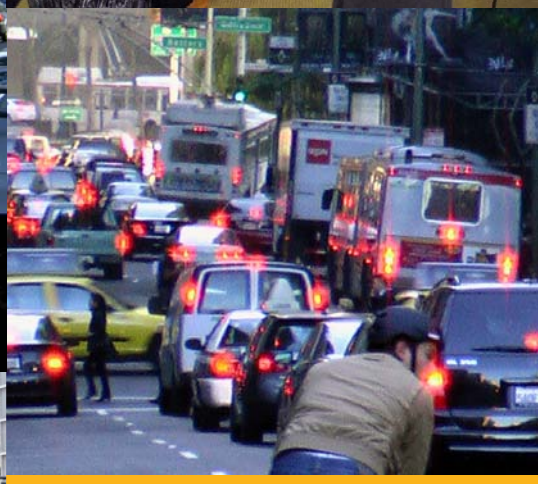

FINAL REPORT

San Francisco Mobility, Access, and Pricing Study

SAN FRANCISCO COUNTY TRANSPORTATION AUTHORITY

PRESENTED TO THE AUTHORITY BOARD, DECEMBER 2010

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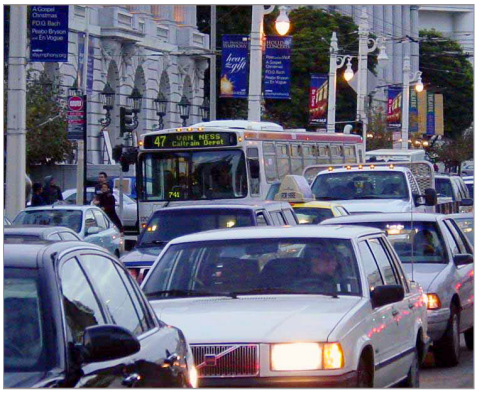

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The Authority is indebted to a number of individuals who helped make the Study possible. The Study was initiated by our past Board Chair Jake McGoldrick and overseen by our current Chair, Ross Mirkarimi. Tilly Chang (Deputy Director for Planning), guided the preparation of this report. Zabe Bent (Principal Transportation Planner) was the principal investigator and Project Manager of the Study. Transportation Planners Jesse Koehler and Liz Brisson contributed both technical writing and study analysis. Billy Charlton (Deputy Director for Technology Services), Elizabeth Sall (Senior Transportation Planner), and Lisa Zorn (Transportation Planner) led SF-CHAMP modeling. The consultant team was led by Tom Biggs (Project Manager, PBS&J) and included Transportation Analytics, IBM, Circlepoint, ECONorthwest, CHS Consulting, and JD Franz Research. Additional outreach support was provided by Barbary Coast Consulting, Bridge Media, Knowledge Networks and Howard-Stein Hudson. The Study was funded by grants from the Federal Highway Administration, the Bay Area Toll Authority, and the San Francisco County Transportation Authority.

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1 Introduction and Baseline Analysis

In 2007, the San Francisco County Transportation Authority (Authority) initiated the Mobility, Access, and Pricing Study (Study) to evaluate the feasibility of a congestion pricing program for San Francisco. Under the direction of the Authority Board, staff sought and received funding for the study from a grant from the Federal Highway Administration (FHWA) Value Pricing Pilot (VPP) program.

The Authority's Proposition K local transportation sales tax program and the Bay Area Toll Authority (BATA) provided local and regional matching funds for the grant. The Study was conducted by the Authority and a technical consulting team led by PBS&J (collectively, the Study Team).

San Francisco's current transportation needs, coupled with its significant growth plans and ambitious climate and livability goals, call for the investigation of new and innovative approaches for improving mobility in an environmentally and economically sustainable manner. Both the Authority's 2004 Countywide Transportation Plan and the City's 2004 Climate Action Plan call for consideration of road pricing as part of a comprehensive strategy to manage travel demand, improve travel options, and advance San Francisco's goals for sustainable growth.

This Study evaluates the applicability of congestion pricing to San Francisco's transportation system within the context of a wider mobility management strategy that encompasses efforts in demand management and investment in Transit First[1] modes, among other strategies. The Study does not serve as the basis of an implementation decision. Rather, the Study's purpose is to assess the feasibility of congestion pricing with regards to transportation, economic, environmental, social, and financial performance considerations. The Study does this by evaluating a range of potential pricing scenarios and design options—including the reinvestment of fee revenue to fund mobility improvements to the transportation system—using rigorous technical analysis methods and an extensive public involvement process. Finally, the Study considers the institutional and regulatory issues that would need to be addressed, and the next steps that would need to be pursued, should there be a desire to advance congestion pricing program development.

This introductory chapter reviews the background and context for the Study, including a review of existing conditions and the impacts of congestion in San Francisco. The chapter also presents the Study Team's baseline analysis, which assessed current and future travel patterns and transportation conditions in San Francisco and the Bay Area region. The chapter concludes with a discussion of the city's sustainable growth challenge and a brief description of the organization of the report's subsequent chapters.

[1] San Francisco's Transit First policy was established in 1973 and encourages the development of transit, walking, and bicycling through the integration of transportation and land use policy. Several other traditional and innovative mobility improvement strategies are underway in San Francisco, and this study coordinated with relevant efforts; these are discussed throughout this report as appropriate.

Case Studies: Stockholm and London

STOCKHOLM

Congestion pricing was instituted in Stockholm in 2006 for a seven-month trial implementation, which was followed by a public referendum on the program and permanent implementation in 2007. The program has reduced traffic by 22 percent and reduced greenhouse gas emissions by 14 percent. Prior to trial implementation, public opinion in Stockholm was two-thirds against congestion pricing. Public support eventually rose to two-thirds as people came to understand the policy and associated benefits.

In Stockholm, motorists are charged on weekdays when entering or exiting the central city, with fees varying based on time of day. Program improvements have included 18 new regional bus lines and 2,800 new regional park-and-ride spaces.

