2015

CONGESTION MANAGEMENT PROGRAM

SAN FRANCISCO COUNTY TRANSPORTATION AUTHORITY

CONTENTS

APPENDICES

CHAPTER ONE

BACKGROUND AND PROGRAM OVERVIEW

KEY TOPICS

- CMP Background
- Congestion Management in San Francisco
- 2015 Program Overview and Key Changes from 2013 CMP

1.1. Background

1.1.1 | Purpose of the CMP

The purpose of the 2015 San Francisco Congestion Management Program (CMP), prepared by the San Francisco County Transportation Authority, (the Transportation Authority) is to:

- Comply with state law by adopting a biennial CMP and submitting it to the Metropolitan Transportation Commission (MTC) for a conformance finding.
- Guide San Francisco agencies involved in congestion management;
- Outline the congestion management work program for fiscal years 2015/16 and 2016/17; and
- Set forth policies and technical tools to implement the CMP work program.

1.1.2 | Organization and Approach

The document follows MTC's Guidance for Consistency of Congestion Management Programs with the Regional Transportation Plan, per MTC Resolution 3000, last revised July, 2013.[1]

Each element required by the CMP legislation is discussed in a separate chapter. Each chapter describes the element's context in San Francisco, the work plan, and implementation guidance. The Transportation Authority Board will adopt any revisions developed during fiscal years 2015/16 and 2016/17 as amendments to the 2015 San Francisco CMP.

The 2015 CMP updates information from the 2103 CMP and reflects several important developments since 2013. The Transportation Authority prepared most of the 2015 CMP. The data in Chapter 4 (Multimodal Performance) is derived from a report prepared by Iteris, Inc. on behalf of the Transportation Authority. In preparing the CMP update, the Transportation Authority has consulted with the San Francisco Municipal Transportation Agency (SFMTA) and other partner agencies to update policies and compile system performance data.

1.1.3 | Origins and Intent of the CMP Legislation

CMP requirements were established in 1989 as part of a bi-partisan state legislative package, known as the Katz-Kopp-Baker-Campbell Transportation Blueprint for the Twenty-First Century (AB 471).

[1] For the complete text of MTC's guidance, please refer to Appendix 1.

These requirements became effective when voters approved Proposition 111 on June 5, 1990. AB 1963 (Katz) in September 1994 and AB 2419 (Bowler) in July 1996 further modified CMP law. The passage of AB 298 (Rainey), effective January 1, 1997, made the CMP exempt from the California Environmental Quality Act (CEQA). SB 1636 (Figueroa), passed in September 2002, amended CMP requirements to allow local jurisdictions to designate Infill Opportunity Zones (IOZs). For the complete text of the CMP legislation, see Appendix 2.

The 1989 state legislation not only provided for increases in transportation funding, but also made significant changes in the requirements for planning and programming the transportation projects funded from these revenue sources. The goal of the legislation is to prioritize transportation funding decisions based on transportation system performance, local land use decisions and their impacts on transportation, and transportation control measures that address air quality goals.

The CMP requirements are the legislature's response to the traffic congestion experienced by all urbanized areas of California. Traffic congestion is widely perceived as outpacing the ability of the traditional transportation planning process to provide solutions. In San Francisco, with its high-intensity land uses and extensive transit network, traffic congestion poses a different problem than in lower-density counties, challenging conventional interpretations of the nature of the congestion problem. For the majority of the state's highly suburbanized metropolitan areas, traffic congestion has its roots in the following:

- Transit does not work well in the suburbs. The low-density suburban growth pattern throughout the state's metropolitan areas does not lend itself to cost-effective transit service, and therefore mobility depends largely on automobiles and freeways.
- Freeways full of solo drivers are inefficient investments. Pricing strategies (e.g., tolls, paid parking at work sites) are politically complicated, and ridesharing strategies (i.e., carpooling and vanpooling) have shown narrow success in sprawled suburbs. Most automobiles still carry just one person, regardless of trip purpose or time of day. The result is inefficient roadway facilities: even when full of cars, they carry only a fraction of the number of people they could accommodate.
- Building freeways and widening roads to address transportation demand is not cost-effective. Because land for transportation facilities is scarce, construction costs have escalated, and environmental constraints are significant, the real costs of capital investment in roads have risen dramatically. These high-cost facilities, which maximize automobile trips but do not maximize the number of people carried, result in a high cost per person transported.

The CMP legislation aims to increase the productivity of existing transportation infrastructure and encourage more efficient use of scarce new dollars for transportation investments, in order to effectively manage congestion, improve air quality, and ultimately allow continued development. In order to achieve this, the CMP law is based on five mandates:

- Require more coordination between federal, state, regional, and local agencies involved in the planning, programming, and delivery of transportation projects and services;
- Favor transportation investments that provide measurable and quick congestion relief;
- Link local land use decisions with their effect on the transportation system;
- Favor multimodal transportation solutions that improve air quality; and
- Emphasize local responsibility by requiring a Congestion Management Agency (CMA) in each urban county in the state.

1.2. Congestion Management in San Francisco

1.2.1 | Applicability of the Concept

The main impetus for the CMP legislation was worsening *suburban* transportation conditions, caused by land use patterns that perpetuate over-reliance on the private automobile. San Francisco has an extensive transit network and long-standing policies to encourage a multimodal transportation system. Congestion management goals are reinterpreted here (within the constraints of State law) to add value to San Francisco's transportation planning process. The City's Transit First policy, for instance, gives rise to our local interpretation of CMP rules: San Francisco tolerates a certain level of traffic congestion in order to enhance the competitiveness of transit service in comparison to private automobiles. The San Francisco General Plan also specifically discourages roadway capacity increases, stating that:

> "The existing vehicular capacity of the bridges, highways and freeways entering the city should not be increased and should be reduced where possible." (SF General Plan, Transportation Element, Objective 3, Policy 1).

If interpreted as improving the throughput of cars in the roadway network, congestion management is at odds with this policy. However, by re-interpreting congestion management as maximizing person throughput, then we have opportunities to capitalize on the City's significant supply of transit services, high densities, and relatively pedestrian-friendly environment. San Francisco can achieve congestion management goals if the measures of performance support the City's transportation and land use patterns and priorities.

1.2.2 | | Relationship to RTP Goals

In July 2013, MTC and the Association of Bay Area Governments (ABAG) adopted Plan Bay Area, the region's long-range Regional Transportation Plan (RTP) and Sustainable Communities Strategy (SCS). The CMP provides context and implementation tools for San Francisco in advancing the goals established in Plan Bay Area, particularly those that pertain to transportation: climate protection, healthy and safe communities, adequate housing, equitable access, economic vitality, and transportation system effectiveness, with emphases on decreasing automobile use and maintaining the system in a state of good repair. These goals are directly supported in San Francisco's CMP through transportation and land use policies; strategic investments and system management; and the performance measures the Transportation Authority uses to monitor transportation system performance. These elements are discussed throughout the 2015 CMP, as appropriate.

1.2.3 | | Future Trends and Strategies

The City's track record highlights the importance of maintaining travel *options,* not just to prevent worsening congestion, but to improve access and mobility for San Francisco residents, workers, and visitors, as the city continues to grow and develop.

Understanding demographic trends is important in charting future action. A development boom in the 1970s and 1980s was characterized by the growth of the city's financial district. This boom was followed by modest employment growth until the mid-1990s. Employment growth in San Francisco and the rest of the Bay Area has been cyclical in the years since, with employment booms accompanied

by increases in construction followed by periods of economic recession. Currently, employment growth and construction of both commercial and residential development are robust.

Future economic and population growth in the Bay Area will differ significantly in pace and character from historic development trends. Regional land use forecasts and policies call for focused housing and employment growth in the region's urbanized core areas. This growth, in conjunction with rising incomes and the increase in commuting by San Francisco residents to job locations outside of the city, will bring new pressures to the local and regional transportation networks. This pattern is already in evidence, with thousands of new housing units and hundreds of thousands of square feet of commercial space currently under construction and more in the pipeline.[2]

Increasing numbers of San Francisco residents are out-commuting to take advantage of work opportunities in other Bay Area counties: the number of San Francisco residents traveling daily to work in Santa Clara County or San Mateo County is approximately 75% the number of Santa Clara County and San Mateo County residents employed in San Francisco.[3] These trends result in auto congestion and high transit ridership both into and out of San Francisco in the peak periods. Long-distance, auto-dominated commute patterns (such as the peninsular corridor) are heavy contributors to regional VMT. Efforts to combat global climate change have made clear the imperative to reduce vehicle miles traveled (VMT) at the regional level. However, current fiscal conditions are difficult for both infrastructure improvements and transit operating expenses, with declining Federal and State funding, resulting in an increasing reliance on local funding sources for solutions to both local and regional transportation challenges.

In spring of 2013, ABAG and MTC released their Draft Plan Bay Area detailing their land use projections to 2040. According to the Plan, San Francisco is set to absorb 90,000 new households by 2040 (using 2010 as a baseline), bringing the number of households to 470,000. Since 2010, San Francisco has added 7,000 net new housing units, and 50,000 more are already in the pipeline.[4] Employment in San Francisco is expected to increase by 190,000 jobs, culminating in over 750,000 jobs in the city by 2040. Enriching the city's inventory of available and auto-competitive transportation options–particularly transit system development–will be a key strategy for congestion management in San Francisco. In order to meet congestion management goals within San Francisco's transportation policy framework, auto-competitive transportation alternatives should be prioritized, including the following types of projects:

- Transit service and reliability enhancements. This is essential to ensure that transit is a viable option to the private automobile as new residential neighborhoods develop, especially in the city's eastern neighborhoods. Non-traditional transit options (zonal express bus service, demand responsive, etc.) may need to be explored as additional alternatives to drive-alone in some instances.
- Bicycle facility and bicycle safety enhancements. Bicycling is a primary mode of travel for a growing number of trips. Bicycling can be a suitable modal shift for many San Francisco automobile trips. We can make this option more viable by improving comfort and safety for cyclists in the City.
- Pedestrian facility and pedestrian safety enhancements. Many trips regardless of the primary mode begin or end with a pedestrian trip, and many San Franciscans make a substantial number

[2] San Francisco Pipeline Reports, San Francisco Planning Department.

[3] Estimated from the 2010-2012 California Household Travel Survey Data

[4] San Francisco Housing Inventory Reports, San Francisco Planning Department

of their trips entirely as pedestrians. Pedestrian safety and access are critical to meet the growing demand for pedestrian-friendly neighborhoods and employment centers.

The Prop K Expenditure Plan for the local half-cent transportation sales tax is San Francisco's investment blueprint for congestion relief: on November 4, 2003, San Francisco voters extended the existing half-cent sales tax (Prop B) and approved a new 30-year Expenditure Plan, with a 75 percent approval rate. The primary goal of the Expenditure Plan is to implement the priorities of the countywide San Francisco Transportation Plan through investment in a set of projects and programs that include planning, maintenance and rehabilitation, and improvements to the city's multi-modal transportation system.

Congestion and demand management measures are also necessary to avoid further deterioration of transit travel times. San Francisco's congestion management activities will also need to focus on key improvements to congested roadway facilities to enable transit to get out of automobile traffic and to improve conditions for pedestrians and bicyclists. Particular attention will be paid to projects that improve the operating efficiency of the existing system, such as bus transit priority treatments. These projects help transit re-gain operating speed and retain or expand its market share.

Bus Rapid Transit (BRT) project development is continuing for two key corridors in the Transit Priority Network: Van Ness Avenue and Geary Boulevard, and the Transportation Authority completed a Feasibility Study for BRT Geneva Avenue and Harney Way. The SFMTA is leading the next phase of the Geneva BRT study. These efforts are examples of our commitment to separating transit right-of-way from congested city streets in an effort improve overall person throughput and reduce transit travel times in key corridors. These BRT corridors, which were identified in the Countywide Transportation Plan and Prop K Expenditure Plan, were also confirmed as priorities in the SFMTA's Muni Forward *Rapid Network*.

The 2004 Countywide Transportation Plan (CWTP) identified pricing as an important demand management tool in the County's congestion management toolkit. In September 2009, the Transportation Authority approved the final report of the *San Francisco On-Street Parking Management and Pricing Study*, which examined the role of parking pricing to manage demand, increase availability, and reduce excess vehicular circulation. In December 2010, the Transportation Authority approved the final study report on the feasibility of implementing an areawide congestion pricing program to manage weekday peak-period congestion. This *Mobility, Access, and Pricing Study* (MAPS) informs policy-makers of the benefits, costs, and impacts of a potential congestion pricing program. The Transportation Authority initiated the Parking Supply and Utilization Study in the summer of 2013 in partnership with the San Francisco Municipal Transportation Agency to evaluate how parking management, focused on private supplies of off-street parking, could reduce roadway congestion and shift trips to walking, cycling, and transit. In December of 2013, SFMTA released the evaluation of the SF*park* Pilot Project, which implemented variable, demand responsive parking prices for on-street parking and SFMTA-owned parking garages. The evaluation found an average decrease in parking prices, decreased vehicle miles traveled, and decreased greenhouse gas emissions.

The Transportation Authority is partnering with the San Francisco Planning Department (SF-Planning) and the SFMTA on the Transportation Sustainability Program (TSP), which supports sustainable transportation through a coordinated multiple-strategy approach. The first component of the TSP, the Transportation Sustainability Fee (TSF), supports transit by funding transportation improvements targeted to offset impacts from new development. The second component, the Transportation Demand Management (TDM) program, will provide guidance and an easy-to-use tool for developers to promote sustainable transportation options for residents, workers, and patrons traveling to and from

the site. The third component focuses on aligning San Francisco's policies with forthcoming changes to traffic impact analysis under the California Environmental Quality Act, through California Senate Bill (SB) 743, which will require lead agencies to replace level-of-service (LOS) -- a measure which implies auto-centric impacts and mitigation measures -- with a vehicle miles traveled (VMT)-based metric that better identifies projects' environmental transportation impacts and also enables those impacts to be addressed through multi-modal solutions.

In December, 2013, The Transportation Authority Board adopted the San Francisco Transportation Plan (SFTP), which updates the 2004 CWTP, is the city's 30-year plan to identify goals, needs, and investment priorities for the city's transportation system and serves as the citywide long-range transportation planning document. The SFTP recommends an investment plan for projected transportation funds between now and 2040, proposes a San Francisco investment vision and revenue strategy for potential new local revenues, and proposes policy recommendations. The Transportation Authority will begin an update to the SFTP starting in 2016.

Congestion management activities during the next two fiscal years are set forth in the work plan section at the end of each chapter in this document. These activities will include advancing the recommendations established in the SFTP, multiple planning and environmental studies, development of key system improvement projects, and continued neighborhood transportation planning efforts. The Transportation Authority will also continue to develop the San Francisco Travel Demand Model in order to measure performance of the multimodal system, analyze Capital Improvement Program (CIP) changes and perform project delivery oversight, and improve forecasting of system performance impacts associated with transportation investments, policies, and land use changes. Since 2013, the Transportation Authority has continued to update and enhance the San Francisco Travel Demand Model.

1.3. Program Overview and Key Changes from the 2013 CMP

1.3.1 | Mandated Program Components

The following statutory requirements of CMP legislation are mandated for all urban counties in the state:

1. A CMP updated biennially. The CMP must contain the following:

- A designated CMP roadway network
- Traffic level of service (LOS) standards and a methodology for monitoring LOS on the designated CMP roadway network
- Transit service standards
- A multimodal performance element
- A land use impact analysis methodology
- A seven-year multimodal CIP;

2. A common database and method to analyze impacts of local land use decisions on the CMP network; and

3. A designated CMA for the county.

1.3.2 | Transportation Fund Programming

The CMP legislation included the creation of new funding sources, as well as changes to existing fund programming mechanisms, tied to implementation of CMP requirements. The Transportation Authority at the local level and MTC at the regional level have been empowered to make CMP conformance determinations affecting funding eligibility.

- State Fuel Tax Increment: The CMP legislation established a 9-cent per gallon in-crease in the state's fuel tax. In order to receive these revenues, urban counties must conform with CMP requirements, particularly performance monitoring and the implementation of required CMP elements. The CMP document itself must be updated every two years.
- Regional Improvement Program (RIP): RIP funds are programmed through the Regional Transportation Improvement Program (RTIP), which is biennially developed and adopted by MTC, and subsequently adopted into the State Transportation Improvement Program (STIP) by the California Transportation Commission (CTC). In order to be considered for funding through the RTIP, transportation projects must be included in the CIP of the CMP.
- Federal Surface Transportation Program (STP) and Congestion Management and Air Quality (CMAQ) Program Funds: In 1992, the California legislature passed SB 1435, which reconciled the CMP programming process with the then new federal Intermodal Surface Transportation and Efficiency Act (ISTEA). As a result, projects seeking certain STP or CMAQ funds (continued under TEA-21, SAFETEA-LU, and MAP-21) must be prioritized by each CMA in their biennial CIP for the CMP.

1.3.3 | Relationship to Ongoing Planning and Programming Efforts

CMPs are a component of a more comprehensive set of ongoing transportation planning and programming efforts at the local and regional levels:

- RTP: The CMP implements the local portion of the RTP and must be consistent with it. MTC determines consistency among CMPs in the region. MTC makes these determinations as a part of the conformance finding process for CMPs.
- RTIP: The RTIP is a 5-year programming document for a variety of federal and state funding sources (e.g., RIP) that are sub-allocated to the region. In the Bay Area, MTC works with the CMAs to develop the RTIP for our nine-county region. RTIPs statewide are approved collectively as the STIP by the CTC. For certain projects to be included in the RTIP, they must be included in the CMP CIP.
- City of San Francisco General Plan: According to the City Charter (section 3.524), the General Plan is a comprehensive, long-term, guide for the future development of the City and County. The General Plan guides transportation demand management measures that are addressed as part of the CMP. Chapter 6 addresses the Planning Department's role in making consistency findings for the CMP's CIP. While the General Plan provides the policy framework, State law does not require that the CMP be incorporated into the General Plan.
- **Air Quality Attainment Plans:** MTC's RTP is required by federal law to conform to the State Implementation Plan for improvement of air quality. Since the CMP must be found consistent with the RTP, the CMP must therefore also conform to the provisions of the State

Implementation Plan. In addition, the San Francisco CMP documents implementation of transportation control measures (TCMs) included in the 2010 Bay Area Clean Air Plan adopted by the BAAQMD pursuant to State requirements. Appendix 11 lists the currently adopted regional TCMs and how they are incorporated into San Francisco's congestion management strategies. BAAQMD is currently working on a 2015 update to the 2010 Clean Air Plan. The 2015 plan will include a Regional Climate Protection Strategy to help se the Bay Area on a pathway toward meeting long-term (i.e., 2050) greenhouse gas reduction goals.

1.3.4 | Key Changes from 2013 CMP

The following sections highlight the most significant updates included in the 2015 CMP.

CHAPTER 4: This chapter introduces a new multimodal count collection effort in order to establish trends in demand over time by different modes. It also includes substantive performance monitoring for auto and transit.

CHAPTER 5: The Transportation Demand Management (TDM) Element has been updated to reflect recent changes to planning code requirements, advancements to San Francisco TDM strategies, including new policies requiring TDM measures for new developments, commuter benefits and the Commuter Shuttle Policy, carsharing, bike sharing, and other policies. We also included information on the TDM programs included in area plans, development agreements, and institutional master plans. Two new pilot projects, the BART Travel Incentives Pilot Project and SF Moves Neighborhood Outreach Pilot Project, are also discussed in this chapter. Finally, updates to ongoing TDM projects and studies are included.

CHAPTER 6: This chapter includes new discussion of the preliminary draft of changes to CEQA guidelines released by the Governor's Office of Planning and Research on August 6, 2014, following the elimination of automobile level-of-service as a significant impact in CEQA environmental review. It also includes discussion of the Core Capacity Transit Study.

CHAPTER 7: This chapter reflects amendments made to the CIP. Per adopted procedures, the CIP is amended concurrently with Transportation Authority programming decisions. An ongoing work program item related to the CIP includes monitoring of state and federal funds to ensure that timely use of funds requirements are met. These requirements impose deadlines for project milestones such as obligation of funds, award of contracts and completion of construction. Failure to meet the deadlines can result in loss of funds to the project, the County, and/or the Bay Area Region.

CHAPTER 8: The Transportation Authority's San Francisco Travel Demand Forecasting Model has under-gone improvements since 2013, which are discussed in this chapter.

1.3.5 | Public Input

A public hearing on the Draft 2015 San Francisco CMP is scheduled for the December 8, 2015 meeting of the Transportation Authority Plans and Programs Committee. The Transportation Authority Board is scheduled to consider approval of the 2015 CMP on December 15, 2015.

CHAPTER TWO

CONGESTION MANAGEMENT AGENCY ROLE & RESPONSIBILITIES

KEY TOPICS

- Legislative Requirements
- Legislative Intent and Application to San Francisco
- San Francisco County Transportation Authority

2.1. Legislative Requirements

California Government Code section 65089 (a), as amended, states "A congestion management program shall be developed, adopted, and updated biennially, consistent with the schedule for adopting and updating the regional transportation improvement program, for every county that includes an urbanized area, and shall include every city and the county. The program shall be adopted at a noticed public hearing of the agency. The program shall be developed in consultation with, and with the cooperation of, the transportation planning agency, regional transportation providers, local governments, the [California] department [of Transportation], and the air pollution control district or the air quality management district, either by the county transportation commission, or by another public agency, as designated by resolutions adopted by the county board of supervisors and the city councils of a majority of the cities representing a majority of the population in the incorporated area of the county." For the complete text of the CMP statutes see Appendix 2.

2.2. Legislative Intent and Application to San Francisco

One of the main thrusts of the CMP legislation is to foster coordination of local land use and transportation investment decisions at the county or subregional level. In order to ensure local involvement in this process the CMP law vests significant authority and responsibility in the Congestion Management Agencies (CMAs). For example, in order to receive state and federal funds, transportation projects in an urban county must now be recommended by that county's CMA as part of its Congestion Management Program[1]. CMAs therefore act as a policy forum and technical resource to guide and help resolve transportation problems within counties when those problems have implications across city boundaries. San Francisco's distinct status as a city and county dictates a somewhat different role for the CMA in this regard, with the focus of involvement shifting to address problems across county lines (such as the effects of regional commute patterns into San Francisco), as well as issues of

[1] If a county opts out of preparing a CMP, per ABE 2419 (Bowler), MTC will work with the appropriate agencies to establish project priorities for funding.

coordination of city department activities affecting congestion management, such as trip reduction program implementation or transit service improvements.

2.3 The San Francisco County Transportation Authority

2.2.1 | Designation and Composition

On November 6, 1990, the Board of Supervisors designated the San Francisco County Transportation Authority (the Transportation Authority) as the CMA for the County. The Transportation Authority Board of Commissioners consists of the eleven members of the San Francisco Board of Supervisors, acting as Transportation Authority Commissioners.

2.2.2 | Roles and Responsibilities

The Transportation Authority is a special-purpose government agency, created on November 7, 1989, when San Francisco voters passed Proposition B. Proposition B increased the local sales tax by ½ cent for a period of 20 years, to fund San Francisco transportation projects and services. In November 2003, voters approved a new Expenditure Plan (Prop K), which superseded Prop B and extends the ½ cent sales tax for 30 years. The Transportation Authority administers, prioritizes, and programs Proposition K revenues. These revenues also leverage large amounts of State and Federal funds for transportation investments in San Francisco.

On November 2, 2010 San Francisco voters approved Proposition AA, authorizing collection of an additional $10 fee annually on motor vehicles registered in San Francisco and approving an Expenditure Plan for the new funds. The fee will fund local street repair, improvements to pedestrian and bicycle conditions, and public transit enhancements. As with Prop K, the Transportation Authority administers, prioritizes, and programs Prop AA funds.

In its capacity as the CMA for San Francisco, the Transportation Authority has primary responsibilities in the following areas:

- Develop and adopt the biennial CMP and related implementation guidance;
- Monitor City agencies' compliance with CMP requirements;
- Program Federal, State, and regional transportation funds;
- Review the programming of all transportation funds for San Francisco;
- Provide policy input into the regional transportation planning and programming process; and
- Develop and periodically update the long-range transportation plan for San Francisco.

The Transportation Authority's dual responsibilities – strategic programming of proposition-authorized funds through Strategic Plan processes, and prioritizing and programming of State and Federal funds through the CMP process – are an opportunity to coordinate San Francisco's transportation planning decisions and optimize the City's investments in transportation infrastructure and services. Leveraging State and Federal funds through strategic use of Proposition K monies is a primary example of the efficacy of this process. The San Francisco Transportation Plan improves the effectiveness of this

process by linking transportation objectives and policies to a specific list of transportation investments, prioritized across a long-range planning horizon. The CMP's 7-year CIP and the Authority's Prop K Five-Year Prioritization Programs serve as the main implementation tools for the San Francisco Transportation Plan.

As the CMA, the Transportation Authority served as the lead coordinator for San Francisco involvement in the regional process to develop a Sustainable Communities Strategy (SCS) and update the Regional Transportation Plan (RTP). Plan Bay Area, which integrates the SCS and RTP into a single regional plan, was adopted in July 2013. As required by SB 375 (Steinberg), passed in 2008, Plan Bay Area integrates long-range land use, housing, and transportation planning in the region to reduce greenhouse gas emissions from motor vehicles.

Assembly Bill No. 981, the Treasure Island Transportation Management Act, authorizes the Board of Supervisors (BOS) of the City and County of San Francisco to designate a board or agency to act as the transportation management agency (TMA) for Treasure Island and implement the Treasure Island Development Program's transportation plan. In October 2011, the Transportation Authority Board recommended to the Board of Supervisors and the Treasure Island Development Authority (TIDA) that the Transportation Authority be designated as the Treasure Island Mobility Management Agency (TIMMA). Subsequent resolutions tasked the Transportation Authority with advancing agency formation documents, planning, and grant-writing.

In addition, acting as the CMA, the Transportation Authority plays a key role in evaluating and providing guidance on major local transportation projects and land use policies that may affect the performance of the transportation system.

2.2.3 | Implications of the Board's Multiple Roles

As described above, the San Francisco Board of Supervisors also serves as the Transportation Authority's Board of Commissioners. These multiple roles require careful balancing of the Board's responsibilities. Policy decisions made by the Board of Supervisors may have negative congestion management impacts and place the Transportation Authority Board, as CMA, in a position to find the City in non-conformance with the CMP. This may in turn generate difficult Proposition K funding choices for the Transportation Authority Board.

In order to minimize the potential for conflict, the Transportation Authority cannot limit its role to just monitoring CMP conformance after the fact. Instead, the Transportation Authority must take a proactive role to serve as a resource in analyzing the potential transportation implications of transportation and land use related actions, projects, or policies proposed for the City. In order to fulfill this responsibility, the Transportation Authority regularly participates in and comments on studies and discussions of key San Francisco transportation and land use issues, such as the Transit Effectiveness Project (now part of Muni Forward), the Transportation Sustainability Program, Better Market Street, and the Transit Core Capacity Study. This approach allows the Board to anticipate potential problems, instead of reacting when congestion impacts reach crisis proportions and require hasty actions.

2.2.4 | Relationship to City Agencies

State law mandates that the Transportation Authority, acting as CMA, biennially determine if the City is in conformance with the adopted Congestion Management Program. A finding of non-conformance

has potentially significant consequences for transportation funding in the City. Also according to state law, it is the City's responsibility to ensure that transportation projects, programs, and services are put in place, through its implementing departments, to maintain conformance with the CMP.

In fulfilling its CMA mandate, the Transportation Authority must function as an independent agency to be able to objectively and credibly evaluate CMP conformance. This dictates a special relationship with City departments involved in transportation-related actions which must be assessed at least biennially relative to their congestion management impacts. On the other hand, because of the Board's multiple roles, as described in the previous section, the Transportation Authority's approach is to act as a resource, maximizing coordination with the City departments responsible for planning and implementation of transportation actions, so that such actions may be evaluated for congestion management impacts before they are put in place.

2.2.5 | Relationship to Regional Planning/Programming Agencies

As the Congestion Management Agency for San Francisco, the Transportation Authority plays a key liaison role with the Metropolitan Transportation Commission (MTC), the Bay Area's regional transportation planning agency, and with the Bay Area Air Quality Management District (BAAQMD), the agency responsible for implementation and monitoring of the region's Clean Air Plan. The Transportation Authority coordinates local input into MTC's Regional Transportation Plan (RTP), which establishes the overall vision for long-range transportation development and funding in the region, and the Regional Transportation Improvement Program (RTIP). Through its membership in the Bay Area Partnership, the Transportation Authority plays a key role in shaping the evolution of planning and programming processes affecting San Francisco's ability to make effective transportation investments and preserve its economic vitality. Further, through its leadership in this regional forum the Transportation Authority is in a position to influence the debate over the vision and goals for transportation and land use planning in the Bay Area, bringing to bear San Francisco's unique perspective on multimodal transportation, mobility, and livable communities.

