]

(continued on next page)

Topic	Planning Code Reference	Planning Code Requirement	Proposed Project	Existing Conditions
Child-Care Plans and Child Care Brokerage Services	§ 165 Required	**[Add applicable information]**	**[Add applicable information]**	**n/a**
Car Sharing	§ 166 Required	**[Add applicable information]**	**[Add applicable information]**	**[Add applicable information]**
Parking Costs Separated from Housing Costs in New Residential Buildings	§ 167 Required	**[Add applicable information]**	**[Add applicable information]**	**[Add applicable information]**
Transportation Demand Management Program (provide the TDM application as an appendix)	§ 169 Required	**[Add applicable information]**	**[Add applicable information]**	**[Add applicable information]**
Mid-block Alleys in Large Lot Developments nstitutional Master Plans	§ 270.2 Required	**[Add applicable information]**	**[Add applicable information]**	**[Add applicable information]**
Institutional Master Plans (transportation strategies)	§ 304.5 Required	**[Add applicable information]**	**[Add applicable information]**	**[Add applicable information]**
Housing Requirements for Residential and Live/Work Development Projects (affordable housing)	§ 415 Required	**[Add applicable information]**	**[Add applicable information]**	**[Add applicable information]**