Stockholm Congestion Charging	
Type of charge	Varies per crossing
Charge amount	10–20kr ($1.50–$3.00 USD)
Traffic reduction	-22%
Economic benefits	+5% increase in sales within the charged zone
Greenhouse gas reduction	-14%
Increase in transit ridership	+5%
Annual net revenues	730 million kr ($100 million USD)
Population	1.2 million

SOURCE: Swedish Transport Administration

The program has also resulted in positive economic impacts: businesses within the charged zone have seen an increase in sales of 5 percent, in part because the charging system requires drivers to pay to both enter and exit the zone, giving Stockholm residents an incentive to shop locally rather than drive out to the suburbs. In addition, businesses benefit from the ability to make 25 percent more deliveries during charged hours as a result of congestion reduction benefits.

LONDON

Since 2003, drivers traveling in an 8.5 square mile area of central London have been assessed a flat daily fee when driving within the designated zone on weekdays. Before congestion pricing was implemented, traffic in central London was flowing at 2–5mph. Now it averages 10mph. Most displaced London drivers switched to transit, and businesses have remained healthy, as a result of substantial net revenues that have been poured into improved transportation improvements, including more frequent transit resulting in 14,000 new bus seats.

London Congestion Charging	
Type of charge	Flat daily fee
Charge amount	£8 ($13 USD)
Traffic reduction	-30%
Economic benefits	Businesses within the zone growing twice as fast as those in comparable areas
Greenhouse Gas Reduction	-16%
Increase in transit ridership	+18%
Annual net revenues	£137 million ($216 million USD)
Population	7.5 million

SOURCE: Transport for London

London has also experienced public health benefits as a result of reduced tailpipe emissions that cause serious illnesses such as asthma, bronchitis, and heart attacks. According to a recent empirical study, 1,888 extra years of life have been saved among the city of London's more than seven million residents who are now breathing cleaner air.*

London's downtown economy has also experienced benefits since the pricing program has been implemented: businesses within the charged zone are growing faster than businesses outside the zone. Other studies have found evidence of higher spending levels in Central London by transit users and pedestrians as compared with automobile drivers.

* Tonne et al (2008). Air pollution and mortality benefits of the London Congestion Charge: spatial and socioeconomic inequalities. Occupational and Environmental Medicine.

1.1 Background and Goals

As the Congestion Management Agency (CMA) for San Francisco, the Authority is responsible for monitoring the performance of the city's transportation network, as well as and identifying and developing strategies to improve the efficiency and effectiveness of the transportation system. Congestion pricing programs in multiple cities have demonstrated that a carefully planned and implemented program has the potential to deliver significant benefits to travelers on all transportation modes. The Mobility, Access, and Pricing Study is an investigation of whether congestion pricing might be similarly applicable and effective in the San Francisco context.

1.1.1 CONGESTION PRICING IN PRACTICE

In perhaps its broadest definition, the term "congestion pricing" refers to policies under which the price for a resource is increased during times of peak demand, in order to shift demand and allocate the resource more efficiently than would be possible under uniform pricing. Such pricing policies are common in many arenas, such as utilities and air travel. In the surface transportation sector, variable pricing strategies may be used in multiple ways, such as to manage parking availability, encourage off-peak transit ridership, or reduce peak-period traffic in an area or along a corridor.

For the purposes of this report "congestion pricing" refers to the lattermost of these categories: relieving traffic congestion through peak-period road pricing. Under a congestion pricing program, private vehicles are assessed a charge when accessing congested areas during the most congested times of day. Congestion fees are collected electronically with minimal equipment, obviating the need for traditional toll collection infrastructure and personnel.

When a congestion charge is in place, some motorists choose to pay the fee and enjoy improved travel times and reliability, while some drivers choose to shift the time of their trip to less congested periods. Other travelers take advantage of improved travel options that have been newly provided or enhanced using congestion fee revenue. Still others may shift their route or destination to avoid the charge. The extent to which travelers respond to each of these options depends on the relative availability, time, and cost of each option, the demographic profile of the traveler, and other factors. These responses and characteristics increasingly can be estimated through robust travel demand forecasting models, such as the Authority's 9-county regional SF-CHAMP model. Surveys of relevant case studies and other research are also instructive.

The experiences of London and Stockholm are notable for their success, and as western democracies have some relevance for the United States.[2] Both are European capital cities, however, with different land use/transportation systems (transit networks, fuel prices, and regional market power). While the scale and extent of London's transportation system—especially its transit network—are much larger than San Francisco, the size, accessibility development pattern and position of Stockholm within the wider metropolitan region is more similar to San Francisco's context.

The box on the previous page presents a summary of key information regarding congestion pricing programs implemented in Stockholm and London. Further information and lessons learned from cities that have implemented congestion pricing programs were documented in the Study Team's earlier case study analysis.

[2] While examples of congestion pricing in the world remain few, it is useful to understand their attributes and performance, as case studies of real-world examples. It is important to understand, however, that each city is unique. Each city's physical, economic, political, and cultural context places important limitations on the comparability of one city's experience to another.

1.1.2 GOALS AND APPROACH

The Study considered roadway congestion pricing in the context of a comprehensive transportation system management strategy, which not only contemplates congestion charging, but also focuses on the improvement of competitive alternatives to driving by using the revenues generated through pricing to support investments in transit, bicycling, and walking. This integrated approach has been used successfully in multiple cities to redefine the transportation choice-set for urban travelers in a way that improves a region's quality of life and supports a vibrant economy.