CHAPTER THREE

CMP-DESIGNATED ROADWAY NETWORK

KEY TOPICS

- Legislative Requirements
- San Francisco CMP Roadways
- Work Program Items

3.1. Legislative Requirements

California Government Code Section 65089(b)(1)(A) requires that the designated Congestion Management Network include at least all state highways and principal arterials. No highway or roadway designated as part of the system may be removed from the system. The statutes do not define 'principal arterial.'

The statutes also refer to regional transportation systems as part of the required land use impacts analysis program, California Government Code Section 65089(b)(4). In 1991, the Bay Area's Congestion Management Agencies (CMAs) developed Congestion Management Program (CMP) networks in coordination with MTC's Metropolitan Transportation System (MTS). The MTS network, which includes both highways and transit services, was subsequently designated as the Congestion Management System, as required by the federal Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991. The MTC contracted with the congestion management agencies in the Bay Area to help develop the MTS and to use the CMPs to link land use decisions to the MTS.

3.2. San Francisco CMP Roadways

CMP legislation requires that all state highways (including freeways) and principal arterials are included in the CMP network. The network must be useful to track the transportation impacts of land development decisions, as well as to assess the congestion management implications of proposed transportation projects. San Francisco's network therefore includes numerous local thoroughfares since most urban traffic occurs on city arterials (rather than on the freeways). The next sections document the network selection criteria and process used in the initial San Francisco CMP in 1991, and describes the current network.

3.1.1 | Selection Criteria

Consistent with State requirements, the San Francisco CMP roadway network includes all freeways and state highways, as well as principal arterials. San Francisco has defined principal arterials as the Major Arterials designated in the Transportation Element of the City's General Plan, defined as follows:

> *"cross-town thoroughfares whose primary function is to link districts within the city and to distribute traffic from and to the freeways; these are routes generally of citywide significance; of varying capacity depending on the travel demand for the specific direction and adjacent land uses."*

Several additional arterials – Market Street, Mission Street, Sutter Street, and West Portal – are also included in the CMP roadway network. These streets experience significant conflicts between auto traffic and transit service.

3.1.2 | Segmentation Method

The 1993 CMP documented the criteria used in 1991 to segment the CMP roadway network in San Francisco, including freeway facilities (see Appendix 3). The following five criteria determined segment limits for the city arterials in the CMP: predominant development patterns (e.g., number of driveways, institutional uses); changes in speed limits; major cross streets; significant changes in traffic volumes; and freeway ramps. These criteria are generally recognized as significant in explaining the operating profile of a roadway.

For freeway facilities the segmentation criteria are simpler. They include major interchange on and off ramps, and points were two freeway facilities merge or bifurcate.

3.1.3 | Current Network

The complete CMP roadway network for San Francisco consists of 233 directional miles on both arterials and freeways.

Table 3-1: 2015 Monitored Segment Miles

ROADWAY TYPE	TOTAL DIRECTIONAL MILES
Arterial	198.2
Freeway	34.9
Total	233.1

As discussed in Chapter 4, performance monitoring was conducted in 2013 for the entire CMP network. The 2013 monitoring network is show in Figure 3-1, including the distinction between "official" and "additional" segments.

FREEWAYS AND STATE HIGHWAYS

San Francisco's CMP roadway network includes freeway segments on Interstate 80, Interstate 280, and US Route 101. State routes designated along City streets are also part of the CMP roadway network, as follows:

- US Route 101 – Richardson Avenue, Lombard Street west of Van Ness Avenue, and Van Ness between Lombard Street and Market Street;
- Route 1 – Park Presidio Boulevard, 19th Avenue, and Junipero Serra Boulevard south of 19th Avenue;
- Route 35 – Sloat Boulevard between 19th Avenue and Skyline Boulevard as well as Skyline Boulevard.

CITY ARTERIALS

The remaining CMP network arterials are city arterials. A table of all arterials included in the CMP network is included in Appendix 3.

3.1.4 | Network Changes

State law prohibits the removal of roadway facilities from the initially designated CMP network (unless facilities are physically removed from the transportation system, such as the Embarcadero Freeway). New facilities may be added to the CMP network without restrictions, subject to the established criteria for inclusion. No network segmentation changes are proposed in the 2015 CMP. Appendix 3 lists all CMP arterials where segmentation changes have been made since 1991, including a technical justification.

From time to time the Transportation Authority may also monitor additional segments that are not part of the official CMP network. These do not constitute official changes to the CMP network, but may be included to support current planning and system management efforts. The Transportation Authority has not monitored any additional segments in 2015.

Figure 3.1: Spring 2015 Monitored Segments

3.1.5 | Relationship to the MTS

San Francisco's CMP roadway network is broadly consistent with the Metropolitan Transportation System (MTS) defined by MTC. The MTS is a regional network of roadways, transit corridors and transfer points. The State highways and major thoroughfares designated in San Francisco's CMP roadway network are all included in the San Francisco portion of the regional MTS network. In a few instances, the local CMP roadway network is not identical to the regional MTS network due to differences in the criteria used to define each network. San Francisco's CMP and MTS networks are coordinated with the networks of adjacent counties, to ensure regional connectivity.

A 1993 agreement delegated responsibility from MTC to the Transportation Authority to implement certain mandates in the federal Interstate Surface Transportation and Efficiency Act (ISTEA) of 1991 and by extension, under the Safe, Accountable, Flexible, Efficient Transportation Equity Act—A legacy for Users(SAFETEA-LU) of 2005. These include the analysis of potential impacts on the MTS of proposed local land use decisions (see Chapter 6). The MTS roadway network was updated in 2001 to reflect "support for 'smart growth' and 'environmental justice' by including new focus on facilities that serve major areas of high density, and that provide essential access to disadvantaged neighborhoods."

3.1.6 | Non-Automobile Networks

Transportation performance measures in the San Francisco CMP have broadened to increasingly incorporate multimodal performance. However, the city's dense grid allows parallel streets in the same corridor to serve different transportation functions, and the designated CMP roadway network does not necessarily align with the most important or heavily traveled routes for transit riders, bicyclists, or pedestrians. Therefore, many of the non-auto performance measures in this CMP include data from non-CMP portions of the street network or use citywide metrics. Some multimodal measures, such as transit speed, use data collected along CMP network segments to facilitate comparisons with automobile performance. Chapter 4 provides details on multimodal performance.

3.3. Work Program Items

- Participate in any future MTC efforts to redefine the Metropolitan Transportation System (MTS).

CHAPTER FOUR

MULTIMODAL PERFORMANCE

KEY TOPICS

- Legislative Requirements
- Legislative Intent and Application to San Francisco
- Applications of Multimodal Performance Measures
- Legislatively Required Performance Measures (Auto LOS and Transit)
- Summary of Monitoring Results
- Local Performance Measures (Transit, Bicycle, and Pedestrians)
- Work Program Items

This chapter presents the 2015 CMP multimodal performance results, including analyses of traffic congestion, transit, and non-motorized performance measures. It combines the traffic Level of Service (LOS) and multimodal performance elements required under state CMP legislation, reflecting the legislation's requirement that LOS be included as one of several multimodal performance measures. This approach is also consistent with San Francisco's urban, multimodal environment. Vehicular traffic congestion remains an important metric of transportation performance in San Francisco, but the City and County's Transit First policy and emphasis on person mobility place higher priority on the performance of alternative modes including transit, bicycles, and pedestrians than on private vehicle speeds.

4.1. Legislative Requirements

4.1.1 | LOS Monitoring

The California Government Code requires that San Francisco use automobile LOS standards to measure the performance of the CMP roadway network, but permits CMAs a choice among the following methodologies for measuring LOS:

- Transportation Research Board Circular 212 (TRC 212);
- Transportation Research Board's Special Report 209: *Highway Capacity Manual (HCM)*; or
- A uniform methodology adopted by the CMA that is consistent with *the Highway Capacity Manual*

The CMA is required to biennially determine the City's conformance with the CMP, including attainment of LOS standards.

In accordance with CMP legislation, the county and city governments are required to show that CMP route segments within their jurisdiction are operating at or above the CMP traffic LOS standard for all segments outside of any designated Infill Opportunity Zone (IOZ). Section 65089(b)(1)(B) states that "In no case shall the LOS standards established be below the LOS E or the current level, whichever is

farthest from LOS A except when the area is in an infill opportunity zone. When the level of service on a segment or at an intersection fails to attain the established level of service standard outside an infill opportunity zone, a deficiency plan shall be adopted pursuant to section 65089.4". In addition, Section 65089.3 establishes that "The [California] [D]epartment [of Transportation] is responsible for data collection and analysis on state highways, unless the agency designates that responsibility to another entity."

Senate Bill 1636 (Figueroa), passed in 2002, authorized local jurisdictions to designate IOZs. IOZs must meet eligibility criteria to ensure they are compact, mixed-use areas that are well-served by transit. In December 2009, the San Francisco Board of Supervisors designated all then-eligible areas within the City and County of San Francisco as an IOZ (see Appendix 4). Senate Bill 743 (Steinberg), passed in 2013, changed the eligibility criteria for IOZ designation. Under the new criteria, an IOZ is an area designated by a city or a county within a half mile of a major transit stop or corridor that is included in a regional transportation plan. Areas that are designated transit priority areas within the regional Sustainable Communities Strategy are eligible for designation. Previous law also set a December 2009 deadline for jurisdictions to designated IOZs and terminated an IOZ designation if no development project was completed within the zone within four years of designation; SB 743 repealed both provisions. Within a designated IOZ, the local jurisdiction is not required to maintain traffic conditions to the LOS standard. Thus, CMP route segments located within an IOZ are exempt from the minimum LOS standards and deficiency plan requirements mandated elsewhere by the CMP legislation.

4.1.2 | Multimodal Performance Monitoring

The CMP legislation also requires a multimodal performance element. AB 1963 in 1994 modified Section 65089(b)(2) of the Government Code to replace the transit service standards requirements previously mandated for the 1991 and 1993 CMPs. The revised statutes state that the CMP shall include "[a] performance element that includes performance measures to evaluate current and future multimodal system performance for the movement of people and goods. At a minimum, these performance measures shall incorporate highway and roadway system performance, and measures established for the frequency and routing of public transit, and for the coordination of transit service provided by separate operators. These performance measures shall support mobility, air quality, land use, and economic objectives, and shall be used in the development of the capital improvement program..., deficiency plans..., and the land use analysis program....".

4.2. Legislative Intent and Application to San Francisco

The original CMP legislation defined performance narrowly as roadway LOS. The amendments acknowledged the need for diversified solutions to complex transportation problems in urban areas, and the inadvisability of tackling them with just one mode. Current performance element requirements recognize that the transportation system performance should be measured for all modes: automobile, transit, bicycle, and pedestrian.

According to the CMP legislation, deficiencies are detected only on the roadway system. Improvements on the LOS scale ensure better travel conditions for motorists, but the LOS scale does not take into account the person throughput capacity of a roadway. A city arterial may carry the maximum number

of automobiles at acceptable speed, but if each vehicle carries only the driver, then throughput of the facility is suboptimal. San Francisco therefore includes performance standards and measurements that evaluate all aspects of the City's multimodal transportation network. San Francisco's high transit, pedestrian, and bicycle mode shares and extensive non-auto mode networks mean that the city benefits from a multimodal approach to system performance.

Consistent with State law, the 2015 San Francisco CMP distinguishes between two categories of performance measures. Legislatively Required measures include roadway LOS plus three transit service performance measures: routing, frequency, and inter-operator service coordination. These are the elements of congestion and multimodal performance measurement that are explicitly required by State congestion management statutes. Section 4.4 details the Legislatively Required metrics.

Local performance measures include multimodal metrics that are not used for determination of CMP conformance under State legislation but reflect performance goals for alternative modes in the City of San Francisco. The local measures are used for planning purposes and to track trends over time. Transit measures included in the 2015 CMP include transit speeds, transit-to-auto speed ratios, transit speed variability. In addition to these, we also include the service standards and milestones reported by the SFMTA, which include measures of transit crowding, transit on-time performance, and bunches and gaps in transit service. Non-motorized metrics include volumes, network connectivity, and safety. These measures are discussed in further detail in Section 4.5.

4.3. Applications of Multimodal Performance Measures

State law requires that link (roadway) LOS be used for determining CMP conformance and conducting deficiency planning, except within a designated Infill Opportunity Zone. Multimodal performance measures will be used for the following purposes:

- CMP conformance determinations. Link (roadway) LOS will continue to be used for conformance determinations for areas that are not designated by the City as an IOZ. Although areas within the designated IOZ are exempt from deficiency planning requirements, the Transportation Authority will continue to monitor multimodal performance, including LOS.
- CIP amendments. The Transportation Authority will continue to evaluate the potential impacts of proposed CIP changes on the performance of the multimodal network. This information is used as one of the factors in determining Transportation Authority concurrence with such proposals.
- Deficiency plans. Link LOS measurements will be used for deficiency determinations. Portions of the congestion management network within a designated IOZ are exempt from deficiency planning requirements. See Appendix 8 for more information on deficiency plans.
- Land use impacts analysis. Multimodal performance measures will be used for the analysis of impacts of local land use decisions on the CMP network.

4.4. Legislatively Required Performance Measures

4.4.1 | Roadway Level of Service (LOS)

This is the most traditional and best documented performance measure. The CMP legislation defines roadway performance primarily by using the LOS traffic engineering concept to evaluate the operating conditions on a roadway. LOS describes operating conditions on a scale of A to F, with "A" describing free flow, and "F" describing bumper-to-bumper conditions. The HCM defines LOS as "…a quality measure describing operational conditions within a traffic stream, generally in terms of such service measures as speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience."

Designation of much of San Francisco as an Infill Opportunity Zone strengthens the Transportation Authority's efforts to develop and employ multimodal performance measures appropriate to a dense, multimodal, urban environment. Under the CMP legislation, CMP segments within an IOZ are exempt from minimum LOS standards. The Transportation Authority continues to work with partner agencies to collect data and develop robust metrics that adequately monitor and evaluate multimodal system performance.

Still, continued monitoring of automobile LOS is useful for a variety of reasons. As the most extensive historical dataset available, LOS allows for the monitoring of traffic conditions over a long period of time. Congestion is also an important factor in the performance of surface-running transit service: where transit operates in mixed traffic, increased congestion will slow transit. Finally, ongoing monitoring of both automobile and transit speeds within the same corridor facilitates the assessment of relative modal performance. As such, the Transportation Authority monitored automobile LOS on the designated CMP network during 2015.

The traffic LOS standard for San Francisco is consistent with CMP-mandated criteria and was established at E in the initial (1991) CMP network. Facilities that were already operating at LOS F at the time of baseline monitoring, conducted to develop the first CMP in 1991, are legislatively exempt from the LOS standards. CMP segments that are within a designated IOZ are also exempt from LOS conformance requirements.

MONITORING APPROACH

The Transportation Authority uses INRIX data, a commercial dataset which combines several real-time GPS monitoring sources with data from highway performance monitoring systems, as the primary source for official speed and LOS calculations. INRIX data is supplemented with floating car data where INRIX data is not available. This method was adopted in the 2013 CMP after initial conducted as part of the 2011 CMP found that results calculated from INRIX were appropriate for use in speed and LOS calculations. The 2011 analysis found that speeds from INRIX data were, on average, higher than speeds from floating car runs, but fell within the range of variability of floating car results for a given segment and time period.

Prior to 2013, the Transportation Authority used the floating car method to collect travel time data on the CMP network. However, the resource-intensity of this method led to small sample sizes, which yielded relatively high variability in the results. In 2013, MTC contracted with INRIX to obtain region-wide commercial speed data, and has made the data available free of charge to CMAs and other local governments for planning and monitoring purposes.

The INRIX and floating car data were collected in April and May, 2015, which is the typical CMP monitoring period for San Francisco.

The methodology and results of the 2015 LOS Monitoring effort are detailed in Appendix 5.

SUMMARY OF 2015 LOS MONITORING RESULTS

Table 4-1, below, presents the change in CMP network average travel speeds, calculated as time-mean speed, between 2013 and 2015 for the AM and PM peak periods (7:00 to 9:00 a.m. and 4:30 to 6:30 p.m., respectively).

Table 4-1: CMP Network Average Travel Speed

CATEGORY	TIME PERIOD	TIME-MEAN TRAVEL SPEED 2013*	2015	PERCENT CHANGE
Arterial	AM	17.1 mph	14.6 mph	- 15%
	PM	16.0 mph	12.7 mph	- 21%
Freeway	AM	38.2 mph	37.6 mph	- 2%
	PM	29.5 mph	26.3 mph	- 11%

* The method used to calculate CMP speeds was improved for the 2015 CMP, and 2013 speeds have been recalculated using the updated method for comparison to 2015 results. See Appendix 5, Attachment 5.4 for details.

Average travel speeds on the CMP network have decreased since 2013 for all times measured times and road types. Average arterial travel speeds have decreased 15% from 17.1 mph to 14.6 mph in the AM peak and decreased 21% from 16.0 mph to 12.7 mph in the PM peak. The average travel speed on freeways decreased 2% from 38.2 mph to 37.6 mph and 11% from 29.5 mph to 26.3 mph in the PM peak.

Freeway segment speeds are historically highly variable. They tend to be slower during the PM peak than the AM. Inbound segments in the AM peak tend to be slower than their outbound counterparts, and outbound segments in the PM peak tend to be lower than their inbound counterparts. Freeway speeds ranged from a decrease of 7.2 mph (on US 101/Central Freeway from I-80 to Market in the PM peak) to an increase of 7.1 mph (on US 101/Central Freeway from Market to I-80 in the AM peak). The last was the 3rd slowest CMP freeway segments in 2013, and has moved to only the 6th slowest. The slowest four segments from 2013 are again the four slowest segments in 2015, and each decreased slightly in speed.

Out of 232 CMP arterial segments, average AM peak speeds increased or stayed the same on 36 segments and decreased on 210 segments. In the PM peak, average arterial speeds increased or stayed the same on 26 CMP segments and decreased on 220 segments. The analysis confirms expectations of decreased speeds across the network.

In the AM peak period, 4 arterial segments and 4 freeway segments were found to operate at LOS F. In the PM peak period, 20 arterial segments and 6 freeway segments were found to operate at LOS F. Each arterial segment operating at LOS F in the morning peak is within an IOZ, and each freeway segment operating at LOS F also operated at LOS F during base year monitoring, and so all CMP segments are exempt from deficiency planning requirements during the morning peak. Similarly, all CMP freeway and arterial segments operating at LOS F in the evening peak period are exempt because they are either within an IOZ or operated at LOS F during base year monitoring.

Full LOS monitoring results can be found in Appendix 5.

DEFICIENCY PLANNING

Since all segments measured at LOS F in the 2015 monitoring were exempt and did not represent a deficiency, and since San Francisco was not found to be deficient for any of the Legislatively Required transit performance measures, no deficiency planning process is triggered by the 2015 CMP. The Transportation Authority is continuing to collaborate with other agencies to incorporate additional multimodal performance measures into the CMP (see subsequent sections of this Chapter) and to improve the performance of the multimodal transportation system regardless of whether a specific deficiency is identified. For a detailed discussion regarding the CMP deficiency planning process, see Appendix 8.

4.4.2 | Transit Coverage/Routing

This refers to the pattern and hierarchy of the transit route network (e.g., radial/grid, rapid/local, etc.) and the service area covered (e.g., percent of total population served within one-quarter mile; or percent of total urbanized area served). San Francisco County has the most extensive transit coverage of any Bay Area county. As shown in Table 4-A at the end of this chapter, the Muni coverage standard is to provide service running at least 19 hours per day within a ¼ mile walking distance. Other transit operators serve smaller areas of the City and primarily provide connections to other parts of the region.

4.4.3 | Transit Frequency

This is the number of transit vehicles (buses, trains, or ferries) per hour (e.g., 4 buses per hour). The inverse of the frequency is called "headway," which is the time between transit vehicles (e.g., 15 minutes between buses).

Figure 4-1 shows key transit service routes in San Francisco operated by MUNI including Rapid, Metro, and Cable Car services.

Table 4-A, found at the end of this chapter, shows frequency (headway) and coverage standards for the major transit operators that provide service in San Francisco.

A number of transit operators provide connections to and from points outside the city. Because of the predominantly suburban, low-density environment in which they function, which limits the amount and kinds of service they can provide, these operators have significantly different standards from those that Muni is expected to achieve in San Francisco. These differences are reflected in Table 4-A. The transit standards are essentially established policy and in most cases are taken directly from each operator's Short Range Transit Plan.

4.4.4 | Interoperator Coordination

This addresses the linkages between transit services provided by different operators (e.g., timed transfers at transit centers, joint fare cards, etc.), to facilitate the use of transit.

Senate Bill 602 required that MTC, in coordination with the Bay Area's Regional Transit Coordinating Committee (RTCC), develop rules and regulations for fare and schedule coordination in MTC's nine-county Bay region. SB 1474, passed in 1996, set coordination objectives for the region's transit services, and MTC has adopted Resolution 3055, Transit Coordination Implementation Plan, to comply with SB 1474. This MTC-led process is considered sufficient to meet the intent of CMP law regarding transit service coordination in the region. Compliance with MTC's process by Muni and all other

operators serving San Francisco will therefore constitute sufficient grounds for a finding of conformance with CMP transit coordination requirements.

The Transportation Authority is currently engaged with partner agencies in various efforts that seek to improve transportation system connectivity and ease interoperator transfers. This unified system, centered on a single farecard known as Clipper, is now operational in San Francisco and provides interoperator functionality. Eventually, Clipper will be part of an even more comprehensive multimodal system. This "integrated mobility account" would potentially include non-transit systems, namely FasTrak (automated bridge-tolling), on- and off-street parking payment, and, if implemented, congestion pricing fees. Such a system would provide ready access to account information through web and mobile interfaces. With a centralized mobility management system, users could also be encouraged to make better transportation decisions and evaluate travel costs and tradeoffs in a more comprehensive manner.

4.5. Local Performance Measures

In measuring performance, we are measuring the ability of the system to satisfy the transportation needs of all San Franciscans, and we must therefore measure performance with reference to particular groups of users—e.g., transit riders, bicyclists, and pedestrians.

Traffic congestion has been measured with a widely recognized, standard approach—LOS—for decades. By contrast, information about the performance of the rest of the transportation network, for those who choose to take transit, bicycle, or walk, is less standardized. Although the 2010 Highway Capacity Manual (HCM) now includes a methodology to calculate multi-modal LOS, its applicability to San Francisco's dense urban grid network is limited (see Appendix 5 for further discussion). Historically, certain transit system data has been collected in response to federal or state requirements tied to eligibility for funding. Typical data collected included total daily ridership—an indicator of current demand for service, and cost per passenger mile, an indicator of cost effectiveness. Increasingly, however, operators are deploying on-board monitoring technologies to help adjust daily operations, improve ongoing system planning, and inform longer-range capital planning.

Similarly, data pertaining to bicycle and pedestrian trips has historically been seldom available. When collected, it is usually in connection with a specific project proposal, and is not a part of a systematic effort that provides a picture of the user's experience.

Multimodal performance data is increasingly needed for system performance measurement pursuant to updates of the San Francisco Transportation Plan and congestion management planning as well as for project planning, transportation impact analysis, and project prioritization. It is necessary to provide better information to the traveling public, as well as to inform policy decisions about funding of transportation projects and services.

By applying the performance measures for travel by car, transit, bicycle, or foot to different neighborhoods in the city, we can produce a countywide picture of comparative mobility between neighborhoods, modes (e.g. transit vs. auto), or types of users (e.g. transit dependent, elderly). We can also evaluate the accessibility of different parts of the city by analyzing the number of destinations that are reachable by different modes of transportation.

The Transportation Authority's travel demand model and GIS database are the main tools for analysis of system performance data.

The Transportation Authority also continues its ongoing technical and policy vehicles for development of further local performance measures. The groundwork for further measures has been supported with allocations of Prop K funding for projects devoted to ongoing collection of multimodal data, such as automatic passenger counters (APCs) on transit vehicles, in-pavement bicycle volume counters, and intersection-level automated pedestrian counters.

4.5.1 | Transit Speed and Variability

APC DATA COLLECTION AND ANALYSIS METHODOLOGY

The San Francisco Municipal Transportation Agency (SFMTA) uses both automatic vehicle locator (AVL) and automatic passenger counter (APC) systems to collect robust, real-time data on bus performance and ridership. AVL and APC data support a wide range of operations, planning, and customer service activities.

AVL technology is installed on Muni's entire fleet of diesel (including hybrid) buses, electric trolley-buses, and light-rail vehicles. A GPS-based real-time monitoring system, AVL is useful both from an operational perspective (i.e., NextBus) and planning perspective. In 2007, the Transportation Authority used AVL data to validate travel demand model improvement efforts, which linked modeled transit speeds dynamically to auto speeds. (The San Francisco model is discussed in further detail in Chapter 8.) The 2007 CMP included, for the first time, reporting of transit speeds on key monitored segments of the Muni system.

APCs are a more robust on-board monitoring tool than AVLs. The SFMTA's APC system provides both running time (i.e., speed) information as well as passenger activity (boardings and alightings) data. In March 2005, the Transportation Authority approved the first of several allocations of Prop K funds to support the procurement and installation of APCs on a portion of Muni's bus fleet. SFMTA's Transit Effectiveness Project (TEP), (now Muni Forward), significantly accelerated the deployment of APCs on Muni's diesel bus and trolley bus fleet, in order to provide the high-resolution (i.e., stop-level and route-level) data necessary for the TEP's comprehensive system analysis.

More generally, the resources and analyses developed for the TEP's original analysis have provided SFMTA with a set of valuable tools and skills for data driven decision-making. Operations-level data, collected in real-time on a sufficient sample of vehicles and runs, supports a range of planning activities, from short-term resource deployment to financial planning and long-range system development. APC data is regularly shared between the SFMTA and the Transportation Authority for planning purposes, including for CMP reporting.

The SFMTA currently has APCs deployed on a significant portion of its bus fleet. Guided by a deployment plan, equipped vehicles are rotated across the system each month; thus each individual run (i.e., a particular scheduled departure of a specific route) is sampled on a regular basis (at least once per month). This is valuable for detailed service planning purposes. For broader system performance monitoring and planning purposes, such as the CMP, the APC data can be aggregated to a weekday peak period and have a relatively large sample set.

APC data was used to report transit speeds in 2009, 2011, and 2013. For the 2015 CMP the LOS monitoring consultants (Iteris) processed two months of APC data collected on Muni's bus (diesel and trolley coach) fleet. Muni light rail vehicles are not currently equipped with APCs, and were thus not

included in the analysis. After undergoing a quality control "cleaning" to eliminate faulty and outlier data samples, the data was filtered to include only weekday peak periods. The same AM and PM peak time periods were as used as in the LOS Monitoring (7:00am-9:00am and 4:30pm-6:30pm).

The APC equipment relies on GPS technology to recognize Muni's designated stop locations as a vehicle traverses its route. The processed dataset provides stop-to-stop travel speed, inclusive of dwell time. Dwell time is assigned to the "upstream" stop: the segment-level data represents upstream stop-arrival point to downstream stop-arrival point. In this way, the processed data corresponds with the travel time and through-speed experience by a transit rider as he or she passes multiple stops while on-board. (This is comparable to manner in which automobile speed is reported in this chapter by including fully-stopped intersection delay in the calculation of through-travel speed.). Where the transit travel time results have been mapped to CMP segmentation, the bus stop segments were split at CMP boundaries, and the distance of each bus segment within a CMP segment was used to weight the average speed over the segment.

The APC dataset is from April and May of 2015, the same period as the roadway LOS monitoring effort. This allowed the comparison of auto to transit speeds on the portions of the CMP network for which Muni data was available. For each segment, the ratio of auto-to-transit speed was calculated. This figure is equivalent to the ratio of transit travel time to auto travel time. A ratio of 2 would indicate that, for a particular route, on-board transit travel time is twice that of auto travel time.

TRANSIT SPEEDS

Transit speeds on the CMP network have declined slightly since 2013, likely due to increasing traffic congestion. Compared to 2013, the average transit speeds (collected for buses only) in 2015 on the CMP network[1] decreased from 8.8 mph to 8.7 mph in the AM peak period. In the PM peak period transit speeds decreased from 8.1 mph to 7.9 mph. A roughly equal number of segments decreased as stayed the same or increased in average transit speed, for both AM and PM peak periods; in the AM, 65 segments decreased in speed while 68 stayed the same or increased, and in the PM 67 segments decreased and 67 stayed the same or increased. Figures 4-2 and 4-3 illustrate average bus speeds on CMP segments in the AM and PM peak periods, respectively.

Transit performs better, relative to auto speeds, in 2015 than it did in 2013. In 2013, auto speeds were greater than transit speeds by a factor of 2 or more on 42% of segments in the AM peak and 49% in the PM peak, for all CMP segments for which transit speeds were reported. In 2015, the number of segments with auto speeds exceeding transit speeds by that amount decreased to only 23% in the AM peak and 19% in the PM peak. The average auto-to-transit speed ratio decreased from 2.0 to 1.7 in the AM peak and 2.1 to 1.7 in the PM peak. Table 4-2 and Table 4-3 display segments with auto-to-transit speed ratios over 2.0 for the AM and PM peak periods, respectively.

Since 2013, one of the CMP segments with the highest auto-to-transit ratio, Fulton Street from 10th Avenue to Arguello, has been operating as part of a pilot service change that has established a limited-stop 5L-Fulton line during daytime hours. Transit speeds improved significantly, from 6.7 mph to 8.8 mph in the AM peak and from 4.5 mph to 9.9 mph in the PM peak. Similarly, the auto-to-transit speed ratio dropped from over 4 to under 2. Improvements to the 14R, which runs the length of Mission St from downtown to the county line, were implemented through one of Muni Forward's travel time reduction projects, and in 2015 CMP monitoring, auto-to-transit speed ratios dropped on all Mission/Otis CMP segments. Several other segments with high auto-to-transit ratios are planned for

[1] Transit average speeds are unweighted.

transit improvements, including Van Ness Avenue with the Van Ness Avenue Bus Rapid Transit (BRT) and on Geary Blvd with the Geary BRT project. On Market Street between Van Ness and Embarcadero, where, as part of a planned series of safety enhancements, several turning restrictions direct traffic off of Market Street and transit-only lanes were painted bright red to encourage better compliance, surface transit has become more competitive with autos in both directions and both morning and evening peak travel periods.

Transit became less competitive relative to auto on 22 segments in the AM peak and 21 segments in the PM peak. By comparison, transit became more competitive relative to transit on 110 segments in both the AM and PM peak periods.

Although useful, the current analysis of individual segments does not account for the number of riders affected on segments or transit routes with different levels of performance. In future monitoring cycles, ridership data could be added to the analysis to enable identification of transit routes that affect the greatest numbers of riders. Route-level speed and travel time information may also be useful.

TRANSIT SPEED VARIABILITY

The standard deviation and coefficient of variation of travel time provide indicators of how reliable transit vehicle travel times are for a given segment. The standard deviation provides an absolute measure of variability, and indicates in minutes how far from the mean speeds typically range. The coefficient of variation (CV) is calculated by dividing the standard deviation by the average speed, thereby normalizing the results to compare relative variability between faster and slower segments. The CV is expressed as a percentage of the mean speed.

Transit speed variability is high for many segments. Coefficients of variation on many segments are 20% or more, indicating that transit travel time on a typically 30-minute trip is more than six minutes faster or slower than average more nearly one-third of the time. The coefficient of variation exceeds 30% for 23 segments in the PM peak and 15 segments in the AM peak, representing approximately ten percent of monitored segments. Table 4-4 and Table 4-5 display these least reliable segments in the AM and PM peak period.

Full results are included in Appendix 7.

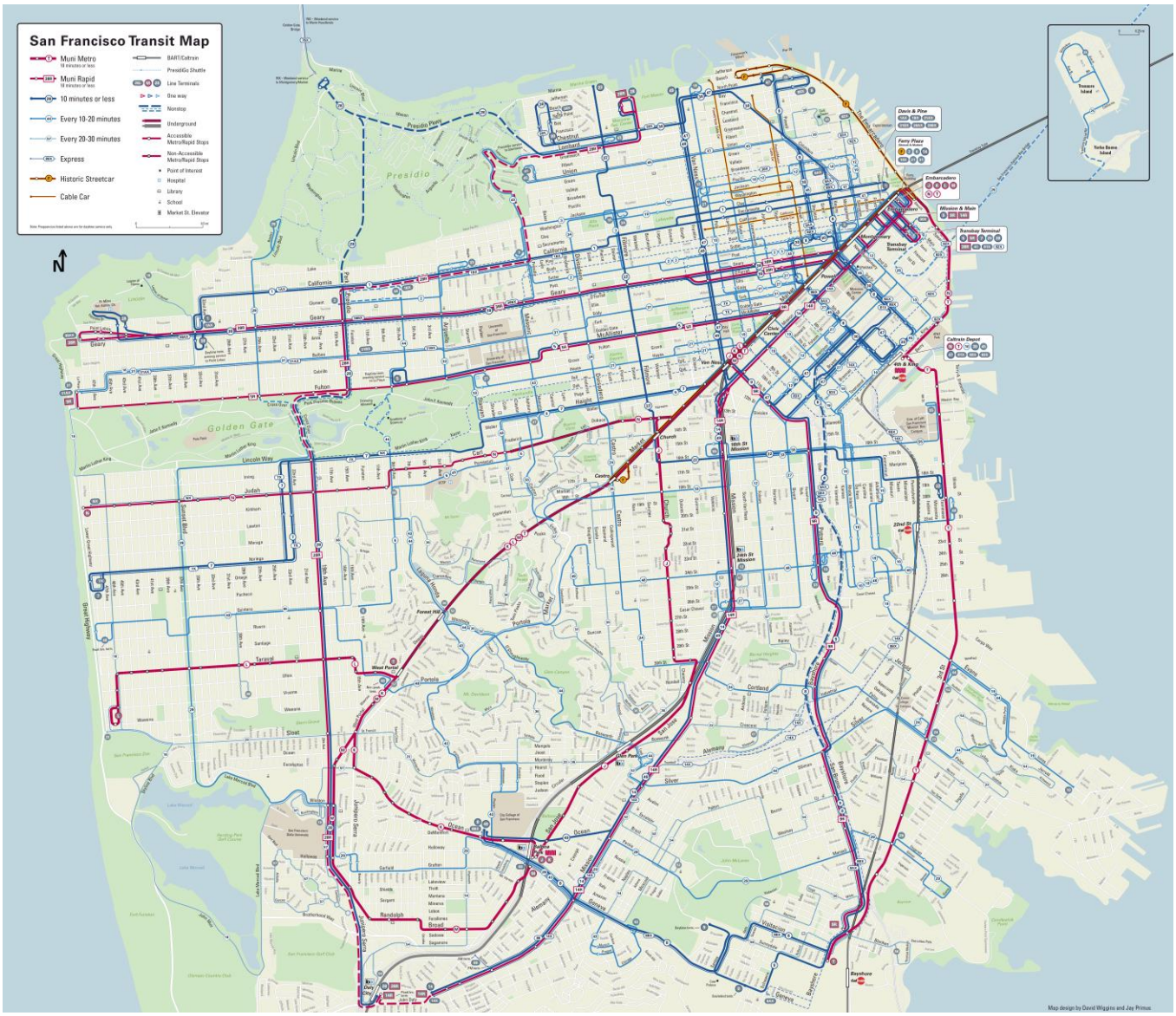
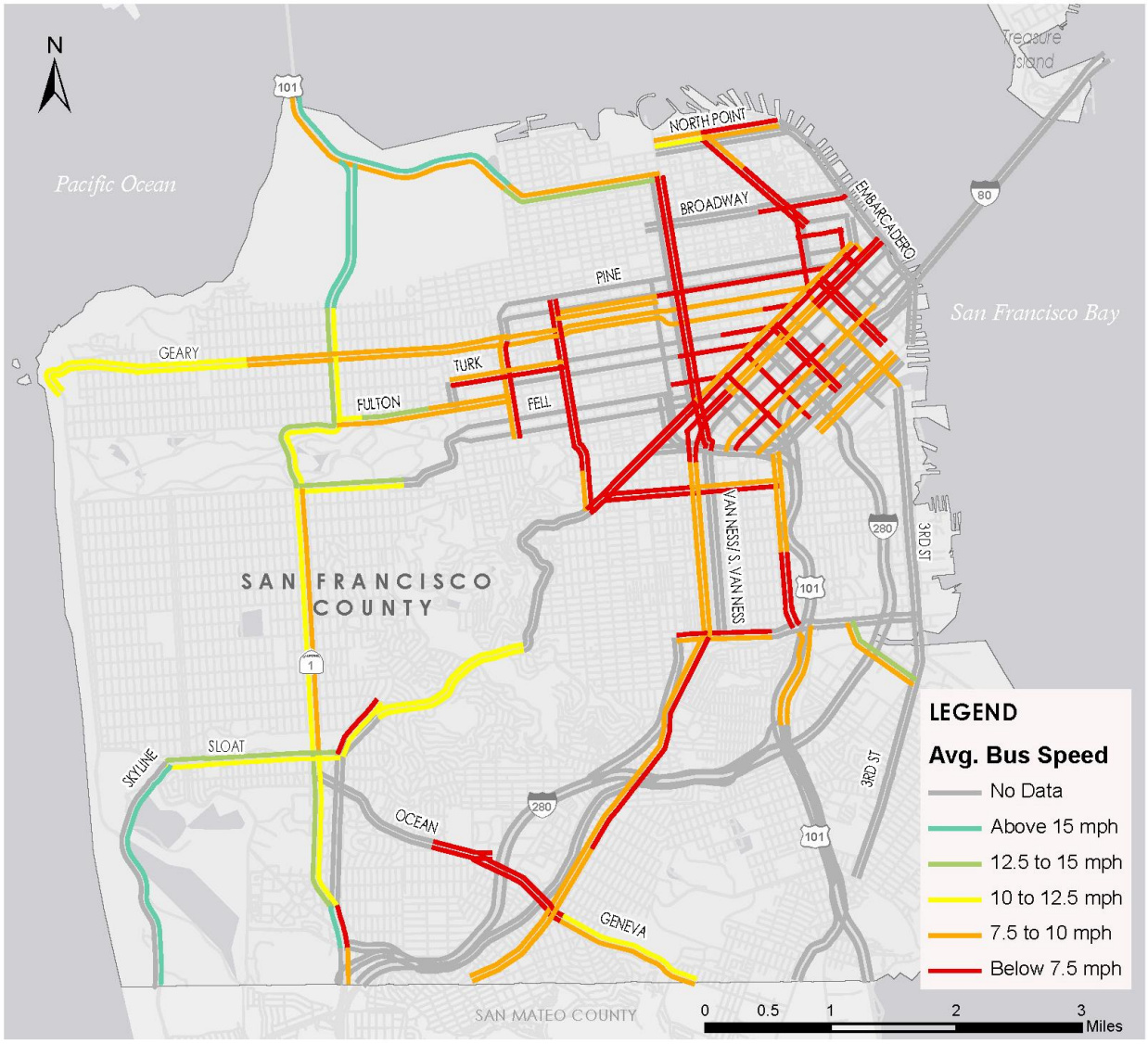


Figure 4-1: Muni San Francisco Transit System Map



Data Sources: Iteris, Inc. & SFMTA Automatic Passenger Counters

This map is for planning purposes only.

Figure 4-2: 2015 Average Muni Bus Speeds on CMP Network Segments, Weekday AM Peak

Data Sources: Iteris, Inc. & SFMTA Automatic Passenger Counters

This map is for planning purposes only.

Figure 4-3: 2015 Average Muni Bus Speeds on CMP Network Segments, Weekday PM Peak

Table 4-2: CMP Segments with Auto-to-Transit Speed Ratios above 2.0 during AM Peak

CMP SEGMENT	DIR.	AVG. AUTO SPEED (MPH)	AVG.TRANSIT SPEED (MPH)	AUTO/TRANSIT SPEED RATIO
Market/Portola: Guerrero to Castro	W	15.1	5.4	2.8
J. Serra: County Line to Brotherhood	N	27.0	9.8	2.8
Bayshore: Jerrold to Industrial	S	24.4	8.9	2.7
Doyle/ Richardson/ Lombard: County Line to SF Cemetery	E	25.4	9.7	2.6
Columbus: Greenwich to Montgomery	S	11.8	4.8	2.5
Van Ness/S. Van Ness: Washington to Lombard	N	12.7	5.2	2.4
Harrison: 8th Street to Division	W	14.0	6.0	2.3
Mission/Otis: 14th Street to 9th Street	N	12.4	5.4	2.3
Van Ness/S. Van Ness: Washington to Golden Gate	S	12.8	5.7	2.2
Market/Portola: Van Ness to Guerrero	W	14.3	6.4	2.2
16th St: Market to Mission	E	13.1	5.9	2.2
19th Ave/Park Presidio: US 101 to Lake	S	39.7	17.9	2.2
Geneva: Paris to Cayuga	W	10.7	4.9	2.2
Cesar Chavez: Bryant to Guerrero	W	13.1	6.0	2.2
North Point: Embarcadero to Columbus	W	13.9	6.4	2.2
Doyle/ Richardson/ Lombard: SF Cemetery to County Line	W	35.1	16.2	2.2
Ocean: Miramar to Howth	E	11.9	5.5	2.2
Potrero: 21st Street to Cesar Chavez	S	14.5	6.8	2.1
Turk: Stanyan to Divisadero	E	15.7	7.4	2.1
West Portal: Ulloa to Sloat	S	14.8	7.0	2.1
Fulton: Park P. to 10th Avenue	E	19.3	9.2	2.1
Potrero: 21st Street to Division	N	19.5	9.3	2.1
J. Serra: 19th to Brotherhood	S	39.3	18.9	2.1
16th St: Mission to Market	W	13.3	6.4	2.1
Sloat: Skyline to Junipero Serra	E	23.0	11.1	2.1
Van Ness/S. Van Ness: Golden Gate to Washington	N	11.1	5.4	2.1
Van Ness/S. Van Ness: 13th to Golden Gate	N	13.0	6.4	2.0
8th St: Market to Bryant	S	13.5	6.7	2.0
Harrison: 4th Street to 8th Street	W	17.2	8.6	2.0
Ocean: Howth to Miramar	W	11.4	5.7	2.0

Table 4-3: CMP Segments with Auto-to-Transit Speed Ratios above 2.0 during PM Peak

CMP SEGMENT	DIR.	AVG. AUTO SPEED (MPH)	AVG.TRANSIT SPEED (MPH)	AUTO/TRANSIT SPEED RATIO
Columbus: Montgomery to Greenwich	N	4.4	12.5	2.8
Market/Portola: Guerrero to Castro	W	4.8	13.0	2.7
Bayshore: Jerrold to Industrial	S	7.5	19.3	2.6
West Portal: Ulloa to Sloat	S	5.8	14.3	2.5
Mission/Otis: 14th Street to 9th Street	N	5.4	13.3	2.5
Columbus: Greenwich to Montgomery	S	4.2	10.2	2.4
Fulton: Park P. to 10th Avenue	E	8.8	20.6	2.3
Harrison: 1st Street to 4th Street	W	5.6	13.1	2.3
North Point: Columbus to Van Ness	W	5.7	13.2	2.3
Market/Portola: Guerrero to Van Ness	E	5.3	12.2	2.3
Market/Portola: Van Ness to Guerrero	W	4.8	10.9	2.3
16th St: Market to Mission	E	6.0	13.5	2.3
Van Ness/S. Van Ness: Golden Gate to Washington	N	5.2	11.7	2.3
Van Ness/S. Van Ness: Washington to Lombard	N	7.4	16.4	2.2
Fulton: 10th Avenue to Park P.	W	6.7	14.7	2.2
Skyline: County Line to Sloat	N	16.4	35.8	2.2
Doyle/ Richardson/ Lombard: County Line to SF Cemetery	E	18.5	39.9	2.2
Hayes: Market to Gough	W	5.4	11.2	2.1
Folsom: 8th Street to 4th Street	E	4.6	9.5	2.1
Harrison: 8th Street to Division	W	6.2	12.8	2.1
19th Ave/Park Presidio: US 101 to Lake	S	18.8	38.0	2.0
Geneva: Cayuga to Paris	E	5.3	10.7	2.0
Ocean: Miramar to Howth	E	5.5	11.1	2.0
Sloat: Skyline to Junipero Serra	E	11.2	22.6	2.0
Ocean: Howth to Miramar	W	4.3	8.6	2.0

Table 4-4: Least Reliable Transit Segments (CV>30%), AM Peak

SEGMENT	DIR.	AVG. TRANSIT SPEED (MPH)	S.D. TRANSIT SPEED (MPH)	COEFFICIENT OF VARIATION
J. Serra: County Line to Brotherhood	N	9.8	7.7	79%
J. Serra: 19th to Brotherhood	S	18.9	12.2	65%
J. Serra: Brotherhood to 19th	N	7.2	4.3	60%
Evans: Cesar Chavez to 3rd Street	E	9.8	4.4	45%
Townsend: 2nd Street to 7th Street	W	9.2	3.9	42%
Masonic: Page to Geary	N	7.4	3.1	42%
Doyle/ Richardson/ Lombard: Lyon/Francisco to SF Cemetery*	W	16.2	6.5	40%
Doyle/ Richardson/ Lombard: SF Cemetery to County Line	W	16.2	6.5	40%
2nd St: Brannan to Market	N	7.2	2.7	38%
Market/Portola: Van Ness to Guerrero	W	6.4	2.2	34%
Doyle/ Richardson/ Lombard: County Line to SF Cemetery	E	9.7	3.1	32%
Doyle/ Richardson/ Lombard: SF Cemetery to Lyon/Francisco	E	9.7	3.1	32%
Fulton: Park P. to 10th Avenue	E	9.2	2.9	32%
Main: Mission to Market	N	8	2.5	31%
Bayshore: Jerrold to Industrial	S	8.9	2.7	30%

Table 4-5: Least Reliable Transit Segments (CV>30%), PM Peak

SEGMENT	DIR.	AVG. TRANSIT SPEED (MPH)	S.D. TRANSIT SPEED (MPH)	COEFFICIENT OF VARIATION
Sloat: Skyline to Junipero Serra	E	11.2	10.8	96%
Main: Mission to Market	N	6	5.5	92%
Townsend: 2nd Street to 7th Street	W	5.7	3.5	61%
North Point: Columbus to Embarcadero	E	7.9	3.8	48%
Pine: Market to Kearny	W	8.9	4.2	47%
Fulton: 10th Avenue to Park P.	W	6.7	3.1	46%
5th St: Brannan to Market	N	3.8	1.7	45%
2nd St: Brannan to Market	N	5.7	2.5	44%
19th Ave/Park Presidio: Lake to US 101	N	11.3	4.8	42%
Fulton: Park P. to 10th Avenue	E	8.8	3.3	38%
Bayshore: Jerrold to Industrial	S	7.5	2.8	37%
J. Serra: County Line to Brotherhood	N	13.2	4.9	37%
Doyle/ Richardson/ Lombard: Lyon/Francisco to SF Cemetery*	W	10.8	4	37%
Doyle/ Richardson/ Lombard: SF Cemetery to County Line	W	10.8	4	37%
Beale/Davis: Clay to Mission	S	7.1	2.6	37%
J. Serra: 19th to Brotherhood	S	17.2	6.2	36%
Harrison: 1st Street to 4th Street	W	5.6	2	36%
Folsom: 8th Street to 4th Street	E	4.6	1.6	35%
Townsend: 7th Street to 2nd Street	E	5.1	1.7	33%

2nd St: Market to Brannan	S	4.6	1.5	33%
Cesar Chavez: Guerrero to Bryant	E	6.8	2.2	32%
Bayshore: Industrial to Cesar Chavez	N	9.7	3.1	32%
Broadway: Montgomery to Embarcadero	E	5.6	1.7	30%

4.5.2 | Muni Service Standards and Milestones

In November 1999, San Francisco voters passed Proposition E which, among other changes, amended the City Charter to require the creation of service standards and milestones for Muni to attain. The SFMTA Board of Directors updates these periodically. Table 4-B lists the service standards and milestones that directly pertain to the improvement of Muni performance.

Muni on-time performance as measured by arrival times against published schedules has fallen since the last CMP update in 2011 from 73% to 60%, below the goal of 85%. Headway adherence has remained constant, with approximately 65% adherence, also below the 85% goal. The proportion of scheduled service hours actually delivered fell to 95 percent from 97% in 2011. The goal for service delivered is 98.5%. Finally, the proportion of vehicles too full to board (pass-ups) increased in the morning peak period to 6.5% (from 5% in 2011) but decreased slightly in the afternoon peak from 8% in 2011 to 7% in 2013. Both morning and afternoon peak pass-ups remain above the 4% goal.

4.5.3 | Pedestrian and Bicycle Volumes

The City and County of San Francisco has placed a high priority on shifting travelers' modes to increase the number of trips made by walking and bicycling. Unlike automobile and transit volumes, increasing volumes of pedestrian and bicycle traffic are a direct indicator of system performance because increased use of these modes alleviates, rather than causes, traffic congestion and transit crowding. Walking and bicycling are space-efficient, healthy, and environmentally beneficial ways to travel, and have minimal negative impact on surrounding communities.

The Transportation Authority estimates from the 2010-2012 California Household Travel Survey (CHTS) that during the study period approximately 24% of trips to, from, and within San Francisco were made by walking, while approximately 2% were made by bicycle. Trips beginning and ending in San Francisco were estimated to be about 34% walking and 3% bicycling. In 2010, the San Francisco Board of Supervisors adopted a resolution establishing an ambitious citywide goal of 20% of trips being made by bicycle by 2020.

Little data has historically been available to measure the numbers of trips made by walking and bicycling, but City and County agencies are now working together to collect volume data for both modes on a more regular basis.

In 2009, the Transportation Authority approved two Prop K allocations to develop SFMTA's ability to collect pedestrian and bicycle data on a regular basis, and in 2013 the Transportation Authority approved an allocation to further develop an automated bicycle counter system. These efforts have collected mode-specific volume data at key locations in the city, although the pedestrian count effort has focused more on collecting data at many different locations than on developing a consistent but smaller set of locations to track over time.

Unlike for automobile and transit performance, volume information—tracked over time—is a reasonable proxy for the "performance" of a non-motorized mode of travel and the shifting usage to

that mode. Under the City's Transit First policy, the Countywide Transportation Plan, and numerous other policy documents, increases in pedestrian and bicycle travel are central and explicit goals.

CITYWIDE BICYCLE COUNTING PROJECT

SFMTA has conducted citywide bicycle counts at key intersections and corridors since 2006. The number of bicycle count locations has grown over the years – 21 in 2006, 40 in 2011, 51 in 2013, and 79 survey locations in 2014. While annual bicycle counts have in the past been completed each August, the count date was moved to late September in 2011 both to align more closely with the bicycle counting standards set by the National Bicycle and Pedestrian Documentation Project (NBPDP) and to capture bicycle trips taken while school is in session. Additionally, count duration has been increased from approximately one-and-a-half to approximately two hours. Counts continue to be conducted primarily during the PM peak period. During the 2014 count effort, video data collection technology was utilized for the first time. This approach captures a more holistic picture of trips at key locations by also counting people walking, taking transit, and traveling in vehicles in the city.

Figure 4-4 shows bicycle counts from 2011 through 2014. It must be noted that count locations have been increasing and the figure shows counts from the same 38 counters for all three years. There has been a significant increase of about 14% in bicycle counts from 2011 to 2013. Assuming uniform growth, the annual growth would be 7%. However, it appears that the growth from 2013 to 2014 has been marginal at 1.5%. A comparison with data back from 2006 (when the counts project started) shows that 3,748 bicycles in 2006 have grown to 11,473 bicycles in 2014 at 19 overlapping locations – a 206% increase over 8 years. A total of 26,817 bicycles were observed at 79 survey locations in 2014. Full results of the bicycle count are available in the SFMTA's 2014 Bicycle Count Report.

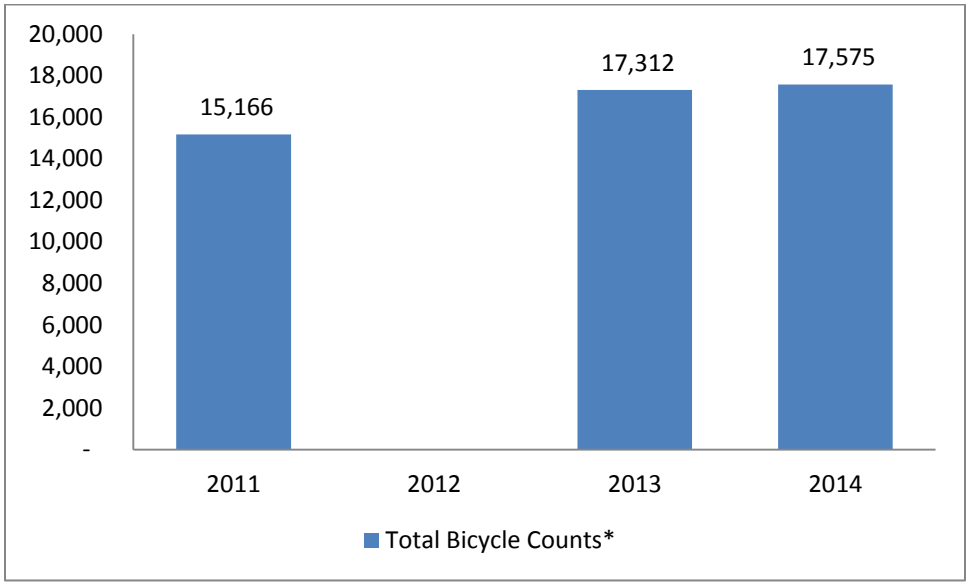


Figure 4-4: Manual Bicycle Counts 2011-2014

* Volumes represented are at the same 38 locations for all three years. No data collected in 2012.

Source: SFMTA Annual Bicycle Count Survey 2014

In recent years, there has been a proliferation of automated counters due to the fact that manual method of data collection is limited by staffing constraints and lacks the ability to quantify bicycle usage at different times of the day, seasonally, and throughout the year. SFMTA currently operates 25

automated bicycle counters all over the city that operate round the year. Data from these automatic bicycle counters has become available for the first time in 2013, providing a set of continuous streams of ridership data in a cost-effective manner. SFMTA plans to add 50 additional counters by 2017. The automated bicycle count data is more robust than that collected manually on a specific day during a specific week. Figure 4-5 shows that monthly weekday bicycle counts collected by 19 automated counters from 2013. Due to gaps in data remaining counters were excluded from the analysis. While SFMTA's citywide bicycle counting effort show an increase in cycling, counts from automated counters indicate a slight decrease. This could indicate that cycling has been relatively flat since 2013, but it could also indicate that cyclists are changing their routes as infrastructure is built, so they are not being counted at the fixed counter locations.

In addition to the SFMTA, SFCTA has initiated a manual bicycle counts effort this year that it intends to continue in future. This effort was implemented along with counting both turn movements and pedestrians at the selected intersections. Bicycle counts were recorded for 2 hours each in the AM (7AM – 9AM) and PM (4:30PM – 6:30PM) peak periods at 14 intersections around the city. The counts by location are reported in Table 4-7. In contrast to the SFMTA counts, these were recorded between the last week of April and third week of May 2015.

Table 4-7: SFCTA Bicycle Counts, April-May 2015

COUNT LOCATION	AM (7-9)	PM (4:30-6:30)	TOTAL
3rd St & 16th St	61	96	157
3rd St & Evans Ave	61	63	124
3rd St & Palou Ave	73	76	149
6th St & Howard St	91	478	569
19th Ave & Holloway Ave	35	50	85
Geneva Ave & Alemany Blvd	21	24	45
Leavenworth St & Eddy St	20	44	64
Mission St & 16th St	121	199	320
Montgomery St & Bush St	87	44	131
Park Presidio Blvd & Geary Blvd	11	11	22
Portola Dr & O'Shaughnessy-Woodside	30	11	41
Potrero Ave & 16th St	74	100	174
South VanNess Ave & 13th St	67	154	221
Stockton St & Broadway	81	78	159
All locations	833	1,428	2,261

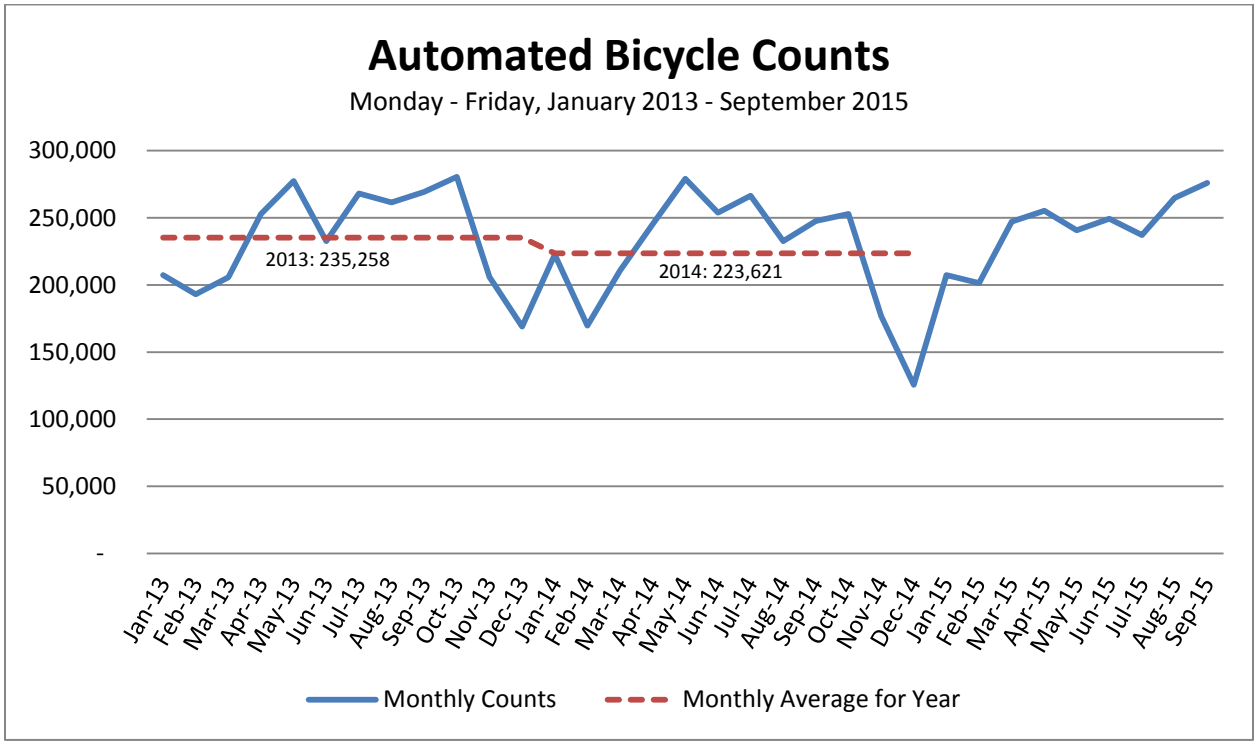


Figure 4-5: Monthly Automated Bicycle Counts (Weekday) 2013-2015

4.5.4 | Bicycle Network Connectivity

The extent and connectivity of the pedestrian and bicycle networks are important metrics of non-motorized transportation performance. Comprehensive networks that allow pedestrians and bicyclists to travel easily and safely between destinations are essential to encourage non-motorized travel as an alternative to driving and contributing to traffic congestion.