At the outset of the Study, the Study Team identified a set of goals for a congestion pricing program. These goals are based on the 2004 Countywide Transportation Plan vision and are consistent with the draft goals of the San Francisco Transportation Plan—the update to the 2004 Countywide Transportation Plan that is underway currently. In addition, the City's Transit First policy requires a focus not only on traffic congestion, but also its impacts on the reliability and performance of other modes of travel. A potential congestion pricing program for San Francisco is intended to:

- Improve ***mobility*** in San Francisco and the region by reducing travel times and increasing system efficiency for both motorists and transit passengers;
- Increase San Francisco's ***accessibility*** by providing improved and more reliable transportation options;
- Enhance overall ***quality-of-life*** in the neighborhoods of San Francisco by reducing traffic and tailpipe emissions as a means to improve safety and health, and by supporting context-sensitive urban design; and
- Promote the city's ***economic vitality*** by reducing congestion-related losses, decreasing vehicle operating costs, and improving multimodal access to facilitate future growth and enhance regional competitiveness.

In light of these ambitious goals, the Study relied upon an approach to congestion pricing tailored to the San Francisco context, in order to guide the development and evaluation of potential congestion pricing scenarios and to help balance competing goals. This approach is encapsulated by following the key concepts:

- Managing, but not eliminating congestion and traffic delay;
- Using pricing to encourage travel decisions that support system efficiency;
- Supporting reinvestment in a balanced transportation system; and
- Evaluating program effectiveness through ongoing transportation system performance monitoring and analysis.

The above goals and approach were the basis for the evaluation of candidate pricing scenarios, as presented in Chapter 2.

1.2 Congestion in San Francisco

The Bay Area is among the most congested urbanized areas in the nation. In both 2006 and 2007—immediately prior to the recent economic

downturn—the San Francisco metropolitan area was ranked as the second most congested region in the nation by the Texas Transportation Institute.[3] Traffic and transportation issues are also important concerns among Bay Area residents, with transportation consistently identified as one of the region's most pressing challenges in the Bay Area Council's surveys of top issues over the past several years.[4] In a 2007 regional poll conducted for this Study, almost 90 percent of travelers characterized downtown San Francisco as congested.

At the outset of the Study, the Study Team conducted a wide-ranging assessment of congestion in San Francisco and its impacts, currently and in the future. In San Francisco, peak-period traffic congestion in the city's core areas negatively impacts transportation system performance, the city's economy, and the environment. This section discusses the sources of traffic congestion in San Francisco and its impact on mobility in the city, as well as impacts to the economy and environment. Section 1.3, which follows, provides further detail regarding current and future transportation network conditions and travel patterns.

1.2.1 CONGESTION'S CAUSES AND SYSTEM IMPACTS

Strong demand to travel to central locations—with a high concentration of employment, housing, services, and entertainment, retail, and cultural destinations—is desirable. Travel demand is a sign of thriving economic activity and a dynamic urban environment. Congestion occurs when many motorists attempt to access the same area at the same time, overwhelming the capacity of the transportation network. As streets become more clogged with vehicles, movements become more difficult. At the extreme, mobility can become so compromised that people cannot reliably access their desired destinations.

[3] http://tti.tamu.edu/publications/catalog/record_detail.htm?id=32636

[4] http://www.bayareacouncil.org/press2005_2006/Biggest%20Problem%201.12.05.pdf
http://www.bayareacouncil.org/press2005_2006/Biggest%20Problem%202.23.06.pdf

Figure 1-1. Weekday PM Peak Automobile Delay Conditions based on Level of Service (LOS) – Spring 2009

Source: SFCTA Congestion Management Program 2009

The traditional solution to congestion has been the provision of additional road capacity. However, San Francisco, like most dense urban areas, does not have room to accommodate additional roadway facilities: existing infrastructure must be managed more carefully in order to maximize system efficiency and facilitate growth. As a Transit First city, San Francisco's policies support the development of "complete streets"—facilities that accommodate the safe and efficient movement of all users, including pedestrians, bicyclists, transit riders, and motorists.

On a typical weekday, San Francisco's transportation system serves more than 4 million trips on a range of travel modes. Considering local and regional development growth projections, by 2030, this figure is forecast to increase to over 5 million daily trips to and within the city. Though San Francisco has a robust local and regional public transportation system and relatively high amounts of non-motorized travel activity, automobile trips account for 58 percent of daily citywide travel.

Within the combined areas of downtown, SOMA, and the Civic Center—referred to collectively in this report as the Focus Area—there are about 1.5 million daily trips. Even in these greater downtown areas, 40 percent of daily travel is made by car.

As a result of heavy demand for automobile travel, the street network in downtown San Francisco is burdened during peak periods with more cars than can be efficiently served. More than half of surface streets in the Focus Area average less than 10 mph during peak periods. The average peak period automobile trip to the Focus Area takes twice as long as the same trip would during off-peak hours. Figure 1-1, left, displays peak-period automobile level of service (LOS) on the Authority's congestion management program (CMP) network as monitored during the most recent CMP cycle.

Traffic congestion also severely hampers the performance of San Francisco's significant surface-running transit operations, particularly where transit vehicles operate in mixed traffic. Many congested corridors serve not only automobiles but also high volumes of transit riders. Traffic congestion exacerbates transit delays, impairs reliability, and contributes to transit travel times that are significantly longer than automobile travel times—up to two to three times those of automobile travel times on many key transit routes. Figure 1-2, right, displays peak-period speeds for the Muni bus (diesel and trolley) network as monitored for the most recent CMP.

1.2.2 ECONOMIC AND ENVIRONMENTAL IMPACTS

In addition to impacts to the functioning of the city's transportation network, congestion negatively impacts the city's economy and environment. Traffic delays impose costs on individuals and businesses in San Francisco through wasted fuel, elevated commercial vehicle operating costs, and excess travel time. In 2005, these costs amounted to an annual economic loss of more than $2 billion in San Francisco. By 2030, this figure is forecast to exceed $3 billion each year, as shown in Figure 1-3, right.

Traffic congestion also impacts the city's environment, health and safety, and quality of life. Vehicular tailpipes release various noxious compounds including particulate matter (PM) pollutants, which are linked to adverse health outcomes. Greenhouse gases (GHGs) from the transportation sector ("mobile sources") account for over half of San Francisco's climate change pollutants, shown in Figure 1-4, next page.