The San Francisco Bicycle Plan, adopted by the SFMTA in 2009, includes improvements to and expansion of the City's existing bicycle routes, which comprised 208 total miles in 2008. The Plan, which was originally adopted in 2005 but subject to a four-year court injunction that was lifted partially in 2009 and entirely in 2010, calls for 34 miles of new Class II bicycle lanes in addition to the previously existing 45 miles, 75 miles of shared on-street bike routes marked with sharrows, new and improved bicycle parking citywide, as well as additional programs, policies, and projects to improve bicycle connectivity and safety.

Since the Bicycle Plan injunction was lifted, the City has moved rapidly to implement it. 30 of the 34 miles of Class II bicycle lanes proposed in the plan had been completed as of August 2014. In addition, six bike lane projects developed after the 2009 Bike Plan were also completed adding another 3.2 miles. Progress on the Plan has also included upgrades to existing bike infrastructure including sharrows and pilot installation of separated bikeways, bike boxes at intersections, and colored pavement treatments to increase the visibility and safety of bicycling on City streets. 51 of the 75 miles of shared bike routes identified in the 2009 Bike Plan had been completed as of August 2014.

Table 4-8 summarizes length of bicycle facilities by type. As of October 2015, the completed network included 436 miles of bike routes, of which 16% were Class I paths and 32% were Class II designated bicycle lanes. The rest are Class III signed routes in shared lanes, many of which have wide shoulders or are marked with sharrows. There are also 13 miles of Class IV bike facilities that are separated by a vertical element from the rest of traffic.

Table 4-8: San Francisco Bicycle Facilities, 2011 to 2015

	2011		2013		2015	
FACILITY TYPE	MILES	% TOTAL	MILES	% TOTAL	MILES	% TOTAL
Bicycle Path (Class I)	69	18%	69	16%	69	16%
Bicycle Lane (Class II)*	121	31%	132	31%	140	32%
Bicycle Route (Class III)	193	49%	213	50%	214	49%
Separated Bikeways (Class IV)**	6	2%	12	3%	13	3%
Total	389	100%	427	100%	436	100%

Source: SFMTA

* includes bike lanes and buffered bike lanes (paint buffer only). ** includes bike lanes with vertical barrier element (such as curb, planter, parking).

The SFMTA 2013-2018 Bicycle Strategy recommends that a new "Comfort Assessment" methodology related to what is termed "Level of Traffic Stress" (LTS) be used going forward. This recognizes the fact that there are diverse arrays of bike facility characteristics that may not be accurately described by just the "Class" level categories. The methodology would further promote the city's goal to create a network that is comfortable for all users, especially vulnerable user groups like youths, the disabled, seniors, and low-income communities. The strategy report identified that about 20 miles of the city's bicycle network has buffered bike lanes, and cycle tracks that satisfy the comfort level of most people. The strategy also stresses that consistency of LTS along corridors is as important as the LTS itself. This kind of an assessment could help identify network gaps and intersection "hot spots".

4.5.5 | Pedestrian and Bicycle Safety

Safety for pedestrians and cyclists are key measures of non-motorized transportation performance, and a critical policy priority for the city of San Francisco. The City and County of San Francisco adopted Vision Zero as a policy in 2014, committing to build better and safer streets, educate the public on traffic safety, enforce traffic laws, and adopt policy changes that save lives. The goal is to create a culture that prioritizes traffic safety and to ensure that mistakes don't result in serious injuries or death.

In tracking progress towards reducing injuries and fatalities, the primary source of data is the California Statewide Integrated Traffic Records System (SWITRS) maintained by the California Highway Patrol, which compiles all local collision reports into a unified database. Fatalities from traffic collisions are tracked, and collisions resulting in injury are classified by severity of injury. Table 4-9, below, displays injury and fatality statistics by involved party for the most recent decade for which traffic collision data has been analyzed (2003-2013).

As shown in Table 4-9, injury collisions among all users has varied throughout the decade, with no clearly discernible trends; injuries peaked in 2012 and then fell to their lowest level in the decade in the following year.

One clear trend is an increase in bicyclist collisions, which grew steadily over the decade, increasing by 112 percent between 2003 and 2012. This increase is likely due to the significant rise in bicycling activity observed in recent years and to the citywide injunction on bicycle improvements which was in place from 2006 until August 2010.

Collisions resulting in injury are a more reliable indicator of safety trends than traffic deaths: fatal collisions, being rarer events, are subject to more random fluctuation and greater relative (percentage) shifts on a year-to-year basis. Still, across a longer timeframe, traffic fatalities have declined significantly. Annual traffic deaths among all users in the 1960s regularly exceeded 100 per year; during the 2003-2013 period, annual traffic fatality totals have varied between 23 and 42 annually. Pedestrian fatalities have represented approximately 60% of total traffic deaths during this ten-year period, with annual figures varying between 13 and 25 pedestrian fatalities per year.

Since the launch of the Vision Zero policy in 2014, city agencies have redoubled efforts to reduce traffic injuries and fatalities. The SFMTA committed to implementing 24 safety engineering projects in 24 months, and has implemented 17 as of fall, 2015. During the same period, a major safety education campaign focused on increasing driver yielding to pedestrians was completed, and police citation activity increased significantly.

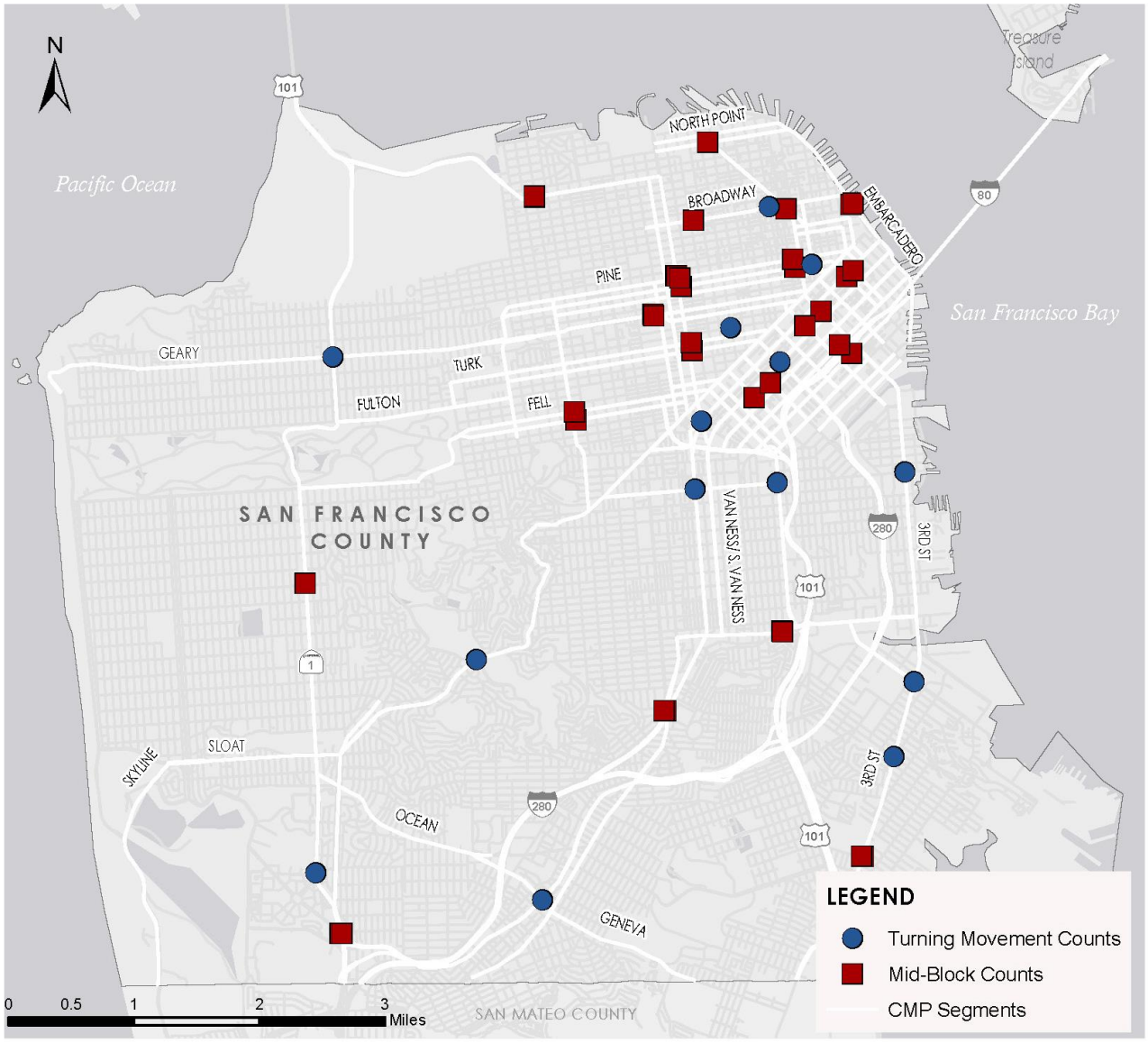
Table 4-9: Traffic Collision Injuries and Fatalities by Involved Party, 2003-2013

	YEAR	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Injury Collisions	All Users	3,511	3,038	3,227	2,869	3,021	3,010	2,877	3,081	3,111	3740	2562
	Pedestrians	815	727	747	726	796	799	695	784	844	942	518
	Bicyclists	311	316	343	343	451	468	531	599	630	658	454
Fatal Collisions	All Users	41	33	26	28	42	27	30	23	28	31	34
	Pedestrians	25	20	14	15	24	13	17	14	17	16	21
	Bicyclists	1	1	2	2	1	3	1	1	4	2	4

Source: California Highway Patrol SWITRS Annual Report

4.5.6 | Multimodal Volume Monitoring

Congestion on city streets and crowding on transit are the outcome of several factors including, for congestion, the number of cars driving; the roadway capacity available; construction, lane blockages, and other special events; allocation of signal green-time to various competing modes and movements, and for crowding, the number of riders; vehicle size, frequency of service, origin-destination demand patterns. These factors can be roughly classified into supply-side and demand-side. In order to understand the latter, and create a set of data that can be analyzed longitudinally by various modes, with the 2015 CMP the Transportation Authority began a biennial multimodal volume monitoring program which, in the first year, collected mainline traffic volumes at 29 locations and intersection traffic, bike, and pedestrian counts at 14 locations. Figure 4-7 shows locations where counts were collected. The mainline counts are continuous 3-day midweek counts (including two locations where weekend counts were also collected). The intersection counts were conducted on one day, with 2-hour AM peak and 2-hour PM peak counts, totaling 4-hours of counts at each location. By collecting volume at a fixed set of locations on a biennial basis, we can form a basis for some insight into trends over time. This complements the SFMTA's annual bicycle count program. Results of multiday mainline traffic counts are shown in Table 4-10. Results of multimodal peak period intersection counts are shown in Table 4-11



Data Sources: Iteris, Inc. & 2015 SFCTA LOS Monitoring

This map is for planning purposes only.

Figure 4-7: Locations of Turning Movement and Mid-Block Counts

Table 4-10: Traffic Volumes at Mainline Count Locations

	NORTHBOUND			SOUTHBOUND		
LOCATION	DAILY	AM	PM	DAILY	AM	PM
19th Ave between Moraga and Noriega	31,547	2,600	4,190	35,793	4,276	4,815
1st St between Mission and Minna	-	-	-	15,061	2,001	1,236
3rd St between Fitzgerald and Gilman	11,169	1,754	1,270	9,892	1,217	1,501
3rd St between Minna and Howard	29,231	3,661	3,274	-	-	-
4th St between Minna and Howard	-	-	-	14,859	1,242	2,274
7th St between Howard and Folsom	22,434	2,719	2,980	-	-	-
8th St between Tehama and Celementina	-	-	-	19,721	2,454	1,920
Columbus Ave between Broadway and Pacific	11,798	1,411	1,677	13,102	2,018	1,327

Fremont St between Mission and Natoma	19,928	2,493	2,109	-	-	-
Junipero Serra Blvd between Font and Brotherhood Ramps	50,644	5,931	6,234	49,438	6,408	6,720
Mission St between 24th and 25th	7,477	1,026	957	7,007	524	1,079
San Jose Ave between Randall and Saint Mary's	20,457	3,399	2,867	17,793	2,354	3,248
The Embarcadero between Broadway and Washington	19,132	2,576	2,022	16,424	2,140	1,664
Van Ness Ave Between California and Pine	25,347	2,997	2,799	21,788	2,025	3,121
	Eastbound			**Westbound**		
Bay St between Leavenworth and Columbus	11,572	2,562	1,325	10,806	947	2,357
Broadway Tunnel between Larken and Powell	16,423	2,114	1,867	14,345	1,295	2,412
Bryant St between 3rd and 4th	20,518	3,227	1,680	-	-	-
Bush St between Grant and Kearny	29,037	3,693	3,244	-	-	-
Bush St between Van Ness and Polk	21,215	2,985	2,021	-	-	-
Cesar Chavez St between York and Hampshire	28,494	3,287	3,782	25,407	3,592	3,282
Fell St between Divisadero and Scott	-	-	-	28,481	2,815	4,080
Geary Blvd between Laguna and Gough	18,189	3,298	2,099	16,443	1,499	2,595
Golden Gate Ave between Van Ness and Polk	13,569	1,997	1,726	-	-	-
Harrison St between 3rd and 4th	-	-	-	24,093	2,489	3,178
Lombard St between Broderick and Divisadero	25,346	3,920	2,939	25,452	2,214	3,820
Oak St between Divisadero and Scott	27,873	3,616	3,095	-	-	-
Pine St between Grant and Kearny	-	-	-	15,109	1,542	2,164
Pine St between Van Ness and Polk	-	-	-	18,327	1,276	2,867
Turk St between Van Ness and Polk	-	-	-	11,917	1,231	1,825

Table 4-11: Multimodal Volumes at Intersection Count Locations

	AM			PM		
LOCATION	VEHICLE TRAFFIC	BICYCLES	PEDESTRIANS	VEHICLE TRAFFIC	BICYCLES	PEDESTRIANS
3rd St and 16th St	3,574	61	172	4,043	96	254
3rd St and Evans Ave	3,445	61	218	3,496	63	230
3rd St and Palou Ave	3,192	73	780	3,696	76	969
6th St and Howard St	5,265	91	835	6,044	478	1,121
19th Ave and Holloway Ave	9,123	35	1,803	10,079	50	2,297
Geneva Ave and Alemany Blvd	5,287	21	216	5,651	24	402
Leavenworth St and Eddy St	2,049	20	1,336	2,225	44	2,216
Mission St and 16th St	2,913	121	3,279	4,238	199	5,352
Montgomery St and Bush St	3,385	87	7,395	2,158	44	9,165
Park Presidio Blvd and Geary Blvd	10,847	11	796	11,226	11	812
Portola Dr and O'Shaughnessy / Woodside	7,625	30	398	8,091	11	270
Potrero Ave and 16th St	4,452	74	776	5,834	100	785
South Van Ness Ave and 13th St	8,918	67	299	8,846	154	395
Stockton St and Broadway	4,178	81	3,554	4,514	78	4,295

4.6. Work Program Items

Work program items consist of those intended to improve the City's performance monitoring as well as initiatives targeted at improving system performance. Transportation Authority work program elements intended to continue and enhance performance monitoring include:

- Monitor CMP network speeds and LOS in Spring 2015.
- Collect vehicle, transit, pedestrian, and bicycle count information to understand longitudinal trends in demand.
- Monitor transit travel times and reliability on the CMP network and Muni Rapid Network, and work with SFMTA to further develop and establish regular spatial reliability data reporting.
- Work to include transit ridership in future monitoring results in order to estimate person-throughput on the CMP network.
- Coordinate with City departments to improve the availability and collection of data about level of service and performance of all modes. Examples of modal performance analyses include SFMTA's planned bicycle network comfort index study to inform project prioritization.
- With OEWD, SFMTA, and other partner agencies, support development of a data monitoring practice for all-night transportation as part of the Late Night Transportation Study.
- Coordinate with the SFMTA on bicycle counting and pedestrian counting projects.
- Collaborate with other City agencies to refine and standardize metrics for bicycle and pedestrian performance.

In addition, the Transportation Authority and City agencies will continue to engage in planning efforts and implement projects to improve performance of the transportation system. The San Francisco Transportation Plan, scheduled for adoption in December 2013, focuses on prioritizing projects and programs and developing strategies to improve system performance. The Transportation Authority will, as part of its efforts to improve performance:

- Continuously improve the San Francisco Model's capability to model all modes of transportation, including bicycle and pedestrian trips.
- Work with SFMTA to identify Transit Performance Initiative priorities (the City's long range priorities for BART, Caltrain, and Muni Metro). Fund a Long Range Transit Network Development study to identify solutions to Muni Metro system bottlenecks and include solutions that would improve the travel time and reliability of Muni Metro tunnel operations.
- Continue to participate in multimodal corridor improvement efforts such as the Better Market Street Project and BRT projects.
- Through a partnership with the region, counties, and Caltrans, identify and promote San Francisco's priorities for the regional freeway network. Set a vision for the management of the City's freeway management through the Freeway Performance Initiative.
- Continue to participate in citywide pedestrian safety initiatives, including through the Pedestrian Safety Task Force, by coordinating with other City agencies to implement the WalkFirst investment strategy, and by supporting the City's traffic calming program.
- Coordinate with SFMTA on development and implementation of the bicycle network.
- Dedicate Prop K funds to the design and implementation of complete streets enhancements that "Follow the Paving."

Table 4-A

Transit Service

Frequency and Coverage Standards

MUNI

Frequency Standard (headway in minutes)

Route Type	Day	Weekday Evening	Late Night
Rapid	10	15	20
Grid	20	20	30
Circulator	30	30	--
Specialized		Based on demand	

Route Type	Day	Weekend Evening	Late Night
Rapid	12	15	20
Grid	20	20	30
Circulator	30	30	--

Coverage Standard

All residential neighborhoods in San Francisco should be within a quarter of a mile of a Muni bus stop or rail line stop.

AC TRANSIT

Frequency Standard (headway in minutes)

SERVICE TYPE	TIME PERIOD				
	Peak	Mid-day	Night	Owl	Weekend/Holidays
Transbay Express	10-30	--	--	--	--
Transbay Basic	10-15	30-45	45-60	--	30

Coverage Standard

AC Transit provides two levels of service to the Transbay Terminal in San Francisco. Transbay Express provides medium to high frequency peak-hour service between San Francisco and selected areas of the District where there is demand for transit services which BART cannot meet. Transbay Basic provides direct service between San Francisco and major East Bay areas that are not well served by BART; the service operates all day at a medium to high frequency on a local and/or limited stop basis.

Table 4-A (cont.)

BART

Frequency Standard (headway in minutes)

LINE

TIME PERIOD	Pittsburg/ Bay Point	Dublin/ Pleasanton	Fremont-Daly City	Richmond-Millbrae	Downtown San Francisco (Combined)
Weekday Peak	5	15	15	15	2.7
Weekday Mid-day	15	15	15	15	3.8
Weekday Night	20	20	--	--	10.0
Saturday Day	20	20	20	20	5.0
Saturday Night	20	20	--	--	10.0
Sunday/Holiday all day	20	20	--	--	

Coverage Standard

BART rail service is provided between the hours of 4:00 a.m. and approximately 1:30 a.m. Monday through Friday, 6 a.m. to approximately 1:30 a.m. on Saturdays, and 8 a.m. to approximately 1:30 a.m. on Sundays and major holidays. Closings for individual stations are timed with the schedule for the last train beginning at approximately midnight.

BART has eight stations in San Francisco: Four spaced a half mile apart on Market Street and four at variable distances in the central and southern areas of the City.

CALTRAIN

Frequency Standard
Three trains per hour during peak periods, supplemented by Baby Bullet express service twice per hour during peak periods.

Sixty-minute headways on weekday midday, evening, and weekend service. Weekend service is supplemented by two Baby Bullet express trains.

Coverage Standard
The Caltrain system operates on a 77.2-mile route between San Francisco and Gilroy. There are 33 stations in the 19 cities that Caltrain serves, including two in San Francisco. San Francisco is also directly served by the Bayshore Caltrain station, located immediately south of the City/County limits in San Mateo County

Table 4-A (cont.)

GOLDEN GATE TRANSIT

Frequency Standard (headway in minutes)

	TIME PERIOD	
SERVICE TYPE	**Peak**	**Base**
Commute Bus	60 (peak direction only)	
Basic Service Bus	60	60
Larkspur Ferry	2 hrs	2 hrs
Sausalito Ferry	2 hrs	2 hrs.

Coverage Standard

Commute bus routes operate weekdays, in the peak travel direction, between residential areas in Marin and Sonoma Counties and the San Francisco Financial District and Civic Center.
Basic service routes operate all day, seven days a week, between the Transbay Terminal and Civic Center in San Francisco and various suburban centers within Marin and Sonoma Counties.

Commute bus service will be considered in the commute and/or reverse-commute directions along service corridors with a demonstrated or projected daily ridership that supports at least two round-trips carrying 30 passengers per trip on average (120 passengers per day) when resources are available to improve service.

On ferries, improved headways will be considered in cases where the maximum load factor is exceeded and resources are available to improve service.

SAMTRANS

Frequency Standard (headway in minutes)

	TIME PERIOD	
SERVICE TYPE	**Peak**	**Off-Peak**
Coastal	90	90
Community	60	--
Local	60	60
Multi-City	60	60
Mainline	30	60

Coverage Standard

SamTrans' goal is to ensure 70 percent of county residents live within walking distance (i.e., one quarter mile) of a bus stop. Transit access is determined by mapping all active bus stops within the system and then calculating the population (based on 2010 Census data) within one-quarter mile radii of those stops. This information is then compared to the total county population.

Table 4-B: Muni Service Standards and Goals 1999-2015

STANDARD	FY 99/00 Actual	FY 02/03 Goal	FY 02/03 Actual	FY 03/04 Goal	FY 03/04 Actual	FY 04/05 Goal	FY 04/05 Actual	FY 05/06 Goal	FY 05/06 Actual	FY 06/07 Goal	FY 06/07 Actual	FY 08/09 Goal	FY 08/09 Actual
Vehicles that run on time	46%	75%	71%	85%	68%	85%	71%	85%	69%	85%	71%	85%	73.30%
Scheduled service hours delivered	95.6%	97.5%	94.5%	98.5%	97.3%	98.5%	94.3%	98.5%	94.2%	98.5%	94.3%	98.5%	97%
Vehicles too full to board	0.2%	<5%	1.6%	<5%	2.1%	<5%	0.4%	<5%	1.6%	<5%	1.30%	<5%	AM: 3.9% PM: 2.8%
Peak period load factors (% of capacity)	Various	<85%	2 lines exceeded goal	<85%	3 lines exceeded goal	<85%	6 lines exceeded goal	<85%	7 lines exceeded goal	<85%	14.9% of lines exceeded goal	<85%	TBD in Next SRTP
Actual headways vs. scheduled	45%	85%	75%	85%	69%	85%	69%	85%	60%	85%	61%	85%	60.2%
Percentage of transit trips with <2 min bunching on Rapid Network													
Percentage of transit trips with +5 min gaps on Rapid Network													
Vehicle availability	99.6%	98.5%	99.6%	98.5%	99.0%	98.5%	98.4%	98.5%	98.3%	98.5%	99.1%	99.0%	TBD in Next SRTP

Sources: San Francisco Municipal Railway FY2008 – FY2027 Short Range Transit Plan, 2008, Prop E Annual Reports, Monthly Strategic Plan Metrics Reports.

Table 4-B: Muni Service Standards and Goals 1999-2015, Continued

STANDARD	FY 09/10 Goal	FY 09/10 Actual	FY 10/11 Goal	FY 10/11 Actual	FY 11/12 Goal	FY 11/12 Actual	FY 12/13 Goal	FY 12/13 Actual	FY 13/14 Goal	FY 13/14 Actual	FY 14/15 Goal	FY 14/15 Actual
Vehicles that run on time	85%	73.50%	85%	73%	85%	60.1%	85%	60%	85%	59%	85%	59%
Scheduled service hours delivered	98.5%	96.6	98.5%	97%	98.5%	96.7%	98.5%	97%	98.5%	97%	98.5%	97%
Vehicles too full to board	N/A	AM: 4.5% PM: 4.4%	<4%	AM: 5.2 % PM: 8.3%	<4%	AM: 5.9% PM: 7.1%	<4%	AM: 5.9% PM: 7.1%	<4%	AM: 7.4% PM: 8.6%	<4%	AM: 7.4% PM: 8.6%
Peak period load factors (% of capacity)	TBD in Next SRTP	TBD in Next SRTP	TBD in Next SRTP	TBD in Next SRTP	TBD in Next SRTP	TBD in Next SRTP	TBD in Next SRTP	TBD in Next SRTP	TBD in Next SRTP	TBD in Next SRTP	TBD in Next SRTP	TBD in Next SRTP
Actual headways vs. scheduled	>85%	60.1%	>85%	64.7%	Replaced by Bunching / Gapping	Replaced by Bunching / Gapping	Replaced by Bunching / Gapping	Replaced by Bunching / Gapping	Replaced by Bunching / Gapping	Replaced by Bunching / Gapping	Replaced by Bunching / Gapping	Replaced by Bunching / Gapping
Percentage of transit trips with <2 min bunching on Rapid Network					Measure in Development	3.9%	Measure in Development	4.0%	Measure in Development	4.0%	Measure in Development	4.8%
Percentage of transit trips with +5 min gaps on Rapid Network					Measure in Development	19.5%	Measure in Development	17.8%	Measure in Development	18.6%	Measure in Development	17.2%
Vehicle availability	TBD in Next SRTP	TBD in Next SRTP	TBD in Next SRTP	TBD in Next SRTP	TBD in Next SRTP	TBD in Next SRTP	TBD in Next SRTP	TBD in Next SRTP	TBD in Next SRTP	TBD in Next SRTP	TBD in Next SRTP	TBD in Next SRTP

Sources: San Francisco Municipal Railway FY2008 – FY2027 Short Range Transit Plan, 2008, Prop E Annual Reports, Monthly Strategic Plan Metrics Reports.

CHAPTER FIVE

TRAVEL DEMAND MANAGEMENT ELEMENT

KEY TOPICS

- Legislative Requirements
- Legislative Intent and Application to San Francisco
- TDM Policy Framework
- TDM Policies and Programs
- Plans and Studies
- Work Program

5.1. Legislative Requirements

The Congestion Management Program legislation[1] requires that the CMP include a travel demand management (TDM) element. TDM refers to tools and strategies that can reduce congestion and driving alone while encouraging travel by walking, bicycling, transit, carpooling, and other modes of travel. TDM can include policies, requirements on new development, and information/outreach programs designed to facilitate the use of sustainable transportation options. This section describes San Francisco's TDM Policy Framework and TDM programs. .