The Bay Area Air Quality Management District (BAAQMD) projects that many air pollutant levels will decline in the coming decades as stricter regulations are enacted

Figure 1-2. Weekday PM Peak Muni Bus Speeds – Spring 2009

Source: SFCTA Congestion Management Program 2009

Figure 1-3. Annual Costs of Congestion ($ millions)

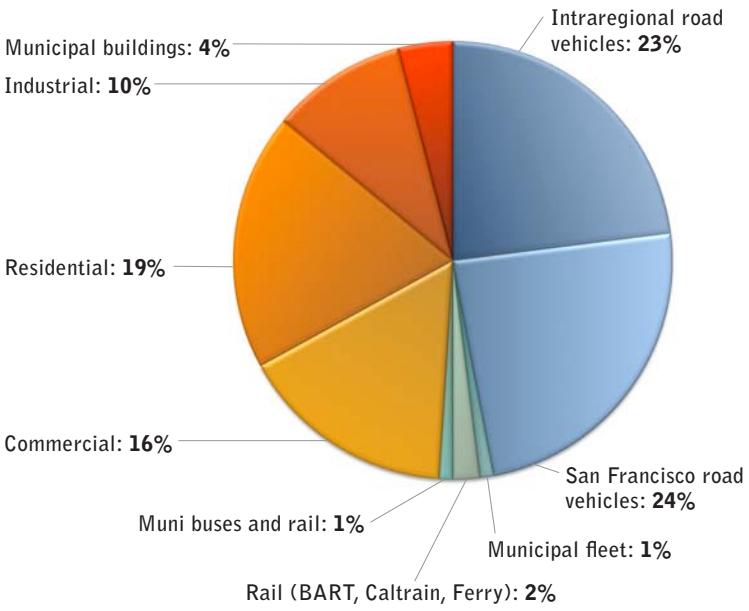
AREA	YEAR	PASSENGER VEHICLE DELAY COST	PASSENGER VEHICLE FUEL COST	COMMERCIAL VEHICLE COST	TOTAL ANNUAL CONGESTION COST
San Francisco	2005	$1,610	$260	$200	$2,070
	2015	$1,920	$300	$240	$2,460
	2030	$2,510	$370	$310	$3,190
Bay Area Region	2005	$18,020	$2,950	$2,320	$23,290
	2015	$22,470	$3,620	$2,920	$29,010
	2030	$30,290	$4,650	$3,970	$38,910

Note: Figures are in constant 2008 $ (millions).

Source: PBS&J, 2008, based on SFCTA data.

and technology improves. In the case of greenhouse gas (GHG) emissions, technology improvements as a result of State laws regulating fuel content and passenger vehicle fuel economy are expected to reduce GHG emissions significantly by 2030. However, as shown in Figure 1-5, next page, the reduction as a result of cleaner technology falls short of San Francisco's local goals for GHG reduction. Similarly, the state and the region have recently adopted aggressive targets to reduce GHG emissions, to be achieved through a range of measures including transportation and land use policies as discussed in Section 1.4, below. From a public health perspective, the air pollutant of greatest concern is fine particulate matter ($PM_{2.5}$) which is linked to illnesses including heart disease, bronchitis, asthma, and other respiratory conditions. The Bay Area was recently designated as a non-attainment area for the federal $PM_{2.5}$ standard, and

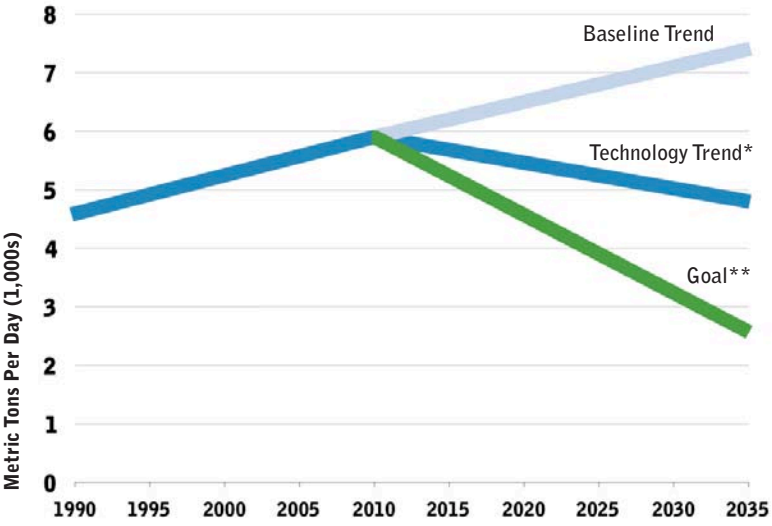
Figure 1-4. Sources of Greenhouse Gas Emissions in San Francisco



Notes: Based on 1990 Greenhouse Gas Emissions Inventory. Total eCO_2 estimated at 9.1 Million tons, projected to increase to 10.8 Million tons by 2012.

Source: SF Climate Action Plan, 2004

Figure 1-5. San Francisco Greenhouse Gas Trends and Goals***



* Technology trend includes Pavley and Low Carbon Fuel Standard State mandates
** Goal based on SF Ordinance 81-08
*** Preliminary forecast, to be refined as a part of the 2011 San Francisco Transportation Climate Action Plan

Source: SF-CHAMP, MVSTAFF

BAAQMD will develop a plan to reduce $PM_{2.5}$ emissions from all sources, including from private vehicle travel, absent which emissions are anticipated to increase dramatically.

In the city's most congested areas, high traffic levels are associated with a concentration of collisions, deteriorating safety for travelers, particularly pedestrians and bicyclists. Figure 1-6, next page, displays the location of vehicular collisions resulting in pedestrian injury or fatality in the most recent five-year period for which data has been compiled. The concentration of these collisions in the city's northeastern area is evident.

All vehicle collisions, including those not involving a non-motorized user, also conform to a similar pattern, concentrated in the northeast quadrant of the city. Collisions are an additional source of significant societal and individual economic losses due to hospitalization costs, vehicular damage, and other expenses such as emergency response services.