5.2. Legislative Intent and Application to San Francisco

The CMP legislation's requirement for a TDM element encourages local policy and programs to promote travel behavior changes to reduce congestion and associated impacts identified in the CMP.

5.3. TDM Policy Framework

San Francisco has several guiding policy documents that shape the development of TDM activities. These include:

- **Transit First Policy.** In 1973, the City Planning Commission and the Board of Supervisors adopted the Transit First policy, giving priority to transit rather than accommodating the single occupant automobile. Over the next twenty years, Transit First has evolved into a set of policies advocating travel demand management and prioritization of alternative modes. The City's Transit First Policy is documented in the City Charter, the Transportation Element of the City's General Plan, the Planning Code, and other City ordinances.

[1] California Government Code Section 65098 (b)(3)

- **San Francisco General Plan.** The San Francisco General Plan includes multiple objectives relevant to TDM (see sidebar box). Many of the city's recent area plans, including the Transbay Transit Center District Plan (2009), the Eastern Neighborhoods Transportation Implementation Planning Study (2011), the Central Corridor Plan (Draft – 2013), and others, also include TDM objectives.
- **Inter-Agency TDM Strategy.** In 2014, City agencies developed an Interagency Travel Demand Management Strategy outlining the city's approach to TDM, including activities related to (1) Implementing new TDM Policies, (2) Enforcement of existing policies, and (3) Developing supportive programs and services.

5.3.1 | Objectives in the General Plan

The Transportation Element of the General Plan lays out the City's policy of transit-oriented solutions for accommodating growth in travel demand and discouraging single-occupant automobile travel:

- Objective 3: Maintain and enhance San Francisco's position as a regional destination without inducing a greater volume of through automobile traffic.
- Objective 4: Maintain and enhance San Francisco's position as the hub of a regional, city-centered transit system.
- Objective 7: Develop a parking strategy that encourages short-term parking at the periphery of downtown and long-term intercept parking at the periphery of the urbanized bay area to meet the needs of long-distance commuters traveling by automobile to San Francisco or nearby destinations.
- Objective 10: Develop and employ methods of measuring the performance of the city's transportation system that respond to its multi-modal nature.
- Objective 11: Establish public transit as the primary mode of transportation in San Francisco and as a means through which to guide future development and improve regional mobility and air quality.
- Objective 16: Develop and implement programs that will efficiently manage the supply of parking at employment centers throughout the city so as to discourage single-occupant ridership and encourage ridesharing, transit and other alternatives to the single-occupant automobile.
- Objective 17: Develop and implement parking management programs in the downtown that will provide alternatives encouraging the efficient use of the area's limited parking supply and abundant transit services.
- Objective 20: Give first priority to improving transit service throughout the city, providing a convenient and efficient system as a preferable alternative to automobile use.
- Objective 21: Develop transit as the primary mode of travel to and from downtown and all major activity centers within the region.
- Objective 23: Improve the city's pedestrian circulation system to provide for efficient, pleasant, and safe movement.
- Objective 27: Ensure that bicycles can be used safely and conveniently as a primary means of transportation, as well as for recreational purposes.
- Objective 28: Establish parking rates and off-street parking fare structures to reflect the full costs, monetary and environmental, of parking in the city.

- Objective 32: Limit parking in downtown to help ensure that the number of auto trips to and from downtown will not be detrimental to the growth or amenity of downtown.
- Objective 34: Relate the amount of parking in residential areas and neighborhood commercial districts to the capacity of the city's street system and land use patterns.

5.3.2 | Regional TDM Requirements - Transportation Control Measures

San Francisco is subject to regional air district requirements to implement TDM measures (also referred to as Transportation Control Measures) to address air quality issues. In 1991 as required by the California Clean Air Act (CCAA), the Association of Bay Area Governments (ABAG), the Bay Area Air Quality Management District (BAAQMD), and the Metropolitan Transportation Commission (MTC) jointly prepared the Bay Area Clean Air Plan, which included measures to reduce the total *number of trips* and miles traveled, ("Transportation Control Measures," or TCMs). The most recent Plan, the *2010 Bay Area Clean Air Plan*, was adopted by BAAQMD in March 2010. The Plan for the first time addresses greenhouse gases, as well as ozone, particulate matter, and air toxics. It also included new and revised TCMs.

Local agencies are expected to incorporate TCMs into planning and implementation for transportation and land use programs. The region, through the MTC, is held responsible for overall progress toward the stated goals. The CMP process provides an opportunity to integrate local planning and programming into the regional air quality planning process. Appendix 11 lists the currently adopted regional TCMs, and discusses how San Francisco's congestion management strategies contribute to, or reinforce, these measures.

5.4. TDM Policies and Programs

San Francisco currently has a range of TDM strategies including programs focused on employers, neighborhoods, schools, new development requirements and enforcement, and policies to promote sustainable modes. These strategies are described below in the following categories:

- TDM requirements on new development, including planning code requirements, requirements in area plans and development agreements.
- TDM policies, including the Commuter Benefits Ordinance and the Commuter Shuttle Policy.
- TDM programs including the on-street carsharing pilot program, bicycle sharing program, residential outreach program, and others.

5.4.1 | TDM Requirements on New Development

AREA PLANS AND DEVELOPMENT AGREEMENTS

Numerous TDM requirements are included within area plans and negotiated agreements for major developments. Significant examples include the following:

- **The Transit Center District Plan** emphasizes Transportation Demand Management as a means of reducing the reliance on automobiles and encouraging mode shifts to transit, carpooling, bicycling, and walking. The plan goals state that 95 percent of trips should be made by transit, walking, or bicycling. It includes supplementary objectives to reach this goal, such as parking

supply and management tools; transit incentives, and expansion of Section 163 requirements (see below).

- **The Park Merced Transportation Plan** includes shuttles to Daly City BART and a Shopper's Shuttle to local destinations. In addition, a transportation coordinator will coordinate and manage additional TDM programs.
- The **Candlestick Point & Hunters Point Shipyard Phase II Transportation Plan** proposes new bus service and infrastructure, and requires a Transportation Coordinator to manage unbundled parking, bicycle support facilities, provide transit passes (paid by homeowner's dues), and implement dynamic pricing for visitor parking. The TDM Program will target both residents and employers in the area, with employers expected to provide bicycle parking and amenities, carpooling and vanpooling services, Guaranteed Ride Home program, information on transportation alternatives, commuter checks, telecommuting options, and parking cash-out programs.
- The **Treasure Island Transportation Implementation Plan** includes a congestion pricing program, parking policies, mandatory pre-paid transit vouchers, ramp metering, and special events and emergency access transportation planning. The program will disincentivize residents' use of personal automobiles and increase the appeal of transit, walking, and bicycling. In addition, the parking policies will utilize parking maximums instead of minimums, and unbundle parking prices. Transit passes would also be mandatory for residential units and hotel guests. Additional TDM programs proposed in this plan include Bay Area Bikeshare stations, carshare availability, and employer TDM programs. In 2014, the San Francisco Transportation Authority was designated as the Mobility Management Agency for Treasure Island, and will be responsible for implementation of TDM on Treasure Island.

INSTITUTIONAL MASTER PLANS

TDM measures are also present in Institutional Master Plans, which city planning code requires for .all medical and post-secondary educational institutions in the City and County of San Francisco; currently 41 institutions are subject to the requirement. IMPs describe any planned campus expansions and present mitigations for reducing the impact of the expansion on the surrounding neighborhood; this could include TDM measures such as shuttles, changes to parking policy, etc. For example, the Institutional Master Plan prepared by the California Pacific Medical Center in 2008 describes the campus TDM program, which includes elements such as free transit passes, vanpool subsidies, and other measures.

SECTION 163 REQUIREMENTS AND TMASF

Planning Code Section 163 requires that all new development of over 100,000 square feet of new office space (or 25,000 square feet in some districts), or 100 residential units in specific zoning designations undertake measures to mitigate impacts on the transportation system, for the lifetime of the project. Section 163 was first added to the Planning Code in 1985 (Ordinance 414-85) as a means to mitigate the transportation impacts, and thus allow a greater density of development than would otherwise be possible. It was subsequently expanded to all new development of over 100,000 sf in downtown areas zoned C-3, and has more recently been expanded again to include other non-residential, office space outside of the C-3-O, and residential development

Planning Code 163 requires that project sponsors provide onsite transportation brokerage and management service to building occupants that include coordination, encouragement, and promotion of TDM activities, including:

- Transit and ridesharing
- Reduced parking demand and efficient use of parking
- Provision of car-sharing pods and use of car-sharing services (per Section 166)
- Flex-time or staggered work hours program
- Other activities determined by the Planning Department to be appropriate to meeting the purpose of this requirement

Buildings can elect to meet Section 163 requirements on their own or by contracting with a City-approved provider (or vendor) of transportation brokerage services or administering TDM services on their own. Currently, TMASF Connects, a non-profit organization, is the only City-approved vendor of transportation brokerage services. TMASF was first incorporated as a non-profit in 1989 and began to provide transportation management services in 1990. TMASF provides information support and promotions to its currently 68 member building tenants to reduce drive alone rates. Its member buildings report a single-occupancy vehicle (SOV) mode share of less than 10 percent in the last several years. TMASF's activities include providing a web site with transportation resources for employers and travelers, publishing a newsletter, issuing traveler alerts, and organizing periodic campaigns to promote sustainable commute alternatives.

MISSION BAY TRANSPORTATION MANAGEMENT ASSOCIATION

As a condition of the Mission Bay Development Plan, the Mission Bay Transportation Management Association (TMA) was formed and began operating in May 2010. The TMA operates shuttle service to and from BART and Caltrain, facilitates TDM marketing, provides bicycle parking assistance, and provides information via a website. Membership includes all property owners and developers. According to the 2014 Mission Bay Annual Report, projected annual shuttle ridership is expected to reach 394,160 boardings and ridership has continually increased since the inception of the shuttle in 2010.

PLANNING CODE REQUIREMENTS

The San Francisco Planning Code contains numerous additional requirements to help ensure new developments include features to support sustainable transportation. For example:

- Unbundled parking is required for residential buildings with ten or more dwelling units
- Carshare parking is required for residential and nonresidential development
- Secure bicycle parking is required across most types of development
- Showers and lockers are required for most commercial uses and for large retail uses

5.4.2 | TDM Policies and Programs

COMMUTER BENEFITS ORDINANCE

In August 2008, the City enacted a landmark Commuter Benefits Ordinance (CBO), which became effective on January 19, 2009. The ordinance requires businesses with locations in San Francisco and more than 20 employees to offer commuter benefits such as transit, vanpool, and bicycle programs to their eligible employees. In 2012, the Bay Area Air Quality Management District (BAAQMD) and the Bay Area Metropolitan Transportation Commission implemented a similar program on a pilot basis, but focused on employers with fifty or more full-time employees in the region (the local ordinance applies to employers in San Francisco with at least twenty employees nationwide).

The San Francisco Department of the Environment (SFE) is working with the region to coordinate both the local and regional ordinances for seamless implementation and program management. SFE works with employers with less than 50 employees and coordinates with the region when outreaching to employers with 50 or more employees. 2520 employers subject to the SF Commuter Benefits Ordinance have submitted a compliance form, with a cumulative 25,000 employees participating in their employer's commuter benefit program.

SFMTA COMMUTER SHUTTLE POLICY

Numerous employers, educational institutions, medical facilities, office buildings, and transportation management associations offer shuttle service to their employees, students, and clients. Some buildings are required to provide shuttle service as part of their conditions of approval, and an employer may comply with San Francisco's Commuter Benefits Ordinance by offering a free commute shuttle to employees. The majority of the commuter shuttles are closed systems that provide service to a specific population and are not open to the general public. Most shuttles are provided for free to employees (or students, tenants, etc.).

In 2014, SFMTA launched the Commuter Shuttles Pilot Program to create clear and enforceable locations and guidelines for private shuttle loading and unloading and reduce conflicts with Muni and other vehicles. In October, 2015, SFMTA released a Commuter Shuttle Policy that permits ongoing use of the shared stops subject to additional requirements.

SFMTA CARSHARING POLICY

Carsharing programs are encouraged in San Francisco as a means to reduce car ownership and decrease VMT[2]. The precise number of carsharing members in San Francisco is unknown but is increasing. In Plan Bay Area, the Metropolitan Transportation Commission (MTC) estimated a total of 60,000 carsharing members in the region when accounting for both City CarShare and Zipcar.

To further encourage carsharing, SFMTA developed a carsharing policy in 2013. The policy outlines a process whereby private carsharing companies can apply to use on-street parking spaces for carshare vehicles. Currently, 202 on-street parking spaces are reserved for carshare vehicles. The spaces are granted to three Carshare organizations (Zipcar, City CarShare, and Getaround), that SFMTA has qualified for the program. SFMTA will be evaluating the program and recommending next steps in spring, 2016.

EMERGENCY RIDE HOME PROGRAM

The San Francisco Department of Environment (SFE)'s Emergency Ride Home (ERH) program promotes sustainable commuting by ensuring a free or low-cost ride home in cases of emergency. The program pays for a ride home for employees of registered businesses in the event of illness, severe crisis, unscheduled overtime, or disruption of carpool or vanpool schedules. The program is designed to remove some of the risks and reliability concerns associated with the choice of carpooling or relying on transit service for the commute trip. SFE promotes the ERH program to City employees and all San Francisco employers and commuters. As of October 2015, over 780 San Francisco businesses were enrolled in the program.

[2] Cervero, R., Golub, A., & Nee, B. (2007). City CarShare: Longer-term travel demand and car ownership impacts. Transportation Research Record: Journal of the Transportation Research Board, 1992, 70-80.

CITYCYCLE PROGRAM

SFE has administered and promoted a bicycle fleet program, CityCycle, since 2005. The aim of the program is to convert a portion of the vehicle fleet of the City and County of San Francisco to bicycles through departmental efforts supplemented by targeted promotion. A Transportation Fund for Clean Air (TFCA) grant funds the bicycles, trailers, locks, helmets, and bike maintenance plan for bicycles in the City's fleet. SFE staff administers the program, including outreach to all City staff making a significant number of vehicle trips to accomplish their work duties. There are currently almost 300 CityCycle bicycles in use across 30 city departments. The SFE estimates that these bicycles eliminate about 30,000 vehicle miles of travel annually from San Francisco city streets.

CARPOOLS

SFMTA encourages the use of carpools and vanpools during the morning and evening commutes. The City provides a casual carpool pick-up location on Beale Street between Howard and Folsom, adjacent to the Temporary Transbay Terminal site. At this location, there is signage indicating several East Bay destination locations.

SFMTA also administers a program through which major employers (those with Transportation Brokerage Services described above) may provide parking for employee carpool vehicles (three or more riders) in City-owned garages at a reduced rate. The City also provides a limited amount of designated on-street parking in the downtown area for registered/permitted vanpool vehicles.

BIKESHARING

The first phase of the regional Bay Area Bike Share program opened on August 29, 2013 with 700 bikes at 70 stations in San Francisco and along the peninsula as a pilot program of the Bay Area Air Quality Management District and the Metropolitan Transportation Commission (MTC), and was initially operated by Alta Bikeshare. Half of the bikes are in San Francisco, concentrated around downtown and SoMa. In May 2015, MTC entered into contract with a private company, Motivate, which has promised to radically expand the program to as many as 7,000 bicycles throughout the Bay Area, drawing on corporate sponsorships for funding.

BART TRAVEL INCENTIVES PILOT PROJECT

Crowding on the BART system has reached untenable levels, especially in the Transbay market connecting the East Bay with downtown San Francisco. Trains have been operating above 100% of programmed capacity during peak periods in this corridor since 2012, and growth is expected to continue. BART predicts ridership growth at between 2 and 6 percent per year through 2040. BART is working on a number of capacity enhancing solutions, but all of these projects will take several years to come online and a more immediate solution is needed.

The Transportation Authority and BART are working together on a pilot project to address crowding by incentivizing riders to shift their travel to the shoulders of the peak period or other stations and routes. This will involve creating a BART loyalty program whereby riders receive rewards for using BART during off-peak periods. Traveler responses to the incentives will be monitored closely using transit smart card (Clipper) data, and incentives would be adjusted accordingly for maximum effect. The pilot is expected to launch during 2016.

SF MOVES NEIGHBORHOOD TDM OUTREACH PILOT PROJECT

SF Moves is a program that connects people who live, work, or own and operate businesses within certain San Francisco neighborhoods with resources to inform them about and familiarize them with

the City's transportation options. SF Moves is currently limited to residents, employees and business owners and managers within the Mission District, but will be expanded to other neighborhoods during 2016.

SF Moves is a partnership of the San Francisco Municipal Transportation Agency (SFMTA) and the San Francisco Department of the Environment through funding by the Bay Area Air Quality Management District's Transportation Fund for Clean Air and the San Francisco County Transportation Authority's Proposition K (San Francisco's half-cent local sales tax for transportation). The pilot is modeled on neighborhood TDM outreach programs demonstrated to be successful in other cities such as Portland, Oregon and Seattle, Washington.

5.4.3 | Parking Management

The General Plan, Planning Code, and Zoning Code guide parking management in San Francisco. San Francisco's existing parking policies are intended to support the city's development, and have been especially successful in the downtown area by limiting the provision of parking provided with new office development. Parking policies are also designed to support the City's Transit First policy through a combination of regulatory controls, revenue transfers, regulations, and incentives. The San Francisco Transportation Plan and Prop K Expenditure Plan category D1 provide policy guidance and funding for parking management initiatives. In November 2007, San Francisco voters approved Proposition A, which shifted responsibility for parking regulations, fees, and fines from the Board of Supervisors to SFMTA. In 2007, the Transportation Authority and the Metropolitan Transportation Commission (MTC) applied for and subsequently received a U.S. Department of Transportation (USDOT) Urban Partnership Program (UPP) grant, which includes $19.4 million for a demonstration of variable parking pricing as part of the Federal initiative to fight congestion. SFMTA is leading the implementation of the variable parking pricing pilots through the SF*park* program.

SFPARK

SF*park* was a demonstration project funded through the Department of Transportation's Urban Partnership Program. For the SF*park* pilot projects, the SFMTA used several strategies to make it easier to find a space and improve the parking experience, including:

- Demand-responsive pricing
- Making it easier to pay at meters and avoid citations
- Longer time limits
- Improved user interface and product design
- Improved information for drivers, including static directional signs to garages and real-time information about where parking is available on- and off-street
- Highly transparent, rules-based, and data-driven approach to making changes to parking prices

SF*park* piloted and cultivated several emerging technologies, including smart meters, parking sensors, and a sophisticated data management tool. The demonstration ran from 2010-2014, after which SFMTA evaluated the program. To isolate and measure the effects of policy changes, the SFMTA designated seven parking management districts as pilot areas, which included 6,000 metered spaces, or a quarter of the city's total metered parking spaces, and 12,250 spaces in SFMTA-administered garages, or 75 percent of the off-street spaces managed by the SFMTA. The SFMTA also used two additional areas as control areas where no changes to parking management or technology were implemented. The SFMTA collected "before", "mid-point", and "after" data in both pilot and control areas. The

evaluation found several benefits including better parking availability, improved ease of payment, and reduced circling for parking and associated reductions in greenhouse gas emissions and vehicle miles traveled, among other benefits. SFMTA is in the process of determining next steps for the SF*park* program.

5.5. TDM Studies and Plans

This section describes recently-completed and ongoing studies and planning efforts relevant to TDM.

5.5.1 | Travel Demand Management Toolkit

The SFMTA, City Planning Department, and SFCTA are partnering to develop a toolkit of TDM measures for new development. The toolkit will be used to ensure a consistent approach to including TDM in new development and ensuring that the most effective measures are prioritized. The toolkit is expected to be complete by 2016.

5.5.2 | TDM Partnership Project

In fall 2015, the Transportation Authority completed the Travel Demand Management Partnership Project, a three-year effort completed in collaboration with the SFMTA, SFE, and the Planning Department, and funded through the MTC's Bay Area Climate Initiatives Program, the Prop K half-cent sales tax for transportation, and the Transportation Fund for Clean Air. The purpose of the program was to pilot test new methods of engagement with the private sector, especially major employers and institutions, and to strengthen collaboration among agencies responsible for TDM. The partnership gave rise to the Commuter Shuttles Pilot Program and the Inter-Agency TDM Strategy, mentioned previously. The project final report recommended focusing employer outreach efforts on employers with a strong internal champion.

5.5.3 | Mobility Access & Pricing Study and Parking Supply and Utilization Study

In December, 2010, the Transportation Authority Board approved the final report of the San Francisco Mobility, Access and Pricing Study (MAPS). The study assessed the potential for implementing a peak-hour congestion charge in the northeast portion of the city, and found that the charge would be effective in reducing congestion. Following adoption of the study, stakeholders suggested exploring whether better downtown parking management could achieve some of the same benefits as congestion pricing.

In response, the Transportation Authority initiated the Parking Supply and Utilization Study in Summer 2013 in partnership with the San Francisco Municipal Transportation Agency. The Study is evaluating how parking management, focused on private supplies of off-street parking, could reduce roadway congestion and shift trips to walking, cycling, and transit. The Study is developing and evaluating different policy alternatives; recommendations are expected in December, 2015.

5.5.4 | San Francisco Transportation Plan

The San Francisco Transportation Plan, adopted in 2013, identifies TDM as a cost-effective investment to move closer to the plan's goals. Therefore, the SFTP recommends a 20 percent increase in funding

in the Investment Plan and a 100 percent increase in funding in the SF Investment Vision scenario. The Investment Plans also recommend the implementation of congestion pricing in the northeast cordon and on Treasure Island.

SFTP POLICY RECOMMENDATIONS RELATED TO TDM

- Implement the recommendations of the TDM Partnership Program including a SFMTA Shuttle Partners Program
- Explore an area-wide parking cap or employer trip reduction programs for SoMa/Mission Bay
- Develop TDM program that touches employers, visitors, schools, and residents
- Develop proactive employer outreach and incentive programs in the downtown core, southwest, and southeast parts of the city, and investigate formation of transportation management associations (TMAs) in these areas
- Increase enforcement efforts to ensure TDM measures included in existing development agreements are implemented, and step up enforcement of the city's commuter benefits ordinance
- Support SFMTA's regulatory programs to allow safe integration of third party providers
- Support development and implementation of the Transportation Sustainability Program
- Further evaluate potential congestion pricing program for the Northeast Cordon

In partnership with the SFMTA and the Planning Department, the Transportation Authority will begin a major update to the SFTP in 2016 as part of a Long Range Transportation Planning Program (LRTPP). As part of this effort, the team will further analyze TDM's role in meeting citywide goals such as vehicle miles travelled. This study will work in partnership with the SFMTA-led TDM framework and strategy. The LRTPP anticipates completing a visioning exercise in 2016, modal studies (including TDM) in 2017, and an update to the SFTP in 2018.

5.6. Inter-Agency Work Program

- Implement the Inter-Agency TDM strategy, developing an integrated TDM framework to guide the development of TDM activities across the City.
- Complete the TDM Toolkit for new development.
- Support enforcement of TDM-related developer commitments and planning code requirements.
- Complete the SF Moves residential outreach pilot, evaluate results and determine next steps.
- Continue enforcement of the SF Commuter Benefits Ordinance and increase rates of compliance.
- Complete the evaluation of the on-street carsharing program and determine next steps.
- Complete the BART Travel Incentives pilot project and determine next steps.
- Complete the San Francisco Parking Management and Utilization studies, and determine next steps for downtown parking management.
- Update the SFTP as part of Long Range Transportation Planning Program, including components focused on Travel Demand Management.
- Continue all other ongoing TDM programs and activities.
- Continue to work on regional TDM initiatives, coordinating with both regional entities (BAAQMD and MTC), and neighboring local agencies.

CHAPTER SIX

LAND USE IMPACTS ANALYSIS PROGRAM

KEY TOPICS

- Legislative Requirements
- Legislative Intent and Application to San Francisco
- Institutional Framework for a CMP Land Use Analysis Program
- Neighborhood Transportation Planning
- Infill Opportunity Zones
- Transportation Impact Analysis
- Work Program

6.1. Legislative Requirements

The California Government Code section 65089(b)(4) requires that Congestion Management Programs (CMPs) include a program to analyze the transportation system impacts of local land use decisions. These analyses must measure impacts using CMP performance measures, and estimate the costs of mitigating the impacts. The estimates should exclude costs associated with inter-regional travel and provide credit for public or private contributions to regional transportation system improvements. The legislation specifies that land use analysis programs should be coordinated with California Environmental Quality Act (CEQA) efforts, wherever applicable.

The CMP legislation also requires the Transportation Authority, as the Congestion Management Agency, to "develop a uniform database on traffic impacts for use in a countywide transportation computer model…" that will be used "to determine the quantitative impacts of development on the circulation system…" (California Government Code section 65089(c)). The database must be consistent with the modeling methodology used by regional planning agencies, the Metropolitan Transportation Commission (MTC) and the Association of Bay Area Governments (ABAG), to comply with the CMP.

The Transportation Authority's GIS database, including ABAG Projections data, updated CMP networks, and numerous other data items (such as roadway level of service, transit ridership, travel behavior survey results, etc.) constitutes the uniform database for San Francisco. In addition, the Transportation Authority has an activity-based travel demand forecasting model used in combination with the uniform database. This is further detailed in Chapter 8.

In September of 2002 the legislature passed SB 1636, which is intended to "remove regulatory barriers around the development of infill housing, transit-oriented development, and mixed use commercial development" (65088(g)) by enabling local jurisdictions to designate "infill opportunity zones." These zones (IOZs) are defined as areas with compact, transit-oriented housing and mixed use in close proximity to transit service. The CMP network segments within a designated IOZ are exempt from CMP traffic level of service (LOS) standards. SB 743 revised the definition and requirements related to IOZs, as discussed in section 6.5. A map of San Francisco's IOZs can be seen in Figure 6-2.

On September 27, 2013, the governor signed into law SB 743, which revised the criteria for determining the significance of transportation impacts within transit priority areas. Transit priority areas are defined as areas within a half mile of a major transit stop, either existing, or planned, which in San Francisco comprises most of the city. The text of SB 743 specifically eliminates automobile delay as measured by level of service as a significant impact on the environment in transit priority areas. Parking impacts from infill development also shall not be considered significant impacts on the environment. On August 6, 2014, the Governor's Office of Planning and Research released a preliminary discussion draft of changes to CEQA guidelines, which identified vehicle miles traveled as generally the most appropriate measure of transportation impacts. After soliciting comments, the Office of Planning and Research has indicated that it intends to release final changes to CEQA guidelines in late 2015, with rulemaking complete in early 2016.

6.2. Legislative Intent and Application to San Francisco

The General Plan and the City Charter are the primary institutional parameters that frame the City's process for reviewing land development impacts on the transportation network. San Francisco is a Charter City, and it has a consolidated city and county government. An eleven-member Board of Supervisors serves as the legislative body for the City's unified city and county government. The City Planning Commission (CPC) has responsibility for land use decision-making throughout the City. The Mayor appoints the seven members of the CPC. Among the responsibilities of the CPC are the following:

- Exclusive authority to act on General Plan policies and area land use plans (per City Charter);
- Holding public hearings on all appeals to Negative Declaration determinations and certification of local Environmental Impact Reports; and
- Discretionary actions on Conditional Use permits, (which can be appealed to the Board of Supervisors) and decisions by the Zoning Administrator, Discretionary Reviews, and others that can be appealed to the Board of Appeals

In addition, both the CPC and the Board of Supervisors must approve all rezoning.

The Planning Department's land use responsibilities include transportation matters. The Planning Department has primary responsibility for assessment of the transportation impacts of development proposals, and to determine consistency with land use and transportation policies in the General Plan. The existing local regulations include measures to mitigate project-specific transportation impacts within the policy and priority framework of the General Plan, the long-range transportation plan, and the Capital Improvement Program (CIP) of the CMP.

As CMA for San Francisco, the Transportation Authority ensures that the City complies with CMP requirements including land use impact monitoring. AB 1619, passed by the California State Assembly in 1994, stipulates that the CMA should prepare any countywide transportation plan. Pursuant to a December 1994 action, the Board of Supervisors directed the Transportation Authority to prepare a countywide transportation plan, and to coordinate City Departments. An Interagency Project Charter for San Francisco Long Range Transportation Planning Program, executed in December 2015, between the Transportation Authority, the SFMTA, and the Planning Department, outlines roles and responsibilities for developing the Countywide Transportation Plan. The most recently adopted Plan,

now known as the San Francisco Transportation Plan (SFTP), was adopted by the Board in December of 2013. The Transportation Authority is currently completing an update of the Plan, which is expected to be adopted by the Transportation Authority Board in 2016.