1.3 Travel Demand and Network Conditions—Baseline Analysis

In addition to examining available data regarding transportation performance and the impacts of traffic congestion, the Study Team utilized travel demand modeling to better understand travel behavior and conditions, particularly for future year analysis. The official San Francisco travel demand model, SF-CHAMP, is developed and maintained by the Authority. The model predicts the region's travel conditions by simulating individual travel behavior. The outputs of the model include information about network conditions for transit and private vehicles as well as travel patterns for individuals across the region.

The Study's baseline evaluation centered on analysis of model scenarios represent-

ing the region's transportation network without a congestion pricing program in place for both existing base year (2005) and future base year (2015 and 2030) conditions. This allowed the Study Team to examine existing and future conditions, including key congestion-related metrics. This section highlights findings from this baseline evaluation.

1.3.1 TRAVEL PATTERNS

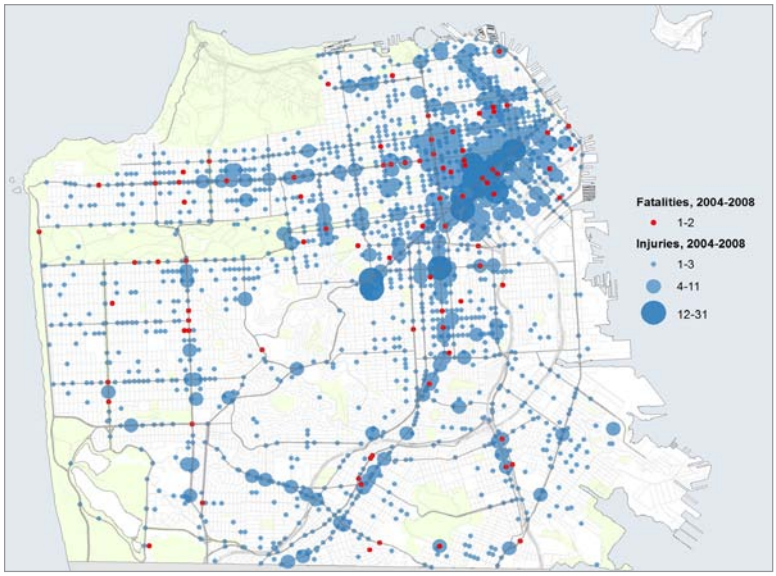
Trip-making to, from, and within San Francisco and the Focus Area[5] is diverse: travelers originate or travel to destinations across the rest of the city and the region on a range of travel modes. Figure 1-7, below right, depicts the distribution of p.m. peak motorized trips (automobile and transit) to and within the Focus Area. Each line indicates a travel market for trips both to and from a respective area (within the Focus Area, the rest of San Francisco, and each of the other Bay Area counties).

There are over 260,000 motorized trips to, from, and within the Focus Area during the p.m. peak. Despite perceptions that regional travelers contribute the most to congestion in the greater downtown area, in fact San Francisco travelers account for the greatest number of trips, followed by East Bay travelers. Of the 120,000 automobile *vehicle* trips[6] in the p.m. peak, intra-San Francisco trips account for more than 70 percent of this travel demand. This finding belies the common perception that downtown traffic congestion is caused primarily by regional travelers. For regional travel, transit mode share varies significantly, with the highest transit shares in the East Bay travel market.

[5] For analysis purposes, the Focus Area is defined as the zone bounded by Harrison Street, 13th Street, South Van Ness Avenue, Van Ness Avenue, Broadway, and The Embarcadero

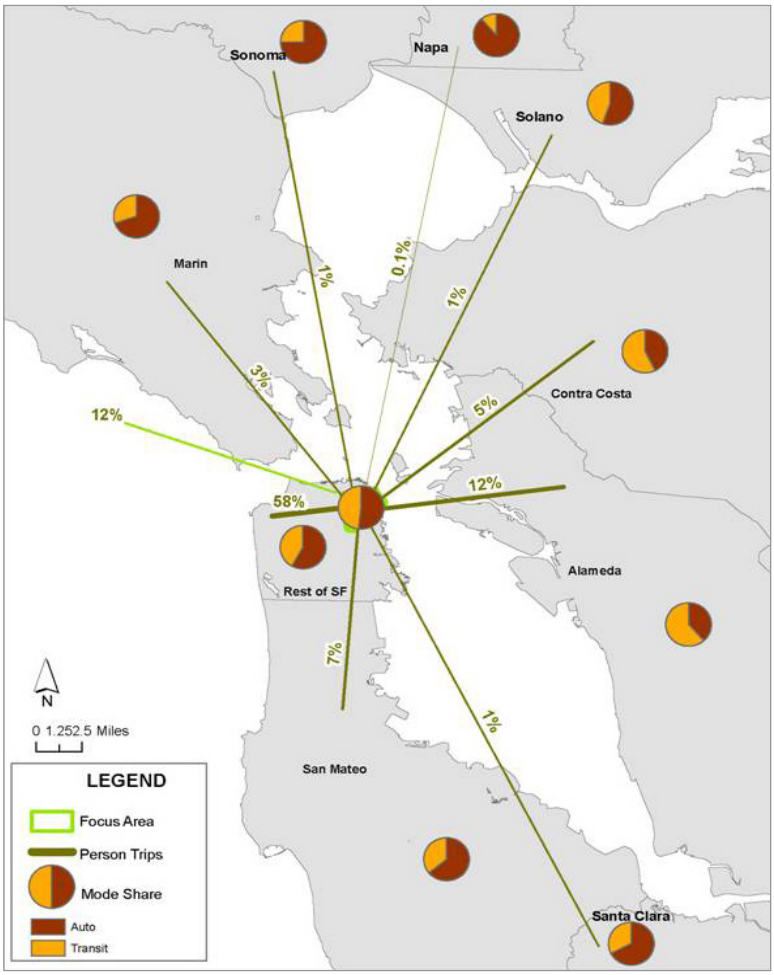
[6] Throughout this report, unless otherwise noted, "automobile trips" refers to automobile person trips, thus a 2-person carpool counts as two automobile trips. Vehicle trips refers to quantity of vehicles, thus the same 2-person carpool counts as a single vehicle trip.

Figure 1-6. Pedestrian Collisions – 2004-2008



Source: Statewide Integrated Traffic Records Systems (SWITRS)

Figure 1-7. Distribution of Motorized Focus Area Trips* – 2005 P.M. Peak

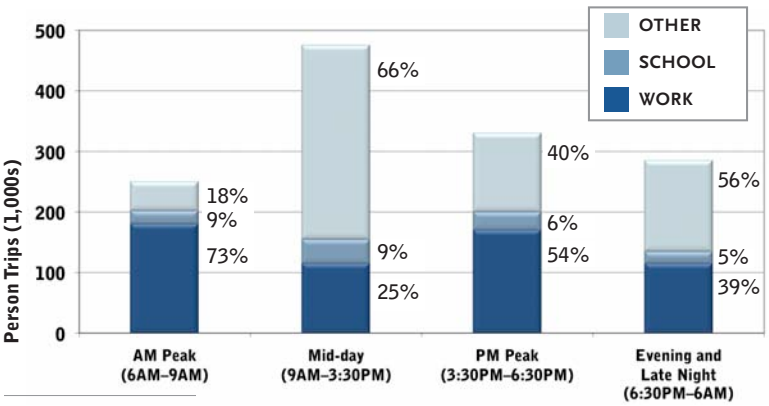


* Motorized trips are the sum of automobile and transit trips.

Note: Trips to and from origins or destinations beyond the nine-county are not shown and represent less than 1.0 percent of the total.

Source: SF-CHAMP, 2010

Figure 1-8. Focus Area Trip Purpose—2005



Source: SF-CHAMP, 2010

Peak-period travel in the Focus Area is dominated by work and school trips, often referred to collectively as non-discretionary travel. Figure 1-8, above, shows travel by purpose and time of day for trips with origins or destinations in the Focus Area. Travel purposes are more diverse during off-peak periods, dominated by the "other" category, which includes shopping and other discretionary trips.

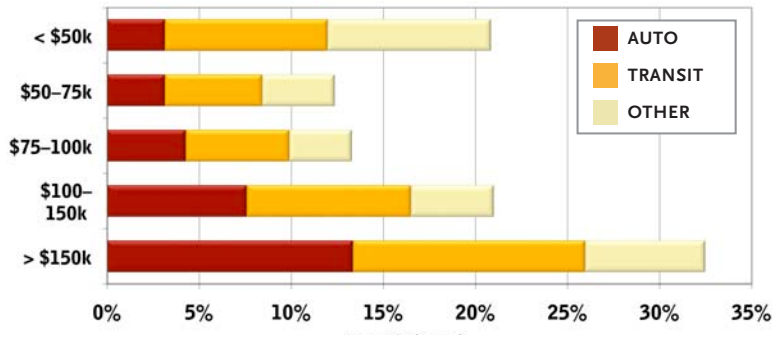
The baseline analysis also examined the income distribution among travelers to the Focus Area. Figure 1-9, below, depicts the relative amount of Focus Area travel among five household income groups. In addition, for each of the income groups, the chart displays mode information for the respective set of trips. The majority of motorists in the peak period are travelers from households with incomes greater than $100,000 per year. Fewer than five percent of travelers in the peak period are motorists from households with incomes less than $50,000 per year.

1.3.2 TRAFFIC AND DELAY

The CHAMP model allows the calculation of aggregate measures of vehicular travel and congestion delay. Two key metrics were evaluated in this regard: vehicle miles traveled (VMT) and vehicle hours of delay (VHD).

VMT is a total measure of automobile travel, reflecting the sum of mileage covered by all private vehicles within a certain area during a specific time period. Figure 1-10, next page, illustrates p.m. peak VMT within the Focus Area in 2005, 2015, and 2030.

Figure 1-9. Income Distribution of Focus Area Trips by Mode (AM Peak)



Note: Income breakpoints are in 2008 dollars.

Source: SF-CHAMP, 2010

VMT, which is a key indicator of the transportation and land use sector's greenhouse gas emissions, is projected to rise significantly in the future, absent strategies to counter the trend. At a citywide level, the trend is similar to that shown above for the Focus Area: daily San Francisco VMT is forecast to increase by 19 percent to more than 11 million daily vehicle miles traveled.

VHD represents the aggregate excess travel time experienced by motorists. Delay is calculated as the difference between congested travel time and "free-flow" (uncongested travel time) summed across all vehicle trips.[7] Although traffic congestion is most concentrated in San Francisco's greater downtown areas, delay is experienced by motorists throughout the city and region. Measures that relieve congestion in high-activity areas also reduce delay elsewhere in the network, as traffic is reduced on corridors to and from these areas. Figure 1-11, next page, illustrates p.m. peak VMT for all of San Francisco in 2005, 2015, and 2030. Peak period traffic delay across the city is forecast to increase by 58 percent by 2030.

1.4 San Francisco's Sustainable Growth Challenge

The ability to travel to and from the city's employment and housing centers quickly and reliably by multiple travel modes is a central factor in San Francisco's economic vitality and quality-of-life for residents, workers, and visitors. This multimodal accessibility will become more essential

[7] In addition to the traditional vehicle delay measure, the Study Team also examined the peak-to off-peak travel time ratio for vehicle trips, discussed above in section 1.2.1.

and advantageous in the coming decades as traffic worsens throughout the Bay Area and growth is refocused to transit-accessible areas in the region's urban areas.