6.2.1 | Policy Issues in Land Use and Transportation Demand

LOCAL TRANSPORTATION IMPACT ANALYSIS

The CMP-based land use analysis program links the City's land development decisions to conditions on the regional transportation system. This link already exists at the regional level in MTC's Regional Transportation Plan (RTP), which links long-range planning for transportation investment with estimates of land development based on regional demographic growth and economic development.

The City already has in place an extensive process for evaluating the transportation impacts of land development proposals. This process, which ensures the City's compliance with State and Federal environmental review requirements, is the responsibility of the Planning Department. In particular, with the passage of California Senate Bill 743 (see section 6.6), the City plans to align its CEQA review and development approval process to better align with RTP goals such as a vehicle miles traveled reduction target. Nevertheless, as CMA, the Transportation Authority has a role in ensuring that the impacts of land use decisions on the transportation system are analyzed with a uniform methodology, consistent with the long-term strategic goals of the General Plan and the San Francisco Transportation Plan.

UNIFORM METHODOLOGY

The Transportation Authority, as CMA, retains its own GIS database and travel demand model to analyze transportation and provide uniform assumptions for City departments. For major land use decisions, the Transportation Authority's tools are used to assess transportation impacts and ensure that the methodology used to assess them is consistent with MTC models and ABAG data.

One key aspect of the CMP approach to land use impacts analysis is that, pursuant to state law, the Transportation Authority will also be responsible for reviewing transportation analysis of specific development projects under CEQA and determining the consistency of these "sub-area" analyses with the citywide model. Examples of this role include our work to support the Bayview/Hunters Point Redevelopment Area Environmental Impact Report (EIR), the Transbay Center District Plan EIR, and the Market/Octavia Better Neighborhoods Plan EIR, and the Central SoMa Plan and EIR.

The primary purpose of the land use analysis program is, therefore, to inform decisions on the supply of transportation infrastructure to the City and how the City should best spend scarce transportation dollars. This program adds no new requirements to the existing local project environmental review process, but it provides a long-term transportation investment policy context for local environmental review. It also informs decision-making in the reverse direction: as CMA, the Transportation Authority is responsible for commenting on local land use decisions and making such comments with an understanding of how land use choices will shape future transportation demand. With the passage of California Senate Bill 743 and the future use of Vehicle Miles Traveled as a primary metric for determining traffic related environmental impacts, review of land use project will be more consistent with other goals in the SFTP and related City documents.

6.2.2 | Consistency with Long Term Strategic Goals of General Plan and San Francisco Transportation Plan

San Francisco has been able to maintain one of the highest levels of transit use among U.S. cities because of its relatively high-density development and because topography and geography limit vehicular access routes to and from the City.

There have been significant numbers of non-resident commuters into the city for over a century. To improve the balance of housing and jobs, during the 1980s San Francisco actively promoted new residential development. Extensive revisions to the City's General Plan and rezonings were undertaken. Each of these land use plans—the Downtown Plan, Rincon Hill, North of Market, Chinatown, Neighborhood Commercial, Van Ness Avenue, South of Market, and Mission Bay—incorporated measures to retain and enhance opportunities for residential development.

In recent years, several more area plans have been developed or adopted including: the Market/Octavia Plan, Eastern Neighborhoods Plan, Balboa and Glen Park BART Station Area Plans, the Treasure Island Plan, and the Transbay Center District Plan. In addition, housing development has been promoted by the policies of the San Francisco Redevelopment Agency and its successor agency, the Office of Community Investment and Infrastructure, in various areas, including the Rincon Point/South Beach, Yerba Buena Gardens, Transbay, the Bayview Hunters Point Redevelopment Plan Areas, Candlestick Point-Hunters Point Shipyard Phase 2, Parkmerced, and Visitacion Valley.

San Francisco's continued role as a regional employment center and its policy of housing development have had an impact on the demand for transportation in the city. A primary mission of the Transportation Authority is to strategize investment in the city's transportation infrastructure and promote the development of demand management tools to address growing travel demand. Infrastructure investment is intended both to address future growth in transportation demand and to improve the city's current transportation system. Demand management is needed to promote a balanced and cost-effective transportation system.

In past decades San Francisco's primary transportation challenge was to absorb new jobs downtown without proportionately increasing the number of workers commuting by car. That challenge was successfully met with the construction of BART and MUNI services focused on downtown commuting, combined with limits on parking provision.

Today San Francisco's transportation challenges are more varied. They are numerous and located across the city, throughout the various neighborhoods as well in core areas, which can expect not only employment growth but also extensive residential growth. Challenges include competitive transit service for non-commute and reverse commute trips; neighborhood parking management; safety for pedestrians and bicyclists; improved transit reliability and speed through the development of a transit priority network; and reducing emissions of pollution and greenhouse gasses. Increasingly, the imperative to address regional land use and transportation relationships is moving to the fore, with the targeting of resources to Priority Development Areas (PDAs) and development of a regional High Occupancy/Toll (HOT) lane system. In addition, state laws promulgated in 2006 and 2007 require greater integration of land use and transportation planning processes in recognition of the climate change challenge. Climate change issues and initiatives are discussed further in Section 6.3.5, below.

Underlying these needs is the challenge of finding new mechanisms to pay for needed transit and other improvements as development decisions are made. A discussion of the city's initiative to update transportation impact and mitigation fees is provided in Chapter 4.

NOTE: California Government Code Section 65089(b)(4) requires the land use program to assess the impacts of land development on regional transportation systems. In the 1991 San Francisco CMP this

was interpreted to mean impacts on the CMP roadway network. However, the federal Intermodal Surface Transportation Efficiency Act (ISTEA), passed in 1991, explicitly requires the development of a metropolitan transportation system (MTS), including both transit and highways. As discussed in Chapter 3, MTC contracted with the Transportation Authority, acting as CMA, to help develop the MTS and to use the CMP process to link land development decisions to impacts on the MTS. For purposes of the land use analysis program, the San Francisco CMP will use the San Francisco component of the MTS, but conformance with roadway level of service (LOS) standards will continue to be assessed using the CMP roadway network, which is a subset of the multimodal MTS.

6.3. Institutional and Policy Framework for a CMP Land Use Analysis Program

6.3.1 | Prop K Mandate

When voters approved Prop K in November 2003, they approved various policies and priorities in the Expenditure Plan designed to implement San Francisco's Transit First policy, and improve the coordination of land use and transportation.

Transit investment accounts for 65 percent of the San Francisco transportation sales tax expenditure plan (74 percent if paratransit is included), and the investment program supports the City's future growth plans.

The Expenditure Plan directs the Transportation Authority to "give priority for funding to major capital projects that are supportive of adopted land use plans with particular emphasis on improving transit supply to corridors designated for infill housing and other transit-supportive land uses."

The Plan goes on to define transit-supportive land uses as "those which help to increase the cost-effectiveness of transit service by improving transit ridership and reducing traffic along transit corridors."

All projects must also demonstrate consistency with the Prioritization Criteria in the Expenditure Plan. This includes "compatibility with existing and planned land uses, and with adopted standards for urban design and for the provision of pedestrian amenities; and supportiveness of planned growth in transit-friendly housing, employment and services."

Finally, the Expenditure Plan provides funding for neighborhood planning studies and local match for regional planning and capital grants such as the Community-Based Transportation Planning (CBTP) and Transportation for Livable Communities (TLC) grant program. TLC supports transit-oriented development and funds related improvements for transit, bicyclists, and pedestrians including streetscape beautification improvements such as landscaping, lighting, and street furniture.

6.3.2 | MTC/CMA Transportation/Land Use Work Plans

MTC provides the nine Bay Area CMAs with a share of regional planning funds ("3% Planning Funds") to support local and county-level planning functions established under state and federal law. These activities include the development of the CMP.

In 2003, MTC approved the San Francisco CMA's Transportation – Land Use Coordination Work Program (T-PLUS). T-PLUS recognizes the expanded role for the CMAs in coordinating transportation and land use planning, such as through the Transportation for Livable Communities (TLC) program. Pursuant to MTC's CMA Transportation/Land Use initiative, the Transportation Authority focuses on the following activities to help integrate transportation and land use decisions:

First, the Transportation Authority prioritizes transportation planning funds and capital investments that meet performance criteria or demonstrate a strong vision for coordinated land use and transportation development.

The Transportation Authority provides technical guidance and assistance with the planning process to partner agencies, communities, and project sponsors, including neighborhood planning, thereby facilitating access to discretionary state and regional grants and providing for coordinated county-level input into the regional transportation planning process.

The Transportation Authority promotes legislative activities that encourage smart growth, more sustainable transportation and development-related investment decisions by the City and developers, and more efficient travel decisions by all transportation system users. Examples include the Transportation Authority's support of the State Resources Agency's revisions to the CEQA Guidelines Transportation Checklist and our work with local partner agencies to reform the City's CEQA transportation impact analysis process.

The Transportation Authority coordinates county-level input into the regional Sustainable Communities Strategy (SCS), the RTP, and related regional land use planning efforts.

Finally, the Transportation Authority conducts project and program delivery oversight to ensure efficient use of funds and effective project delivery.

6.3.3 | Plan Bay Area and Priority Development Areas

ABAG and MTC have been working for years to encourage the region's municipalities to plan for compact, transit-oriented development to meet the region's sustainability goals. This work was previously conducted through the FOCUS program that invited municipalities to nominate locations to be considered as Priority Development Areas (PDAs) or Priority Conservation Areas (PCAs) based on regionally established criteria. In 2013, the region adopted Plan Bay Area, the first SCS for the San Francisco Bay Area prepared pursuant to Senate Bill 375 (Steinberg). PDAs and PCAs are key "building blocks" of the region's land use strategy presented in Plan Bay Area.

San Francisco has identified twelve PDAs, generally in the eastern part of San Francisco, and generally locations that have been comprehensively planned as part of an Area Plan process. Collectively, San Francisco's PDAs make up approximately 25% of San Francisco's land area and have the capacity to take on approximately 80% of the housing growth and 60% of the job growth that has been forecast in San Francisco as a part of the Plan Bay Area process (or about 80,000 housing units out of 92,000 and 143,000 jobs out of 191,000). San Francisco's PDAs were first identified and approved by the San Francisco Board of Supervisors in 2007 and have been updated since then to reflect slight changes to boundaries. San Francisco's PDAs are shown in Figure 6-1. San Francisco has also identified four Priority Conservation Areas (PCAs), as adopted by the Board of Supervisors in 2015: Sutro Tower, Aquavista/Twin Peaks, Bayview Radio Property, and Palou/Phelps Open Space. In August 2015, ABAG approved three additional regional PCAs that cross San Francisco: California Coast Trail (along the Pacific coast), San Francisco Bay Water Trail (including access points in San Francisco's Marina

District), and San Francisco Bay Trail (along the Embarcadero, through the Marina and over the Golden Gate Bridge).

Figure 6-1: Priority Development Areas in San Francisco

As a part of Plan Bay Area, the region has begun to identify more robust funding incentives for PDAs and PCAs, as demonstrated through the One Bay Area Grant (OBAG) framework using funds from the Cycle 2 federal Surface Transportation Program and from the Congestion Mitigation and Air Quality Improvement Program for the five-year cycle (Fiscal Years 2012-13 through 2016-17). This includes the County OBAG program, administered by the Bay Area's Congestion Management Agencies (CMAs), that was created to incentivize jurisdictions to fulfill the region's land use and sustainability goals in several ways as listed below. More recently, these efforts to link transportation funding with PDAs and PCAs through the regional transportation plan and funding framework continue as part of the Plan Bay Area 2040 update and Cycle 2 OBAG (Fiscal Years 2017-18 through 2021-22) development processes.

- Cycle 1 County OBAG funds were distributed to the region's nine CMAs using a funding formula that was based 50 percent on population, 25 percent on historic housing production (with 12.5 percent of that share for affordable housing), and 25 percent on future housing growth assigned through the Regional Housing Needs Allocation (with 12.5 percent of that share for future affordable housing). While this change did not increase San Francisco's share of funding, it is an important policy direction of linking land use planning with transportation investment. For Cycle 2, MTC is considering giving an even greater weight to housing production and affordable housing, which would increase San Francisco's share from Cycle 1, despite the reduction in total OBAG program-wide funding.
- San Francisco and the other larger CMAs were required to program 70 percent of funds to support PDAs (smaller CMAs were required to program 50 percent of funds to support PDAs).

- All jurisdictions receiving funds were required to have a certified Housing Element and have adopted a Complete Streets policy to be eligible for funds.
- Each CMA was required to create a Transportation Investment and Growth Strategy that describes how it expects to support its PDAs through transportation investment. The Transportation Authority prepared San Francisco's Transportation Investment and Growth Strategy that was adopted by the Transportation Authority Board in July 2013.

The OBAG funding framework also created a new program being administered in concert with the Coastal Conservancy to support Priority Conservation Area-related planning and implementation activities.

In order to facilitate growth and transportation investments in the San Francisco's PDAs, the $2.38 million in Local PDA Planning funds were administered by the San Francisco Planning Department (SF Planning) in line with the Transportation Investment and Growth Strategy (see Table 6-1 for the list of projects).

Table 6-1: Local PDA Planning Projects in San Francisco

PROJECT	PDA SUPPORTED	FUNDING LEVEL
Rail Storage Alternatives Analysis & Boulevard Feasibility Study	Multiple (Mission Bay, Eastern Neighborhoods, Transbay Terminal)	$514,940
Embarcadero Multi-Modal Planning	Multiple (Port of San Francisco, Mission Bay, Eastern Neighborhoods, Transbay Terminal, Downtown/Van Ness/Geary)	$250,000
Bayshore Station Re-location	San Francisco/San Mateo Bi-County Area	$392,000
M-Ocean View Re-Alignment Study	19th Avenue Corridor	$492,000
Ocean Avenue Pedestrian and Streetscape Improvements	Balboa Park	$342,000
Caltrain North Terminal Study to Support Future Operations	Mission Bay	$177,060
Market/Noe Technical Analysis	Market & Octavia	$100,000
Administration	n/a	$112,000

6.3.4 | Multi Agency Land Use and Transportation Studies

In addition to projects identified to receive PDA Planning Funds, San Francisco is leading or plans to lead several studies in which transportation is closely tied to land use development. All planned development areas are located within PDAs and involve a multi-agency approach in which the Transportation Authority has a supporting role.

CORE CAPACITY TRANSIT STUDY

The Core Capacity Transit study is a multi-agency study to identify and prioritize the major investments needed to serve the growing demand for transit service in to the San Francisco Core, both from within the City and County of San Francisco as well as Transbay trips. The study will consider short, medium, and long term investments that could help upgrade the overall transportation system in these markets, with an eye towards the interrelationship between changes in local and regional land use and both transit service demand and provision. This study is expected to be completed in 2017.

6.3.5 | Climate Change Initiatives

AB 32, enacted in 2006, established a statewide target for greenhouse gas (GHG) emissions reduction and gave the California Air Resources Board (CARB) the authority to regulate GHG emissions, including those from private vehicles. The target reduction is to reach 1990 emission levels by 2020. In 2008, CARB approved a Scoping Plan that outlines the state's approach to reducing GHG emissions. Among other strategies, AB 32 calls for implementation of a cap-and-trade program to regulate GHGs, which commenced in January 2013.

SB 375, passed in 2008, provides a mechanism for the implementation of AB 32 for the transportation sector, which is responsible for approximately 40 percent of the state's GHG emissions. As required by SB 375, the Metropolitan Transportation Commission (MTC) and the Association of Bay Area Governments (ABAG) have developed Plan Bay Area the Bay Area's Sustainable Communities Strategy (SCS), described above.

Further proactive approaches that are both realistic and effective in addressing GHG reduction are needed to achieve AB 32 goals. It is also only prudent to recognize that there are limits to what can effectively be achieved in any one region. Climate change is not a local issue, and the federal government will need to play an expanded role in helping the state and region achieve GHG reductions. The effectiveness of that role will depend, in large measure, on the direction of federal climate legislation and the degree to which updates to federal surface transportation legislation will be able to secure reliable and stable revenues for transportation infrastructure projects and services, beyond what the state is able to fund in the foreseeable future.

It is inescapable that, in order for GHG reduction efforts to be effective, there will be a need to realign not just travel behavior, but locational choices for many economic activities that take place in the region. A timid approach will only produce marginal results. Local jurisdictions will be called to do their part in accepting growth, density and changes in travel behavior, and the region will need to realign its transportation investment priorities to provide funding for the infrastructure necessary to support those choices.

Locally, the City of San Francisco has adopted a citywide ordinance (81-08) that sets ambitious goals for local reduction to achieve an 80% reduction below 1990 levels by 2050. The Transportation Authority's SFTP effort is exploring strategies to meet that goal for the transportation sector, finding that efforts to significantly increase investment in non-auto transportation infrastructure and strong pricing and other demand management policies will not be enough to get the City to its GHG reduction goals, and that unprecedented behavior change is necessary. The Transportation Authority also coordinated with the San Francisco Department of the Environment (SFE) and the SFMTA on the 2013 update to the Climate Action Strategy (CAS) for the Transportation Sector, a component of the City's Climate Action Plan.

6.3.6 | Regional Land Use Forecasts

For most forecasting activities, the Transportation Authority is required to use regionally-adopted projections of future Bay Area land use growth, including the distribution and nature of that growth across the region's individual jurisdictions.

In 2013, ABAG adopted its most recent regional land use forecast. The SCS Jobs Housing Connection targets San Francisco to absorb an additional 90,000 households by 2040 (using 2010 as a baseline),

bringing the number of households to 470,000. Employment in San Francisco is projected to add 190,000 jobs by 2040, bringing the total to more than 750,000 jobs located in the city.

The region will require bold investment and system management policies—both to achieve a future in which Bay Area growth is more focused and to reach targets that cannot be attained with land use strategies alone. The need for substantial VMT reduction to reduce climate change impacts makes transit investment a priority need, with increased funding necessary for operations, maintenance, and prioritized capital projects. Transit is most constrained in the region's core areas, as was demonstrated by recent record levels of ridership across multiple Bay Area systems, including consistent ridership counts at or above capacity on multiple corridors and services.

System management and demand management must also begin to be more of a focus in the City's and region's investment programs. Pricing strategies, in particular, will be a crucial growth management tool and means of self-help for the region, system operators, and local jurisdictions. Pricing policies are already regionally supported through development of a regional HOT lane system, regional parking pricing initiatives, and initiatives to use pricing incentives to shape travel demand.

The region must recognize the real and pressing infrastructure and service needs of core areas if the RTP/SCS and related regional planning work is to be meaningful. San Francisco is committed to playing a central role in the region's sustainable growth.

6.4. Neighborhood Transportation Planning

The Transportation Authority supports community-based transportation improvements by leading and funding neighborhood-focused transportation planning studies. These efforts help address community transportation concerns and engage community leadership in the transportation planning process, especially in underserved and disadvantaged communities.

Over the last decade, the Transportation Authority, working with other agency partners, has completed several neighborhood transportation plans, many of which were funded with grants from the Metropolitan Transportation Commission's Community Based Transportation Planning (CBTP) program, which focuses planning resources in minority and low-income communities – referred to by MTC as Communities of Concern. These plans have included the following:

- Chinatown Neighborhood Transportation Plan and Pilot Study (2015)
- Potrero Hill Neighborhood Transportation Plan (2015)
- Western SOMA Neighborhood Transportation Plan (2012)
- Bayview Hunters Point Neighborhood Transportation Plan (2010)
- Columbus Avenue Neighborhood Transportation Plan (2010)
- 19th Avenue Park Presidio Neighborhood Transportation Plan (2008)
- Mission-Geneva Neighborhood Transportation Plan (2007)
- Mission South of Chavez Neighborhood Transportation Plan (2007)

The Transportation Authority also manages the Neighborhood Transportation Improvement Program, a Proposition K funded program established to support community-based neighborhood scale planning efforts in San Francisco neighborhoods, especially in underserved neighborhoods and areas with vulnerable populations (e.g. seniors, children, and/or people with disabilities). The goal of the program

is help neighborhoods in each supervisorial district create a pipeline of grant-ready projects that have a high degree of community and agency consensus. Another objective of the program is to increase the capacity of neighborhoods and Community-Based Organizations (CBOs) to undertake neighborhood transportation planning. Current projects include:

- District 1: Improving Connections from Golden Gate Park to the Presidio
- District 2: Lombard Study: Managing Access to the "Crooked Street"
- District 2: Lombard Street / U.S. 101 Corridor Pedestrian Safety Study
- District 5: Western Addition Community Based Neighborhood Transportation Plan (also funded with MTC CBTP funds)
- District 9: Alemany Interchange Improvement Study
- District 10: Cesar Chavez / Bayshore / Potrero Intersection Improvement Project
- District 10: Potrero Hill Pedestrian Safety and Transit Access

6.5. Infill Opportunity Zones

Senate Bill 1636 (Figueroa), passed in 2002, granted local jurisdictions the authority to designate Infill Opportunity Zones (IOZs) in areas meeting certain specified requirements. Within a designated IOZ, the CMA is not required to maintain traffic conditions to the automobile level of service (LOS) standard. The San Francisco Board of Supervisors adopted San Francisco's IOZ on December 8, 2009.

SB 743 (Steinberg), passed in 2013, changed the eligibility criteria for IOZ designation. Previously, local jurisdictions that met a minimize population threshold could designate an IOZ in areas that met certain criteria regarding zoning and transit proximity. Under the new requirements, jurisdictions may designate an IOZ in any area:

- That is within a half mile of a major transit stop or corridor that is included in the RTP;
- That is within a designated transit priority area within the regional SCS; and
- Where an IOZ would be consistent with the jurisdiction's General Plan and any applicable Specific Plan.

Figure 6-2 identifies the current IOZ areas in San Francisco. Under the new criteria, additional areas could be eligible for designation. See Appendix 4 for the Board of Supervisors resolution on the IOZ.

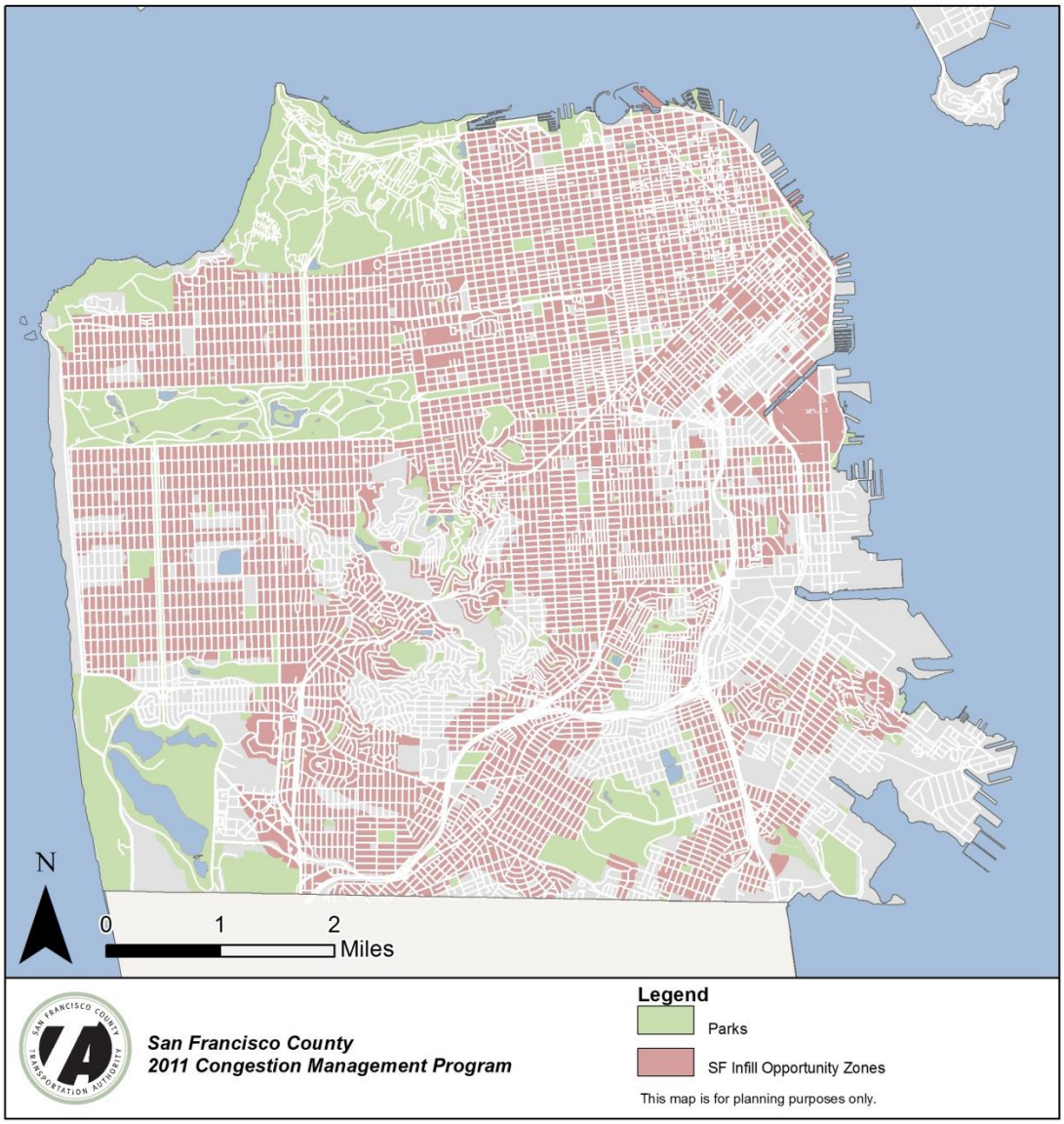


Figure 6-2: San Francisco IOZs

6.5.1 | Congestion Management Agency Requirements

State congestion management law requires CMAs to establish vehicle level of service (LOS) standards for a designated countywide network of roadways (see Chapter 3). Within a designated IOZ, CMP automobile LOS standards are not applicable. Instead, an alternative metric can be applied for local analysis of transportation impacts. The Transportation Authority is coordinating with relevant City agencies through the Transit Sustainability Fee effort to develop and implement the alternative to LOS, consistent with statutory requirements. The investment strategies, program funding, and policy recommendations in the San Francisco Transportation Plan is representative of the flexible level of service mitigation options as is required under SB 1636.

6.6. Transportation Impact Analysis

San Francisco's approach to conformance with the CMP land use impacts analysis requirements is based on the existing process administered by the Planning Department. The Planning Department works from its Transportation Impact Analysis Guidelines for Environmental Review (see Appendix 8).

The Transportation Authority is currently partnering with the Planning Department and other City agencies to improve the City's CEQA transportation impact analysis methodology and process, by advancing a measure consistent with SB 743 for assessing transportation impacts.

6.6.1 | Uniform Land Use Analysis Methodology

The Transportation Authority uses tools and analysis techniques that use regionally-consistent land use assumptions. For example, in updating the SFTP the Transportation Authority used land use forecasts developed by the Planning Department (subject to regional requirements for consistency with ABAG), generated new estimates of future travel demand, and tested alternative projects and investment strategies to address those future transportation needs.

6.6.2 | Transit Impact Development Fee

First enacted in 1981, the Downtown Transit Impact Development Fee (TIDF) ordinance was enacted as a means to have new development pay its fair share for expanded transit capacity to serve that development. TIDF assesses a one-time fee per square foot on new or converted office space in the downtown area.

In 2004, the Board of Supervisors recognized that a significant number of new transit trips would be generated by non-residential development. The Board approved an amendment to the TIDF legislation that expanded the ordinance to include the following land uses: visitor services; medical and health services; cultural, institutional, and educational (CIE); retail and entertainment; office use; and production, distribution, and repair (PDR). The legislation was also amended to include all new developments citywide, rather than just in the downtown office area. The 2004 TIDF ordinance established a fee schedule, which is subject to annual adjustment without further action by the Board of Supervisors to reflect changes in the relevant Consumer Price Index, as determined by the City Controller. The current fee schedule was last updated in February 2013, based on a nexus study completed in 2011, and is shown in Table 6-2. In addition to the annual fee adjustments, the ordinance lowered the threshold for triggering the TIDF from 3,000 square feet of new development to 800 square feet. It also established a new policy credit against the fee that could be available for small businesses and projects that provide less than the maximum authorized parking.

Table 6-2: 2013 TIDF Ordinance Fee Schedule

LAND USE CATEGORY	TIDF PER SQ. FT. OF DEVELOPMENT
Visitor Services	$12.64
Medical and Health Services	$13.30
Cultural/Institution/Education	$13.30
Museums	$11.05
Retail/Entertainment	$13.30
Management, Information and Professional	$12.64
Production/Distribution/Repair	$6.80

Appendix 9 contains a copy of the 2004 TIDF ordinance.

The revenues from the fee may subsidize capital and operating expenses for existing and new transit service. New development generates more transit trips, which add to the already heavily utilized transportation system, especially in the downtown area during peak periods. This, in turn, creates a greater burden on the City transit system. Because transit operates at or near capacity during peak periods, ridership growth must be addressed through increased Muni service frequencies. However, constrained infrastructure (e.g., Market Street tunnel) and reduced operating funding (e.g., from the state) limit the ability of Muni to increase peak-period service.