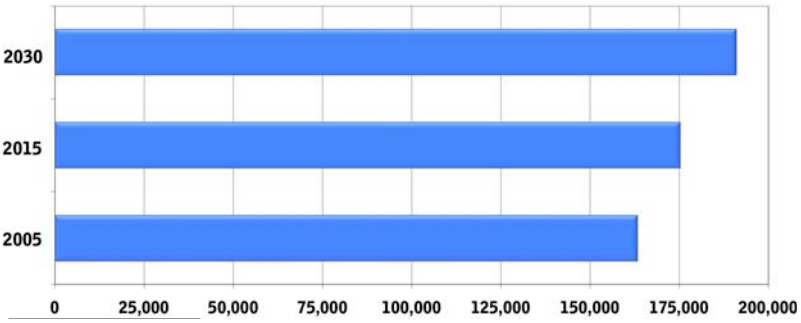
Already, the MTC and the Association of Bay Area Governments (ABAG) have established Priority Development Areas (PDAs) in transit accessible neighborhoods and along major transit corridors, to promote and support more rich transit rich development. Over the next 25 to 30 years, San Francisco is projected to add approximately 150,000 new residents to its population and more than 200,000 jobs to its workforce.[8]

City goals, policy, and investment will concentrate future growth in San Francisco's most transit most transit accessible areas—locations that are already the city's most congested. This growth will present unique challenges and will differ in pace and character from previous generations of San Francisco development, which was dominated by financial district employment growth and was supported by major transit investments including the Muni Metro and BART systems. The city's future development patterns will include substantial quantities of housing and will occur as the trend in out-commuting to suburban job centers continues. If growth proceeds in a business-as-usual fashion—without new system management policies and funding strategies—traffic congestion will substantially worsen, bringing gridlock and stifling economic activity.

There is a need for robust solutions that address environmental imperatives, manage private vehicle demand, and create new revenue streams for increased transit service and strategic capital investments.

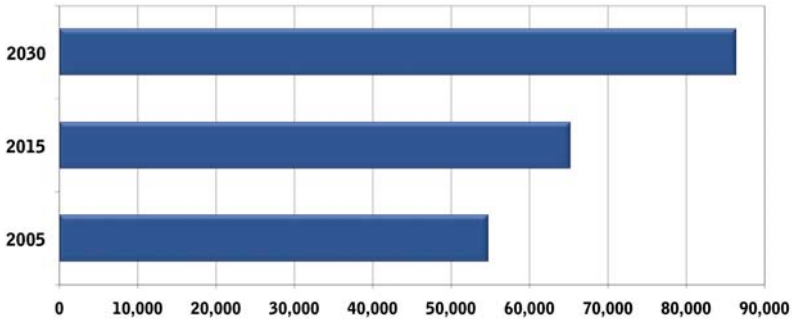
[8] Association of Bay Area Governments, Projections 2007. More information on regional land use and housing forecasts through the Sustainable Communities Strategy is discussed below.

Figure 1-10. Focus Area P.M. Peak Period Vehicle Miles Traveled



Source: SF-CHAMP, 2010

Figure 1-11. San Francisco P.M. Peak Period Vehicle Hours of Delay



Source: SF-CHAMP, 2010

The state's adoption in recent years of landmark climate change and regional planning statutes—Assembly Bill 32 (AB 32) and Senate Bill 375 (SB 375)—has codified into law aggressive goals and methods for fostering sustainable growth and realizing substantial reductions in GHG emissions through coordinated transportation and land use policy. At the same time, state and regional funding sources for transportation are increasingly constrained, challenging jurisdictions to make the investments necessary to meet these goals.

The Bay Area's next long-range Regional Transportation Plan (RTP) must take an integrated transportation, housing, and land use approach through the development of a Sustainable Communities Strategy (SCS), which must meet a regional greenhouse gas reduction target set by the California Air Resources Board. The SCS is expected to build on the strategies included in the previous RTP, adopted in 2009, which highlighted the importance of land use and pricing policies to achieve system performance and environmental objectives. The SCS is expected to focus growth even more intensely in the region's core urbanized areas.

Preliminary SCS analyses have further illuminated the large gap between the need for new investments in infrastructure and currently available funding levels. Pricing strategies are among the most promising policy tools available to jurisdictions and the region, given their ability to both reduce VMT and generate new locally- and/or regionally-controlled transportation revenues.

1.5 Report Organization

This Final Report summarizes the Study's analyses, documents technical tasks and public outreach activities, present Study findings, and identi-

fies potential next steps for advancing a congestion pricing program in San Francisco. The remaining chapters are organized as follows:

- Chapter 2 (Scenario Analysis and Program Design) presents the Study Team's evaluation of candidate congestion pricing scenarios and reviews key elements of program design.
- Chapter 3 (Outreach and Feedback) documents the Study's extensive public involvement efforts, which substantively shaped the study's development.
- Chapter 4 (Financial Analysis) discusses key financial considerations and presents the findings of the Study Team's financial modeling efforts.
- Chapter 5 (Technology and System Design) summarizes the analysis of potential technology systems that could be employed for a potential congestion pricing program in San Francisco.
- Chapter 6 (Institutional and Implementation Considerations) closes the report with a preliminary examination of institutional considerations, such as governance for a potential pricing entity, and outlines the potential steps for advancing a congestion pricing program into future phases of analysis and potential project development.

The central finding from the scenario analysis is that a congestion pricing program for San Francisco would be both technically feasible and effective. Specifically, the analysis found that a weekday peak-period fee of approximately $3 when crossing[1] a cordon of the northeast portion of the city is the highest-performing feasible program. This scenario, referred to as the Northeast Cordon, would effectively manage demand in the city's most congested areas, deliver substantial net revenues, and present manageable impacts. The Study Team also assessed the opportunity to utilize a pilot implementation approach and developed two options for a limited demonstration of congestion pricing. Finally, the scenario analysis included a preliminary assessment of the potential for comprehensive parking pricing and parking regulatory strategies to advance congestion management goals.

2 Scenario Analysis and Program Design

The central technical task of the Study was the evaluation of potential congestion pricing scenarios. This process allowed the Study Team to test various elements of program design, assess benefits and impacts, and iteratively examine the feasibility of a pricing program for San Francisco.