The impact fee levied on developers must be related to providing new or expanded transit service to support peak period travel generated by new development (including any costs associated with operations or capital). The need for transit services as a result of new development must be established. Furthermore, the proposed expenditures of the fee and the dollar amount of the fee must also have a "nexus" to the development project impacts.

At the time of writing, the Transportation Sustainability Fee, which increases the amount of the TIDF and expands its application to market rate residential development, is under consideration by the Board of Supervisors for approval.

6.6.3 | Transportation Sustainability Fee Nexus Study

CEQA TRANSPORTATION IMPACT ANALYSIS AND IMPACT FEE MITIGATION REFORM

CEQA requires California's public agencies to determine the potential for proposed projects to have significant impacts on the environment, including transportation impacts. CEQA also encourages agencies to develop thresholds of significance—the quantitative point at which an environmental effect may be considered significant—to facilitate these determinations. Although CEQA gives local jurisdictions discretion to adopt impact measures and significance thresholds, many agencies in California measure a project's effects on transportation using the Highway Capacity Manual's intersection Level of Service (LOS) measure, which measures delay to automobiles.

In October 2008, the Transportation Authority adopted the Final Report on the Automobile Trip Generation Impact Measure as an alternative to automobile LOS. The Report recommends that the City measure the transportation impacts of projects under CEQA based on the net new automobile trips generated (ATG) by a project. Project sponsors could mitigate trip generation impacts by paying a new auto trip mitigation fee (ATMF) that would fund a set of citywide and local area projects designed to address environmental impacts caused by the project.

The proposed replacement measure and mitigation approach was considered superior to the existing practice because it was:

- A better indicator of environmental effect than LOS;
- Consistent with the City's Transit First Policy and other environmental and health goals;
- More efficient and transparent for the Planning Department to implement and for project sponsors to understand; and
- A more effective approach to transportation impact mitigation.

In a separate but related development the Transportation Authority worked with the State Office of Policy and Research in 2009 to revise the CEQA Guidelines section on transportation impact analysis, which removed the exclusive reference to automobile LOS and replaced it with an option for local jurisdictions to select an alternative measure of transportation impact. The revisions also deleted references to parking as a transportation impact area.

In 2011, the Transportation Authority, together with the Planning Department, SFMTA and Mayor's Office of Economic and Workforce Development (OEWD), completed a Nexus Study for the proposed fee, the Transportation Sustainability Fee Program. The fee would be based upon the motorized trips generated by a project and fund a package of improvements designed to offset the transportation impacts of development including transit service and priority improvements, transportation demand management projects and bicycle and pedestrian network enhancements. Legislation for the Program was introduced to the San Francisco Board of Supervisors in May 2012. Since then, the City has been simultaneously pursuing environmental review and updating of the fee Nexus Study to be consistent with Plan Bay Area. On September 27, 2013, the governor signed into law SB743, which revised the criteria for determining the significance of transportation impacts within transit priority areas.

In the fall of 2014, the State of California Office of Planning and Research released draft guidelines for implementation of SB 743, indicating that vehicle miles traveled would be the primary metric for evaluating transportation impacts. Final guidelines are anticipated by the end of 2015 and completion of the rulemaking process will likely be completed by the end of 2016. At that point in time, level of service will no longer be used to determine transportation impacts under CEQA.

6.7. Work Program

The Transportation Authority will continue to work jointly with City departments and regional agencies to assess the transportation impacts of planned growth, to better link transportation and land use planning, and advance climate change-related goals related to transportation. Specifically, the Transportation Authority will:

- Support the development of the regional land use model.
- Continue to develop applications of land use data within the GIS and model databases to conduct multimodal performance measurement and analysis (e.g., the relationship of land use patterns to transit usage and coverage).
- Participate in statewide, regional, and local SB 375 implementation activities by coordinating San Francisco input and advocating for San Francisco priorities in such activities as the setting of targets and preparations for the next RTP/SCS.
- Coordinate with appropriate City departments to reform transportation impact analysis in San Francisco through participation in the Transit Sustainability Fee Nexus Study and follow-up efforts.
- Continue development of the Neighborhood Transportation Planning and PDA Planning efforts as recommended in the Transportation Investment and Growth Strategy.
- Coordinate with appropriate city departments to develop and adopt the 2017 SFTP update.

- Continue to review and provide technical support to ongoing area plans and land use studies under development, including PDA projects as listed in Table 6-1.

CHAPTER SEVEN

CAPITAL IMPROVEMENT PROGRAM

KEY TOPICS

- Legislative Requirements
- Relationship to Other Plans
- Relationship to City Department Activities
- Funding and Programming
- Amendment
- Project Delivery

7.1. Legislative Requirements

California Government Code 65089(b)(5) requires that the CMP contain a seven-year Capital Improvement Program (CIP), developed by the Congestion Management Agency (CMA), the Transportation Authority for San Francisco, to maintain or improve the transportation system performance measures established in the CMP, and to address impacts on the regional network, as identified through the land use impact analysis program.

7.2. Relationship to Other Plans

7.2.1 | Regional Transportation Plan and Countywide Transportation Plan

The CMP statute requires that each CMP be consistent with the long-range Regional Transportation Plan (RTP), developed by the regional transportation planning agency (the Metropolitan Transportation Commission, or MTC, for the Bay Area), and each county's component of the RTP must be supported by a long-range countywide transportation plan (San Francisco Transportation Plan, or SFTP), developed by the CMA. The CIP is intended to serve as a short or medium-range implementation vehicle for investment priorities as prioritized in the long-range plans.

Through the RTP, the MTC establishes the Bay Area's vision for transportation with supporting policies and investment strategies, including a list of specific projects and programs. Inclusion of projects and programs in the RTP is a prerequisite for receiving state and federal transportation grants for certain state or federal approvals and a requirement for capacity expanding projects that may have air quality impacts. The MTC adopted the most recent RTP, titled Plan Bay Area, in July 2013. Plan Bay Area is the region's first RTP that explicitly integrated transportation and land-use strategies to meet the SB 375 requirements to accommodate future population growth and reduce greenhouse gas emissions.

The Transportation Authority develops the SFTP for San Francisco, consistent with MTC guidelines, to guide transportation investment and to serve as a basis for RTP assumptions. The Transportation Authority adopted the SFTP in December 2013, which identified four goals (economic competitiveness, safe and livable neighborhoods, environmental health, and well maintained

infrastructure) and proposed scenarios that invest strategically in a diverse set of projects to make progress toward each of the goals. The Transportation Authority ensures the CIP projects, as well as their selection processes, are consistent with the SFTP. The SFTP is discussed in further detail in Chapter 6 (Land Use Impacts Analysis).

7.2.2 | Prop K and AA Expenditure Plans

In 2003, 75% of San Francisco voters approved Prop K, extending the existing half-cent sales tax for transportation and adopting a new 30-year Expenditure Plan. The 30-year Expenditure Plan directs $2.35 billion (in 2003 $'s) to a list of transportation projects that were developed through the first SFTP and are expected to leverage another $9.6 billion in other federal, state and local funds. In 2010, San Francisco voters approved Prop AA, authorizing an additional $10 vehicle registration fee on motor vehicles registered in San Francisco. Prop AA revenues fund projects in a 20-year Expenditure Plan and are meant to complement Prop K by adding funding to address capital shortfalls (e.g. in street resurfacing) and provide new funding for pedestrian safety, which has few dedicated funding sources.

As further discussed in the Funding and Programming section, the Prop K Strategic Plan and 5-Year Prioritization Programs (5YPPs) continue to ensure Prop K investments, one of the major funding sources for the CIP, are aligned with the updated SFTP priorities.

7.2.3 | Bay Area Clean Air Plan

The Transportation Authority ensures that the CIP conforms to air quality mitigation measures for transportation-related vehicle emissions, as detailed in the Bay Area Air Quality Management District's (BAAQMD) Clean Air Plan and related documents. This also raises San Francisco projects' competitiveness for external funds, since the MTC gives priority to proposed projects that support or help implement the mitigation measures outlined in the Clean Air Plan. See Appendix 11 for San Francisco's trip reduction efforts in relationship to the regional mitigation measures.

7.2.4 | Other Capital Plans and Short Range Transit Plans

Each City department develops its own capital investment plans for inclusion in San Francisco's ten-year Capital Plan. In addition to the citywide Capital Plan, the SFMTA has multiple short-term and long-term processes to prioritize its capital needs, including its Strategic Plan, Transit Fleet Management Plan, Short Range Transit Plan, and an Enterprise Asset Management System under development. Five regional transit operators that serve San Francisco also develop their own capital plans and Short Range Transit Plans: BART, AC Transit, SamTrans, Golden Gate Transit, and Caltrain. The Transportation Authority considers these plans as an input into its programming process to facilitate better coordination of San Francisco programming decisions with citywide and regional priorities in compliance with CMP requirements. Also see Section 7.3: Relationship to City Department Activities.

7.2.5 | San Francisco General Plan

The San Francisco City Charter assigns responsibility to the Planning Department for consistency review of capital improvements with the General Plan. This consistency review function is incorporated into the Transportation Authority's CIP programming process. If necessary, projects in the CIP may be

submitted to the Planning Department for a General Plan consistency check. However, in practice, this is not typically required as the SFTP is consistent with the General Plan.

7.3. Relationship to City Department Activities

The changes in programming introduced by the 1995 CMP, as explained in this chapter, do not substantially alter programming-related activities currently performed by City departments. The goal of the process is, in fact, to streamline the programming process so that complete and timely information is available to the Transportation Authority Board, providing a well-defined context that facilitates strategic programming policy decisions. It is important to note, for example, that each City department or other eligible project sponsor will continue to develop its own capital investment plans. The Transportation Authority's intent is not to suggest changes to the priorities within those plans, but rather to steer the overall programming strategy and analysis of trade-offs, with a particular focus on the fund sources included in this CIP.

The Transportation Authority review process, as explained in Section 7.5, provides the required structure to analyze programming and performance data that will inform those Transportation Authority Board decisions. It is important to note that the process is intended to function using information already developed by project sponsors. The most significant value added by the Transportation Authority's review process is in providing an overall context for transportation programming strategy and system performance to facilitate Transportation Authority Board decisions.

Key roles and responsibilities of the City departments and the Transportation Authority in the transportation programming process are summarized below.

7.3.1 | City Departments

1. Prepare plans, prioritize capital improvement programs and develop financial plans on an annual or biannual basis
2. Use financial constraints and strategies imposed by external agencies in addition to those established by the Transportation Authority and departments for various funding sources
3. Revise financial plans at regular intervals to reflect changes in project scope, budget or schedule, and changes in funding projections
4. Process CIP amendments through the Transportation Authority, and obtain Transportation Authority Board approval or administrative review before submittal of new information to outside agencies
5. Check eligible project list consistency with the San Francisco General Plan before adoption by Authority Board (performed by the Planning Department)
6. Make prioritization recommendations at the time of eligible project consistency review

7.3.2 | Transportation Authority

1. Develop, adopt, and update the CMP and its CIP
2. Process CIP amendments according to the established procedures
3. Provide input into the MTC, state, and federal agencies' process for the preparation and updates of the Regional, State, and Federal Transportation Improvement Programs (RTIP, STIP, and TIP) in coordination with sponsors.
4. Provide Prop K and Prop AA revenue estimates and advise on financial strategies

5. Develop Prop K and Prop AA Strategic Plan and 5YPP updates to respond to revisions in departments' and other project sponsors' (e.g. regional transit operators) capital and financial plans and to reflect CIP amendment decisions
6. Notify outside programming agencies of decisions on CIP amendments
7. Program the Prop K, the Prop AA, and the local (40%) portion of the TFCA funds, as well as discretionary funds as directed by the MTC, state, and federal agencies

7.4. Funding and Programming

As a result of the Transportation Authority's role as the Prop K and Prop AA administrator and the CMA, the capital priorities programming process not only involves state and federal funds that are required by state law to be programmed through the CMP but also incorporates the Prop K and Prop AA programming strategy. Listed below are major CIP funding sources administered by the Transportation Authority. Importantly, as described in the Relationship with Other Plans section, the Transportation Authority ensures that all CIP projects, as well as the programming and project selection processes, are consistent with the RTP, SFTP, and other requirements attached to the funding.

Evaluation of potential impacts of CIP projects on multimodal system performance is embedded throughout the project selection and monitoring processes. The results of the CMP multimodal system performance analysis and any deficiency findings will also be incorporated into the future CIP development as appropriate. Please refer to Chapter 4 for a detailed discussion of multimodal system performance.

7.4.1 | Surface Transportation Program / Congestion Mitigation Air Quality Program

Conformance with the CMP is required for a local jurisdiction to receive federal Surface Transportation Program (STP) funds or Congestion Mitigation and Air Quality Improvement Program (CMAQ) funds. STP funds are among the most flexible and are used to support a wide range of transportation improvement projects across all modes. CMAQ funds are intended for projects that reduce transportation related emissions. Both funds are distributed mainly by the regional transportation planning agency, i.e. the MTC for the Bay Area. The MTC has divided the Bay Area's share of STP and CMAQ funds into multiple programs under the umbrella of the One Bay Area Grant (OBAG) program. Each of the OBAG programs typically has its own associated policies and guidelines in pursuant of RTP goals. Since the 2013 CMP, the MTC extended the overall STP/CMAQ investment framework from a four-year to a five-year period (originally federal fiscal years 2012/13 through 2015/16, now through 2016/17) since federal revenues had come in lower than expected for the first four years and projects were taking longer to deliver. One of the centerpieces of OBAG is the county share program, which is intended to better integrate the region's transportation program with land use and housing policies and to promote transportation investments in Priority Development Areas (PDAs). PDAs refer to locally-identified, regionally designated infill development opportunity areas within existing communities. Since the adoption of the final OBAG program of projects in June 2013, the Transportation Authority has provided monitoring and support for sponsor agencies as projects advance through the design and construction phases under the federal aid guidelines. See Appendix 12 for the updated project list.

7.4.2 | State Transportation Improvement Program

Inclusion in the CIP is a prerequisite for inclusion in the State Transportation Improvement Program (STIP), a five-year program of projects adopted by the California Transportation Commission (CTC) every two years. Priorities for approximately 75% of the STIP programming capacity are set by regional transportation planning agencies, and the remaining 25% is established by the state. The Regional Transportation Improvement Program (RTIP) is the MTC's submittal to the state, which is merged with other regions' RTIPs and additional CTC priorities to become the STIP. In the Bay Area, the practice has been for the CMAs to establish priorities for their county share, subject to the MTC's concurrence and the CTC approval of the region's RTIP. The Transportation Authority's Board-adopted list of San Francisco RTIP priorities include remaining commitment of about $147 million to four projects: Central Subway (first priority, $75.5 million), payback to MTC of an advance for Presidio Parkway (second priority, $34 million), Caltrain Electrification ($20 million), and Caltrain Downtown Extension to a Rebuilt Transbay Terminal ($17.9 million).

The STIP used to be a significant, although highly variable source of state funds for highways, local streets and roads, transit rehabilitation and expansion projects, and pedestrian and bicycle projects. In recent cycles, the biennial STIP programming cycles have experienced a drastic reduction in available funding, due primarily to reduced revenues from fuel taxes, but also to the lack of an adequately funded multi-year federal transportation bill. Given that this year's fund estimate is only $46 million statewide (vs. $1.3 billion in 2014 STIP), CTC is making no new funds available for CMAs in the 2016 STIP. In accordance with MTC's 2016 RTIP Policies and Procedures, CMAs must still submit their carryover programming and any associated changes from the 2014 STIP to MTC. Appendix 12 shows the San Francisco draft 2016 RTIP priorities. The 2016 STIP is expected to be approved by MTC in December 2015, followed by the CTC's adoption in March 2016.

7.4.3 | Prop K Transportation Sales Tax

Prop B was the first half-cent local sales tax for transportation in San Francisco, approved by San Francisco voters in 1989. Prop K, passed by the voters in November 2003, extended the half-cent local sales tax for transportation and adopted a new 30-year Expenditure Plan, superseding the prior one. At the time of the Expenditure Plan adoption, Prop K was expected to generate $2.35 billion (in 2003 $'s) over 30 years and to leverage close to $10 billion in federal, state, and other local funds.

The Expenditure Plan established four overall categories of investment and attached mandatory percentage shares of total Prop K revenues: Transit (65.5%), Street and Traffic Safety (24.6%), Paratransit (8.6%), and Transportation System Management / Strategic Initiatives (1.3%). The Expenditure Plan details eligible projects and programs, including named major capital projects (e.g. Central Subway, Caltrain Downtown Extension to a Rebuilt Transbay Terminal, Caltrain Electrification, and Replacement of Doyle Drive) and 21 programmatic (i.e. not project-specific) categories, ranging from street resurfacing to pedestrian and bicycle improvements to transit vehicle replacements to transportation demand management. Appendix 13 provides a summary of the Expenditure Plan, which lists the eligible projects and programs along with their shares of Prop K funds and expected leveraging goals.

As required by the Expenditure Plan, the Transportation Authority Board adopts a Prop K Strategic Plan to guide the day-to-day implementation of the Prop K program, and for each of the programmatic categories, a 5YPP. The Prop K Strategic Plan is the financial tool that guides the timing and allocation of Prop K revenues over the 30-year Expenditure Plan period, and it considers many factors, such as the presence of matching funds and the likelihood of projects to move forward in the year proposed. The 5YPP includes prioritization criteria, a five-year list of projects (with scope, schedule, cost, and

funding information), and performance measures. The Strategic Plan and 5YPPs are updated quadrennially in coordination with updates to the RTP and may, between quadrennial updates, be amended as needed, as determined and recommended by the Executive Director. In 2014 the Transportation Authority approved the 2014 Strategic Plan and 5YPPs, which cover Fiscal Years 2014/15 - 2018/19. The update was strongly coordinated with Plan Bay Area and the SFTP update. Appendix 14 provides a list of programmatic categories in the Expenditure Plan and refers to the current 2014 5YPP project lists. Appendix 15 summarizes the funding levels in the 2014 Strategic Plan baseline as adopted in September 2014.

7.4.4 | Prop AA Vehicle Registration Fee

Prop AA is a $10 countywide vehicle registration fee that was passed by San Francisco voters in 2010. Total revenues are estimated over the 30-year period at approximately $150 million (year of expenditure), or approximately $5.0 million annually, to fund smaller, high-impact projects throughout the city on a pay-as-you-go basis. The Prop AA Expenditure Plan established four categories of investment and attached mandatory percentage shares over 30 years: Street Repair & Reconstruction (50%), Pedestrian Safety (25%), and Transit Reliability & Mobility Improvements (25%). In December 2012, the Transportation Authority Board approved the first Prop AA Strategic Plan, which guides the timing of expenditures, and sets policies for day-to-day management of the program. The Strategic Plan directs $26.4 million to projects through Fiscal Year 2016/17. See Appendix 16 for the Prop AA Strategic Plan Programming.

7.4.5 | Transportation Fund for Clean Air

The Transportation Fund for Clean Air Program (TFCA) was established to fund the most cost effective transportation projects that achieve emission reductions from motor vehicles. Funds are generated from a $4 surcharge on the vehicle registration fee. Forty percent of the funds are set aside for Program Managers for each of the nine counties in the Bay Area Air Quality Management District (BAAQMD). The Transportation Authority is the designated TFCA Program Manager for San Francisco. In that capacity, it programs approximately $800,000 every year to clean air vehicles, shuttle operations, bicycle and pedestrian improvements, and other eligible transportation projects that help clean up the air by reducing motor vehicle emissions. The Transportation Authority also provides assistance to project sponsors in applying Regional TFCA funds, programmed directly by the BAAQMD. The remaining sixty percent of the revenues, referred to as the Regional Fund, is distributed on a competitive basis to applicants from the nine Bay Area counties. See Appendix 12 for the list of San Francisco TFCA projects selected since the last CMP.

7.4.6 | Lifeline Transportation Program

The MTC established the Lifeline Transportation Program (LTP) to improve transportation choices for low-income persons as part of the 2005 RTP. For the Cycle 4 LTP, the MTC assigned a total of up to $4.9 million in two different funding sources (i.e. federal Job Access and Reverse Commute (JARC) and State Transit Assistance (STA) funds) to the Transportation Authority, and assigned state Prop 1B funds to transit operators, including $6.1 million to the SFMTA and $4.6 million to BART, to program with the Transportation Authority's concurrence. See Appendix 12 for the Cycle 3 LTP project list.

7.5. Amendment

The previous sections describe the central role of the CMP in establishing standards and measuring or otherwise assessing the performance of the multimodal transportation system, and the role of the CIP in helping to maintain that level of performance. Any proposed changes to CIP projects must therefore first be assessed by the Transportation Authority for potential effects on the system performance. Because project viability can be affected by changes in any component of its funding package, the requirement for Transportation Authority review applies to all funding components of CIP projects, whether they are directly programmed by the Transportation Authority or not. There are two kinds of CIP amendments: policy level and administrative level.

7.5.1 | Policy-Level CIP Amendments

Policy-level amendments apply to changes that are deemed by the Transportation Authority to be significant enough that they have the potential to affect the performance of the multimodal transportation system, such as scope, schedule, or budget changes that will affect the year of delivery (completion), the amount or availability of operating funds, the year of programming, the fund source designation, or any other aspect of the funding packet requiring action by the MTC or the CTC for funds initially prioritized or programmed by the Transportation Authority. Policy-level amendments require approval by the Transportation Authority Board prior to processing of the change by the project sponsor.

Regardless of the funding source or other programming aspects affected, the Executive Director may rule that a requested CIP amendment is administrative if the proposed changes, involving one or more projects and one or more funding sources, requires programming actions that can be authorized at the staff level at the MTC or the CTC, or at the regional office level for federal agencies, such as administrative TIP amendments, or if it results in the following:

- no net change in the total amount of funds allocated to each of the projects involved; and
- no change to the total amount of dollars of each funding source, all affected projects combined; and
- no increase in Prop K or Prop AA match required, all affected projects combined; and
- when a programming year is involved, it will have no effect on the delivery schedule for the project because the schedule is determined by documented external factors.

7.5.2 | Administrative-Level CIP Amendments

These apply mostly to programming changes that can alter the overall transportation programming strategy for San Francisco even though their individual effects on system performance may only be very marginal. Such programming changes will trigger the need for administrative level review even if they are not tied to a specific project listed in the CIP as long as they affect San Francisco's share of a transportation funding source listed in the CIP. The purpose of this requirement is to ensure that the Transportation Authority has the required information to evaluate programming strategy and the performance of CIP projects in the context of the universe of programming and project delivery decisions in San Francisco. Administrative-level amendments will only require notification to and concurrent review by the Transportation Authority's Executive Director or her designee. In addition,

proposed changes to Prop K and Prop AA programming will automatically trigger administrative-level review and, at the Executive Director's discretion, may require policy-level amendments.

7.5.3 | Applicability of CIP Amendments

Applicable funding sources include but are not limited to those programmed directly by the Transportation Authority, such as county share STP/CMAQ, RIP, LTP (JARC, STA, and STP), TFCA, Prop K, and Prop AA. Certain funding sources are programmed through state or regional processes and typically become available to project sponsors through a separate application procedure. In some cases, the funds are allocated on a first-come, first-served basis, so project sponsors' ability to act quickly is crucial. Further, many sources have timely use of funds requirements where failure to meet deadlines can result in loss of funds to the project or to San Francisco or prohibition from applying for future cycles until deadlines are met. The MTC has requested that CMAs assist with oversight of certain funding sources (e.g. Highway Safety Improvement Program) even if not directly prioritized by CMAs. The intent is to improve project delivery and specifically to avoid loss of funds to the region. The Transportation Authority encourages sponsors to proactively notify the Transportation Authority of any project delivery issues or other issues that may threaten a project's ability to meet timely use of fund deadlines, whether sources covered by CIP amendments or not. The Transportation Authority can serve as a resource and facilitator to help resolve delivery issues and avoid loss of funds to San Francisco projects.

7.5.4 | Amendment Process

In order to avoid additional reporting burdens on project sponsors, there is no specific form or format for submittals to the Transportation Authority. However, project sponsors wishing to make application to regional, state, or federal programming agencies for changes affecting current CIP programming must provide a brief written explanation (email is acceptable) and a description of proposed changes.

The Transportation Authority performs an initial administrative level review, to determine the need for further application information as well as to suggest the appropriate level CIP amendment required. This is followed by detailed, concurrent reviews for programming and performance implications. The process also calls for discussions with project sponsors to resolve any issues identified by the Transportation Authority's review, and establishes basic procedures to ensure disposition of the requests for review within a reasonable period of time. The timelines proposed below will vary depending upon the urgency of the request and external factors, such as deadlines established by the MTC or Caltrans.

REQUEST IN-TAKE REVIEW: Upon receipt of a request for programming changes, the Transportation Authority will perform an initial staff-level review. Within ten (10) working days after receipt of the request, the Transportation Authority will communicate in writing to the applicant the need for any additional information, necessary in order to further process the application. Within ten (10) working days after receipt of all information necessary to complete the request, the Transportation Authority will notify the applicant in writing if the amendment is approved administratively; appears to be administrative but requires additional information to approve; or is a policy-level amendment requiring Transportation Authority Board action. If the Transportation Authority finds that a policy-level amendment will be required, the communication will include:

- a schedule for Transportation Authority Board approval;

- a preliminary list of unresolved conformance or consistency issues identified in connection with the request; and
- a proposed course of action for resolution of these issues, including, at least, consultation and joint efforts with the applicant.

DETAILED REVIEW FOR POLICY-LEVEL AMENDMENT: Unless otherwise specified in the proposed schedule for resolution of issues, within ten (10) working days after the notification, the Transportation Authority will complete a detailed review of the request. The detailed review will include two components: a programming review, and a performance review. To expedite the process, both reviews will be carried out concurrently at the Transportation Authority.

The programming review will evaluate issues of Prop K and Prop AA Strategic Plan consistency and CMP CIP conformance, focusing on the following key strategic programming and fiscal policy factors:

- **Cost of Money:** Does the proposed change limit availability of funding by Prop K or Prop AA category or by state or federal funding source? Does it require or bring the Transportation Authority closer to the need to bond in order to deliver the Prop K program? Does it otherwise affect other CIP funding sources so as to increase the cost of money?
- **Leveraging Capacity:** Does the proposed programming change improve or worsen the Transportation Authority's prospective ability to capture state and federal funds for San Francisco projects? Does it increase the required local (Prop K, Prop AA, or other) match?
- **Other Programming Policy Consistency:** Does the proposed programming change result in a skew of the funding category targets established in the Prop K or Prop AA Strategic Plan? Does it substantially alter the programming priorities established in the Strategic Plan of 5YPPs? Does it substantially alter the programming priorities established in the latest CMP CIP?

The performance review will evaluate impacts on the performance of San Francisco's multimodal transportation system according to the criteria described below. These analyses are intended to provide order-of-magnitude findings about future system performance, particularly cumulative impacts on operating conditions at the facility, corridor, or systemwide level. The process is not focused on prediction of minor changes in individual CMP network segments.

- **Effects of Schedule Changes on Performance:** Does the proposed programming change involve or result in a delay in the delivery (completion) of any CIP projects? Are there significant anticipated impacts on system performance because of completion delays?
- **Effects of Scope Changes on Performance:** Does the proposed programming change result in a downsizing of CIP projects?
- **Potential Deficiencies:** Does the proposed programming change create the potential for a deficiency on the CMP network? Does it adversely affect the City's ability to implement already adopted deficiency plans? Does it adversely affect the likely effectiveness or delivery timelines for an already adopted deficiency plan?
- **Multimodal Balance:** Does the proposed programming change affect the multimodal balance of the CIP? Does it significantly degrade performance conditions for one mode vis-à-vis other modes? Is it likely to significantly affect certain categories of travelers vs. others (e.g., will it adversely affect off-peak transit riders vs. drivers, or local vs. through trips?).
- **Subarea Impacts.** The analysis will address questions such as is the proposed programming change likely to result in disproportionate adverse impacts to system performance for one subarea of the City vs. the others?

DISPOSITION OF POLICY-LEVEL AMENDMENT REQUESTS: If there are no outstanding issues identified during the review process, the item will be scheduled for Transportation Authority Board action at the next meeting, with a recommendation for approval. If issues identified during the review process are not resolved within the time frame specified in the initial notification, the Transportation Authority will establish a schedule for final resolution of these issues, and invite the pertinent programming agencies to facilitate the process. The findings and recommendations from this process will be agendized for Transportation Authority Board action on a schedule determined by the Executive Director.

As part of the evaluation process for all CIP Amendments, the Transportation Authority will explicitly consider and recommend adjustments to the Prop K and Prop AA Strategic Plans and to the TFCA program, as appropriate, to maintain consistency. Such adjustments will be scheduled for Transportation Authority Board action concurrently with the corresponding CIP Amendments.

The Transportation Authority will notify the pertinent regional, state, or federal agencies of the Transportation Authority Board action on policy level CIP Amendments, and/or staff-level approval of Administrative-Level CIP Amendments, as appropriate.

7.6. Project Delivery

One of the key purposes of the CMP is to establish the link between transportation investment and system performance. Programming projects in the CIP is only half of the picture. In order to be effective, the CIP must also function as a transportation project *delivery* mechanism. Failure to deliver projects or delays in implementation can affect system performance. Further, depending upon the fund source, delay in obligating funds or implementing a project can result in loss of funds to the project, to San Francisco, and/or to the Bay Area. In the long run, poor project delivery rates can influence state and federal authorization levels for transportation funding, leading to fewer resources to dedicate to maintaining and improving the transportation system.

The Transportation Authority has mechanisms in place for tracking Prop K and Prop AA project delivery (i.e., the Strategic Plan, 5YPPs, the Portal, MyStreetSF.com, and ongoing project management oversight activities). As a CMA, the Transportation Authority continues to work with the MTC and Caltrans to monitor project delivery rates for projects programmed in the RTIP and federal TIP, and serve as a resource to facilitate and advocate for San Francisco sponsors.

CHAPTER 8

TRAVEL DEMAND MODEL AND UNIFORM DATABASE

KEY TOPICS

- Legislative Requirements
- Legislative Intent and Application to San Francisco
- Technical Approach
- Work Programs Items

8.1. Legislative Requirements

California Government Code section 65089 (c), requires that each Congestion Management Agency (CMA), in consultation with the regional transportation planning agency (the Metropolitan Transportation Commission (MTC) in the Bay Area), the county, and local jurisdictions, develop a uniform database on traffic impacts for use in a countywide transportation computer model. The CMA must approve computer models used for county sub-areas, including models used by local jurisdictions for land use impact analysis. All models must be consistent with the modeling methodology and databases used by the regional transportation planning agency.

8.2. Legislative Intent and Application to San Francisco

Congestion management legislation was enacted in part to help transportation planning agencies identify the source of the transportation impacts of land use decisions. All Bay Area counties except San Francisco include multiple local jurisdictions each of which has authority over land use within its boundaries. The transportation impacts of decisions made in one local jurisdiction are felt across local jurisdictional boundaries. The travel demand model is intended as a technical tool to analyze land use impacts across local jurisdictions from a uniform technical basis.

As a unified City and County, San Francisco is spared the need to estimate transportation impacts across city boundaries, although inter-county impacts must still be considered. San Francisco's travel demand forecasting challenge is primarily the forecasting of travel by modes other than the private automobile, (e.g. transit, pedestrian, and cycling trips).

The Transportation Authority continually updates and refines their travel demand forecasting model, San Francisco Chained Activity Modeling Process (SF-CHAMP). Since the creation of the original San Francisco model in 2000, the model's geographic scope has been extended to the full nine-county Bay Area, along with significant improvements to pricing sensitivity and time-of-day modeling. The

Metropolitan Transportation Commission (MTC) has also now developed an activity based model with a similar structure.

In 2014, the Transportation Authority completed SF-CHAMP 5.0, which was calibrated using Census 2010 and The California Household Travel Survey (CHTS) 2010-2012. Previous model versions used earlier Census and household travel survey data. The Model Consistency Report for CHAMP 5.0 is included as Appendix 17. In 2015, the Transportation Authority updated their model to SF-CHAMP 5.1, which includes an updated bicycle route choice model, and are currently testing SF-CHAMP 5.2 which will include more accurate representation of parking prices and better sensitivity to them.

The Transportation Authority continues to use its Geographic Information System (GIS) database as a supplemental analysis tool for appropriate CMP purposes.

The model is integrated with the Transportation Authority's GIS database. The GIS is ideally suited for the graphic display of model outputs and more detailed spatial analysis. Together, GIS and the San Francisco Travel Demand Forecasting Model can be very effective both for sketch planning and the policy-level travel demand and performance forecasting exercises associated with long-range planning. The Transportation Authority's integrated model and GIS allow the ready presentation of data using graphics and maps.

The following section provides an overview of the San Francisco Travel Demand Forecasting Model and the GIS database.

8.3. Technical Approach

8.3.1 | The San Francisco Travel Demand Forecasting Model

The San Francisco Travel Demand Forecasting Model, known as SF-CHAMP, is a computer-based tool used to assess the impacts of land use, socioeconomic, and transportation system changes on the performance of the transportation system. SF-CHAMP was developed to reflect the unique transportation, socioeconomic, and land use characteristics of San Francisco and the Bay Area. The Model uses residents' observed travel patterns; detailed representations of the region's transportation system, population and employment characteristics; transit line boardings during specific time periods; roadway volumes; bicycle networks; tolling and parking pricing; and the number of vehicles available to households to simulate daily travel activity and measure performance. Future year transportation, land use, and socioeconomic inputs are used to forecast future travel demand.

I. ACTIVITY-BASED MICROSIMULATION

SF-CHAMP incorporates a state of the art approach to forecasting travel demand. This activity-based microsimulation model is sensitive to a broad array of conditions that influence travelers' choices.

One of the fundamental differences between SF-CHAMP and traditional models is that it is tour-based not trip-based. A tour is a sequence of trips made by an individual that begins and ends at home without any intermediate stops at home, whereas a trip is a single movement from an origin to a destination. Furthermore, the Transportation Authority's model predicts tours for individual household members (over five years old) and the resulting trips that comprise each tour, rather than just trips for each household, as in most traditional travel demand models. Tour-based models do not

require data beyond what is needed to develop a four-step travel model system. However, the tour-based methodology allows the model to:

- deal more realistically and precisely with trip chaining and interrelationships between individual trips made over the entire day;
- separate travel into mandatory and discretionary tours; and
- provide a more precise estimate of volumes that can support microsimulation models.

The second fundamental difference between SF-CHAMP and traditional models is that each individual's travel patterns are microsimulated, allowing previous decisions and preferences to inform subsequent decisions. Importantly, the combination of microsimulation and tour-based methodology allows decision-makers to understand not just the changes in the magnitude and direction of trip-making associated with a transportation or land use change, but also which San Francisco or Bay Area residents are most directly affected by that change. This equity analysis is a key advancement over traditional four-step models. Tour-based models also account more reliably for the complexities involved in multi-mode trip making. SF-CHAMP addresses the tradeoffs between modes for the full tour, as well as the tradeoffs between modal options of trips within a tour.

II. MODEL APPLICATIONS

The Transportation Authority uses the SF-CHAMP to provide detailed forecasts supporting a number of specific planning applications, including the countywide transportation plan known as the San Francisco Transportation Plan (SFTP), the Transportation Authority's Strategic Analysis Reports (SARs), policy analyses, mobility assessments, the Transit Core Capacity Study, the Regional Transportation Plan, the Transportation Sustainability Fee Nexus Study, and environmental analyses. Current model applications include Better Market Street, the Parking Supply and Utilization Study, the Freeway Corridor Management Study, and the Treasure Island Mobility Management Study.

Historically, the Transportation Authority also applied the model to assess Proposition K Expenditure Plan performance and impacts, as well as the full 2004 Countywide Transportation Plan package.

III. MODEL DEVELOPMENT AND ENHANCEMENTS

The key inputs required to develop and apply a travel demand forecasting model include information on household and individual travel behavior (obtained in a household travel survey), representations of the pedestrian, transit, and roadway networks, and spatial representations of employment and residential characteristics. In the SF-CHAMP, most of the model components were estimated (the process of establishing the relationship between various relevant inputs) using household travel data collected by the Metropolitan Transportation Commission (MTC). In addition to the household travel survey, a "stated preference" survey collected preference data on transit reliability, crowding, personal security, and auto parking availability and cost.

Note that SF-CHAMP is not a single model but, in fact, a series of component models that operate in a coordinated fashion, each with its own unique purpose. The following paragraphs provide brief overviews of the model inputs and components. Figure 8-1 illustrates how the model components are structured to produce travel demand forecasts.

At the time of its initial release, SF-CHAMP was one of the first activity-based travel demand models used in practice and has been continuously used and updated both in order to take advantage of new data, and to be appropriately sensitive to issues confronted in new projects and plans for which it is

used. SF-CHAMP version 5.1 is the current version of the model. The following paragraphs discuss the evolution of SF-CHAMP from version 3.0 to 5.1.

SF-CHAMP 3.0 is a hybrid model that forecasts the daily activity patterns and travel for San Francisco residents, but uses the Metropolitan Transportation Commission's (MTC) BAYCAST-90 model for non-San Francisco residents. This approach was appropriate to keep the initial implementation of an advanced tool manageable. For modeling pricing policies in San Francisco, however, this approach was limiting because much of the travel activity within San Francisco is generated by residents of other counties. In order to treat the entire Bay Area region in a consistent manner, CHAMP 4.0 predicts the daily activity patterns and tours of every Bay Area resident in all nine counties.

SF-CHAMP version 4.0 Harold added capabilities with respect to pricing sensitivity. Previous model versions did not have an explicit toll-choice model. Rather, SF-CHAMP 3.0 considered any bridge tolls during the "highway assignment" model component. SF-CHAMP 4.0 uses a "nested logit" approach for modeling tolls, which more accurately represents carpool cost-sharing, variations in travelers' values-of-time, and relationship to mode choice. Through this enhancement, it is possible to represent the choice of driving around a congestion pricing zone for free, or paying a toll to take advantage of time savings offered by reduced congestion in the priced area.

The SF-CHAMP 4.0 model was also enhanced to use continuous value-of-time distributions, rather than a single value of time for each of three income groups. This particular enhancement allows for a much greater range of variability across individuals, and is very well suited to models, such as SF-CHAMP, implemented in a micro-simulation framework. A new stated-preference survey was used to analyze the elasticities of mode and time-of-day choice to pricing policies. In addition, the following structural changes were made:

- Destination choice for non-work tours was moved up in the model chain so that chosen destinations can inform time-of-day choice (work destination choice already preceded time-of-day choice); and
- A detailed half-hourly trip time-of-day choice model was added to the end of the model chain, specifically to model peak spreading for auto trips.

SF-CHAMP version 4.3, Fury, incorporated significant advances in transit, pedestrian, and bicycle modeling. In order to more robustly address the effects of transit crowding, SF-CHAMP version 4.3, Fury, incorporated an iterative transit assignment was used that incorporated a feedback function that calculated dwell times as a function of boardings and alightings, and sought an equilibrated transit assignment similar to how highway assignment has been traditionally addressed. A bicycle route choice model, estimated using the CycleTracks smartphone data, was added in order to capture the effects of bicycle infrastructure construction. Furthermore, a simplified pedestrian route choice model was added in order to take into account hills and varying levels of pedestrian attractiveness. All of these improved route choice components were then used to estimate new mode choice models, which also included additional modes such as Ferry. These mode choice models were estimated using BATS2000 data and also included a more nuanced understanding of the effects of congested travel time on the utility of driving. In addition to mode choice, the auto ownership models were re-estimated using BATS2000 data. All models were calibrated to 2000 and where possible 2010 conditions and validated using transit boardings and vehicle count data.

Mode choice models were re-calibrated for SF-CHAMP 5.0 using California Household Travel Survey 2010-2012, which performed better than previous household travel surveys at capturing all trips made by a household during the survey day, and especially non-motorized trips, which are historically more

likely to be underreported. The calibration also used observed highway volumes from Caltrans' Performance Measurement System (PeMS), and observed transit data from BART, Muni, AC Transit, Caltrain, and other transit operators. SF-CHAMP 5.1 implements and updated bicycle route choice model, which was estimated using data obtained from CycleTracks and calibrated using bicycle counts from SFMTA's array of permanent, automatic bicycle counters.

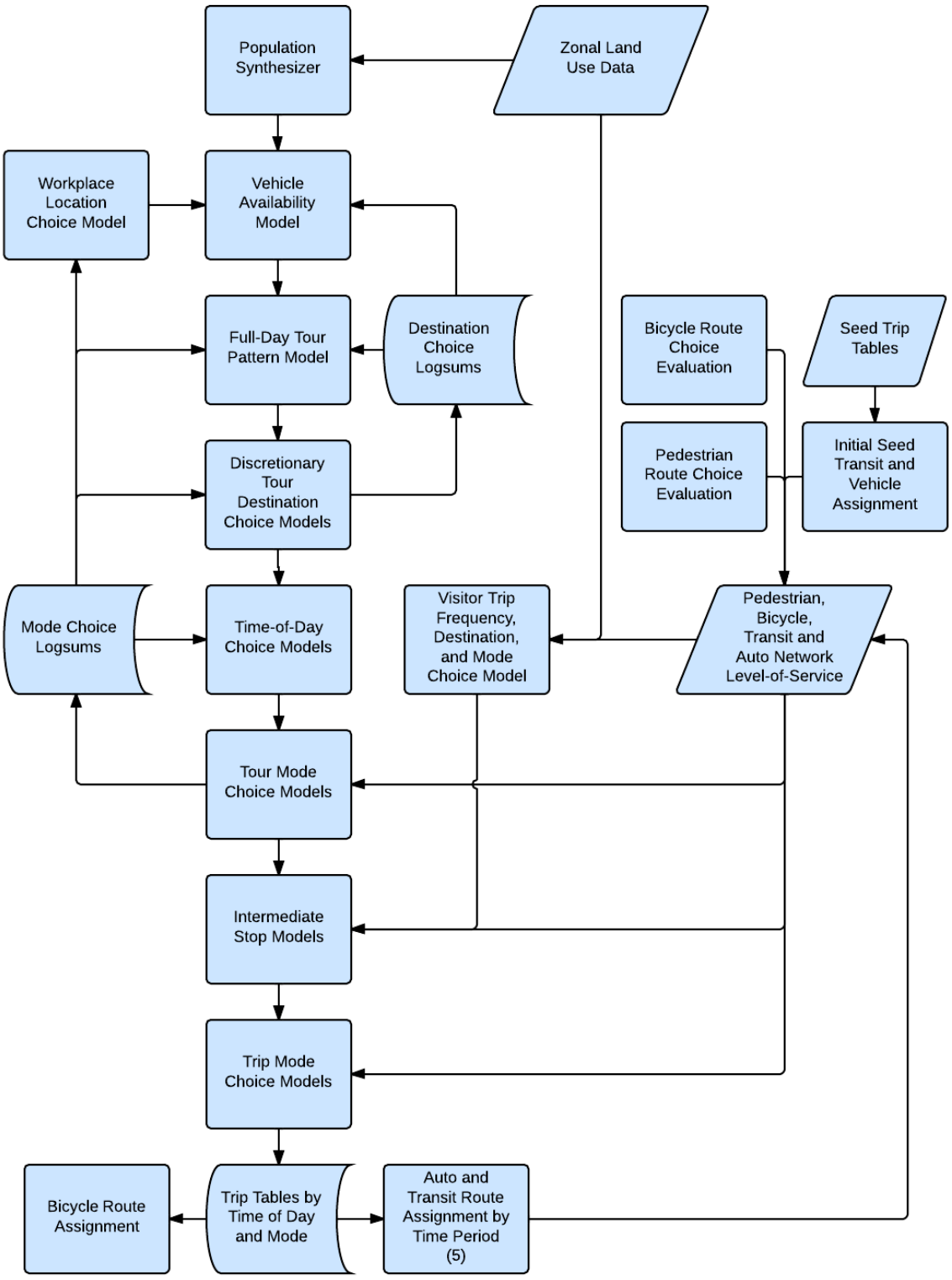


Figure 8-1: CHAMP 5.1 Model Components

IV. MODEL INPUT AND COMPONENTS

San Francisco's travel demand model has the capability to use any standard set of ABAG land use projections as an input. Currently, most projects use the Sustainable Communities Strategies - Jobs Housing Connection ABAG forecast for population, households, jobs, and employed residents. Outside of San Francisco, the direct land use inputs to the MTC model are used. Within San Francisco, the San Francisco Planning Department allocates the countywide control totals for population, households, jobs, and employed residents to Transportation Analysis Zones (TAZs). Base year and future year forecasts were developed using a parcel-level residential and employment database, inventories of new development projects under construction, approved, and under review, and information on development potential for major area plans.

The San Francisco 981 TAZ system is used within the City and County of San Francisco. Outside of the City, the San Francisco Model zone system is the same as the MTC Model 1454 zone system. Overall the model has approximately 2,250 zones. As part of the CHAMP 3.0 release, the model zone system was updated in 2007 to reflect MTC's new 1,454-zone system. The number of zones within San Francisco was also increased from 766 to 981 as part of this update.

SF-CHAMP's transportation networks are very detailed and use network assumptions consistent with the MTC Regional Transportation Plan. Within San Francisco, the network is the original City base map developed by the San Francisco Department of Public Works. It is highly spatially accurate and it includes every street segment within the City. For external counties, the roadway network from the MTC regional model highway network was used as a base. All local and regional transit route alignments and all stop locations are coded in the SF-CHAMP's transit networks. Outside San Francisco, the MTC regional model transit network is used to represent the pertinent transit services. The model networks are ground-truthed and updated on an ongoing and project-specific basis.

V. POPULATION SYNTHESIS

The model uses a synthesized population of Bay Area residents. As described earlier, SF-CHAMP is an activity-based microsimulation model. This means that the model works at the level of the individual decision-maker – each Bay Area resident. It is therefore necessary to create a representation of each decision-maker. TAZ-level totals of households, population, and employed residents, as well as census-based distributions of household configuration, age, and income-level serve as inputs to the population synthesis model.

The model samples the Census Public Use Microdata Sample (PUMS) (from the American Communities) household records, and then assigns these to the TAZ, based on the control totals and marginal distributions. The result is a file with one record for each decision-maker. It matches all control totals and distributions when aggregated to the TAZ-level.

VI. VEHICLE AVAILABILITY

The vehicle availability model predicts the vehicles available in each household for each Bay Area resident. The model estimates the probabilities of having zero, one, two, or three or more vehicles available. The Model accounts for tradeoffs for auto ownership based on the employment locations of workers in the household. This is a significant factor for auto ownership in a transit-rich environment such as San Francisco..

The vehicle availability model was validated primarily on two key variables, number of workers per household and super district1, using the 2010 Census and CHTS 2010-2012.

VII. FULL DAY PATTERN MODEL

The main feature of the full day pattern approach is that it simultaneously predicts the main components of all of a person's travel across the day. Predicting tours (a sequence of trips made by an individual that begin and end at home without any intermediate stops at home) rather than trips is a significant improvement over traditional trip generation procedures because of the relationships between trips on any tour. Figure 8-2 illustrates the difference between trips (as estimated in the traditional four-step process) and tours.

Several models are used to predict the full day pattern. The **Primary Tour Generation Models** predict whether each individual will make either no tour on a typical weekday or will make a primary tour for one of the following purposes: work, school, or other. The individual's primary tour is defined as the longest tour in elapsed time made with a stop at work, school, or for other purposes. All of these tours are home-based. Work-based tours and secondary home-based tours are also predicted. The models also predict whether there are intermediate stops on each primary tour: none, one, or more on the outbound portion only, one or more on the inbound portion only, or one or more on both portions. Subsequent models predict the exact number of intermediate stops on each tour leg.

By using tours as a key unit of travel, we capture the interdependence of different activities in a trip chain. This provides a better understanding of non-home-based trips, especially in the case of the work-based sub-tours that represent a significant proportion of non-home-based travel.

The full-day pattern tour models were validated by converting tours to trips and comparing these to the CHTS 2010-2012.

VIII. TIME OF DAY MODELS

The time-of-day model predicts the period when the traveler leaves home to begin the primary tour simultaneously with the period when the traveler leaves the primary destination to return home. It also predicts the time period of any intermediate stops. The periods used in SF-CHAMP are defined as:

- Early (3:00 AM to 5:59 AM)
- AM peak (6:00 AM to 8:59 AM)
- Midday (9:00 AM to 3:29 PM)
- PM peak (3:30 PM to 6:29 PM)
- Late (6:30 PM to 2:59 AM)

Activity-based models can account for tradeoffs between trip chaining and time of day by evaluating time of day decisions at the tour level rather than the trip level. Pricing policies (such as parking or toll policies) can be tested more accurately by including these tradeoffs between the need to travel for purposes that are time-dependent (such as day care or work) and the desire to avoid peak period pricing. Activity-based models can also account more reliably for the complexities involved in multi-mode trip making.

[1] Superdistrict is a geographic area defined by MTC.

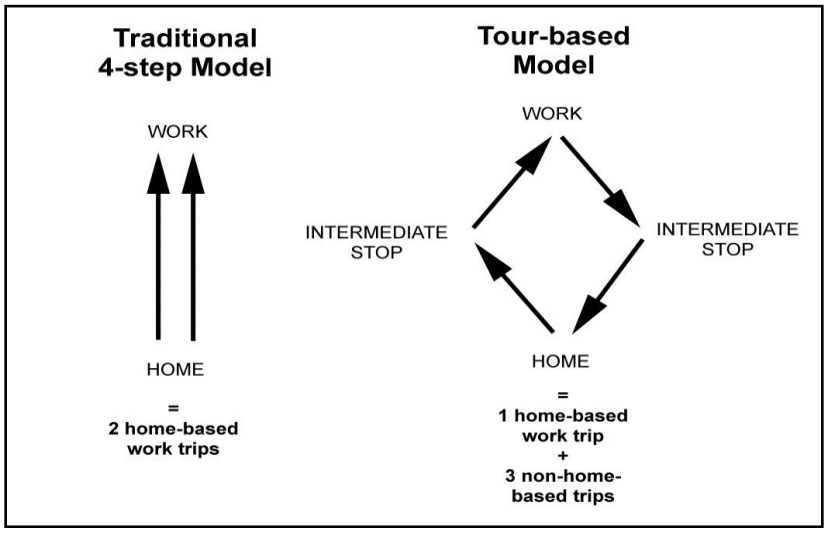


Figure 8-2: Trip Definitions: 4-step model vs. tour-based model

IX. DESTINATION CHOICE MODELS

Given that the full day activity model has predicted that a traveler makes a tour with a primary destination as well as potentially some number of intermediate stops, the destination choice models select the likely destinations for these trips. The San Francisco Model includes two types of destination choice models.

The **Primary Tour Destination Models** predict the destination of tours such as the workplace or school. The **Intermediate Stop Location Models** predict the location of intermediate stops for tours with stops on the way to and/or from the primary destination, where those stops are conditional on where the primary destination is located. Factors considered in destination choice include distance, accessibility for various modes (for that individual's auto-ownership level), and the land use density and type at various locations (i.e. retail, office, etc).

The Destination Choice Models were validated against the 2010-2012 CHTS survey data for primary destinations by purpose and trip length frequency distributions.

X. MODE CHOICE MODELS

After the Full Day Pattern Models and the Destination Choice Models have predicted the number, timing, and destination of trips, the Mode Choice Models predict the mode used by the traveler to reach their destination. Mode refers to the type of transportation, such as walking, bicycling, riding transit (such as light rail or bus), driving alone, or sharing a ride. The San Francisco mode choice models differ from traditional trip-based mode choice models in that there are two distinct sets of mode choice models. The Tour Mode Choice Model determines the primary mode for the tour, while the Trip Mode Choice Models determine the mode for each individual trip made on that tour, based on the mode chosen for the tour.

An analysis of trips by mode revealed the significant percentage of transit trips and non-motorized (walk and bike) trips made by San Francisco residents. It also showed that a number of transit trips are made using several transit modes; i.e., local bus access to BART. San Francisco can be considered a transit-rich environment, where most residents can walk to transit, and a limited supply of parking is available with a high cost. Based on this analysis, a detailed representation of available modes was developed, including:

- Muni Light Rail
- Muni Local Bus
- Regional bus routes (Golden Gate Transit, AC Transit, SamTrans)
- Caltrain
- BART
- Ferry
- Walk
- Bike
- Drive Alone
- Shared Ride 2
- Shared Ride 3+

The mode choice models were validated against the 2010-2012 CHTS, Census and ACS Journey to Work data, and observed SFMTA, BART, Caltrain, and Ferry ridership levels.

XI. VISITOR MODELS

Given San Francisco's popularity as a tourist destination, trips made by visitors from beyond the San Francisco Bay Area had to be accounted for in the San Francisco Model. A series of models were estimated to predict the visitor trips by mode for San Francisco tourist destinations. These models were not based on BATS household travel survey of Bay Area residents, but rather were estimated using San Francisco Visitor & Convention Bureau data, and coefficients derived from the Honolulu model visitor development effort.

The visitor models are significantly less complex than the San Francisco resident models. They estimate the number of visitors to 29 key visitor destinations for each of three modes. The destinations include among others, Alcatraz, Golden Gate Park, North Beach, Union Square, and a cable car ride.

XII. ASSIGNMENT

The detailed estimate of activity patterns of Bay Area travelers (including the type and timing of trips, destinations, and modes of travel) results in tables of trips by mode of travel from zone to zone by time of day. For example, a matrix may contain the number of transit trips during the AM peak, while another may contain a matrix of drive alone trips in the evening time period. This time period-specific demand is then assigned to the regional roadway and transit networks.

There are three primary components to the assignment process – transit, bicycle and roadway. Transit assignment uses detailed information from the mode choice models to determine the particular route that a traveler uses. For example, the mode choice models may predict that a traveler uses a bus to get from the Inner Sunset to Civic Center, but it does not predict which bus. The Transit Assignment Model predicts the specific route chosen, and any transfers, based on walking time to the nearest stop, expected wait time, presence of other transit alternatives (such as the multiple routes that serve a significant portion of Van Ness Avenue), fares, in-vehicle travel time, and walk time to the final destination. The transit assignment algorithm is based on the minimization of generalized cost for a certain origin-destination pair by time period. Generalized cost is a weighted cost that takes into account in vehicle travel time, waiting time, walk access time, transfers, and transfer time. The trip mode choice model dictates which transit modes is the "primary mode" for each user. Depending on

the primary mode, other secondary modes may be made available as access and egress modes (e.g., walk access mode to BART primary mode).

Roadway assignment predicts the specific route chosen by travelers based primarily on congested travel times and traveler cost (distance and tolls), collectively summed into a generalized cost function. If a particular route between two points has a smaller generalized cost than another, it will attract drivers until the generalized cost on all routes between two points is equal. This equilibrated state is often referred to as Static Deterministic User Equilibrium.

Bicycle assignment predicts the route taken by cyclists based on a bike route choice model estimated using revealed choice bicycle route data from the CycleTracks smartphone application. The bicycle route choice model takes into account hills, bike lanes, bike route, number of turns, wrong way streets, and distance.

The validation of transit and highway assignments is done separately, using observed volumes of vehicles and passengers on the highway and transit systems, respectively. Assignment validation at the county level was completed using aggregated volumes by corridor (identified by screenlines), type of service (facility type, mode or operator), size (volume group), and time period. Speeds and travel times are also used in highway and transit validations to ensure that these are accurately represented in the models.

8.3.2 | GIS Database and ArcGIS 10.1

The Transportation Authority uses a GIS database coupled with ESRI's ArcGIS 10.1 software to complement the strategic analysis facilitated by SF-CHAMP. The Transportation Authority's GIS database includes a large repository of shape files corresponding to local and regional street networks, census tracts, census block groups, census blocks, TAZs, transit routes, public facilities, and more.

The GIS database is refreshed on an ongoing basis with data obtained from our citywide and regional partner agencies, as the Transportation Authority generally does not directly develop comprehensive GIS files in-house.

However, the Transportation Authority is obligated to maintain a geodatabase of CMP level-of-service shape files. These shape files contain travel time and speed data for all auto CMP segments. The auto data is updated every two years as part of our CMP update. Transit data is also available.

For all other GIS shape files, the City provides a website complete with Census data for San Francisco geography and street centerline files for throughout San Francisco.

8.3.3 | MTC Model Consistency

The Transportation Authority completed a Model Consistency Report in November 2015 to demonstrate the consistency of CHAMP 5.0 with the MTC regional model and modeling requirements. The MTC Consistency Guidelines list the items that need to be documented as part of this Consistency Report. The CHAMP 5.0 Model Consistency Report is included as Appendix 17.

8.4. Work Program Items

The Transportation Authority will continue to work collaboratively with the Planning Department, MTA, other City agencies, regional transit operators, Caltrans, and MTC to:

- Continue to apply the model to assess impacts of policy and transportation changes on local and regional trip making behavior and network conditions. Better Market Street, the Parking Supply and Utilization Study, the San Francisco Transportation Plan, the Transit Core Capacity Study, and other ongoing projects will depend heavily on modeling support.
- Continue to apply and develop the citywide Dynamic Traffic Assignment model.
- Continue the development of a Dynamic Transit Assignment model to better represent individual transit route choice decisions, the aggregate impact of those decisions on transit performance (particularly in regard to reliability), and the feedback of transit performance into transit route choice.