This chapter presents the process and findings of the analysis of candidate congestion pricing scenarios for San Francisco and discusses key program design elements. Building on the goals and baseline findings summarized in Chapter 1, the chapter begins with a presentation of the overall technical approach and evaluation framework that guided the scenario analysis. Subsequent sections discuss the results of the Study Team's analysis of potential congestion pricing scenarios, which proceeded in two phases: a screening stage and an evaluation stage. Then, detailed evaluation findings are presented for the three best-performing scenarios, the Northeast Cordon and two pilot designs. The chapter's closing sections address the reinvestment of revenues through a multimodal improvement program, review the preliminary parking pricing assessment, and summarize the key findings from the scenario analysis.

2.1 Background—Approach and Evaluation Framework

Existing and future transportation conditions in San Francisco were reviewed in Chapter 1. As that discussion revealed, congestion is a pressing issue today, and its impact on the economy, the environment, and the city's quality of life are projected to worsen significantly in the future. Informed by the experience of cities that have successfully implemented forms of road pricing, the Study's scenario analysis sought to explore the tradeoffs and varying effects of different congestion pricing program elements as applied to San Francisco.

[1] As described later in this chapter, the introduction of a daily maximum charge of twice the one-way cordon charge effectively changes the fee from a per crossing fee to a per period (day) charge when two or more trips across the cordon are made. See Section 2.2.4.

The overall approach for the analysis was as follows:

- **Focus on mitigating congestion where and when it is has the greatest impact and where alternatives are most robust.** The Study Focus Area, introduced in Chapter 1, was defined for analysis purposes as the zone bounded by Harrison Street, 13th Street, Van Ness Avenue, Broadway, and The Embarcadero. This zone, home to the city's densest concentrations of employment and housing, is significantly affected by peak-period congestion. It is also well-served by local and regional transit that can best accommodate improvements by reinvesting potential program revenues. The scenario analysis sought to minimize the geographic and urban design footprint of potential programs while also effectively managing peak-period congestion in the Focus Area.
- **Evaluate program design elements through an iterative process.** The analysis proceeded in two general phases, described in subsequent sections of this chapter. The first phase of analysis was iterative: a wide range of combinations of potential program elements were tested in order to narrow the range of scenarios and pricing characteristics under consideration. The first phase of analysis is described in Section 2.2.
- **Following initial screening, refine scenario design by seeking to maximize benefits, limit impacts, and assess the range of elements pertaining to program feasibility.** The second phase of analysis, presented in Section 2.3, led to the identification of the best-performing scenarios and the development of a package of mobility improvements to accompany the congestion charge as part of comprehensive program design. The second analysis phase also included the assessment of the broader range of program feasibility issues, including financial performance, economic effects, institutional arrangements, implementation considerations, technology options, and other factors. These issues are discussed in this chapter, as well as in relevant subsequent chapters of the report.

Figure 2-1. Evaluation Framework—Categories and Metrics

CATEGORY	METRIC
i. Transportation Network Conditions	1. Vehicle Miles Traveled (VMT)
	2. Vehicle Hours of Delay (VHD)
	3. Roadway Volumes
	4. Peak-Period Travel Times
	5. Transit System Performance/Loads
ii. Trip-Making and Mode Share	6. Daily Person Trips
	7. Peak Period Mode Share
	8. Trips by Mode by Income Group
iii. Environmental and Economic Effects	9. Greenhouse Gas Emissions
	10. Criteria Pollutant Emissions
	11. Collisions
	12. Economic Effects
iv. Financial Performance	13. Program Capital Costs
	14. Program Operating Costs
	15. Annual Net Revenues
	16. Daily Tolled Vehicles

To support the scenario analysis, the Authority's SF-CHAMP travel demand model (introduced in Chapter 1) underwent a substantial upgrade to incorporate improved pricing sensitivity and to model the travel behavior of residents in all nine Bay Area counties. Model runs that represented a specific pricing scenario were compared to the un-priced baseline scenario in order to estimate the effect of potential pricing programs on the transportation system and travel behavior. Model results from multiple scenarios were also compared to each other in order to assess the relative performance of different features and attributes. The primary analysis year was 2015, reflecting a conceptual yet reasonable time horizon for potential implementation, if such a decision were to be made.

The Study Team developed an evaluation framework, which was used to compare potential congestion pricing scenarios. The evaluation framework is based on the Study goals for congestion pricing, which were discussed in Chapter 1. Model results provided or allowed the calculation of most of the evaluation framework metrics. Comparison of scenarios required an understanding of the model's capabilities and limits, and thus model results, though critical components, were only one aspect of the analysis process.

The evaluation framework is organized into four categories: transportation network conditions; trip-making and mode share; environmental and economic effects; and financial performance.[2] Each category

[2] Additional feasibility analyses addressed in other Study tasks include an assessment of public views (see Chapter 3)

encompasses multiple metrics. Collectively, these metrics allowed the Study Team to assess the performance of pricing scenarios in light of broader economic, environmental, and social goals. The categories and metrics are listed in Figure 2-1, previous page.

2.2 Phase I Analysis—Initial Scenario Design and Screening

The design and analysis of potential pricing scenarios proceeded in an iterative fashion, in two large phases. The Study Team utilized SF-CHAMP, the Authority's 9-county Bay Area travel demand model, which was run repeatedly and frequently, allowing the Study Team to test a wide range of design and policy variations. For the Study, CHAMP was significantly enhanced to include more robust pricing analysis features.

The first phase of scenario design focused on assessing the tradeoffs associated with the following key elements of program design: area-wide pricing approach; pricing structure; travel directions; discount policies; and geographic extent. Collectively, these elements determine who, when, and how much will be charged. This section reviews of each of these design elements in turn and then discusses overall findings from the first phase of analysis.

2.2.1 AREA-WIDE PRICING APPROACH—AREA VERSUS CORDON CHARGING

Road charging program design can be contemplated in many ways, but the dominant models can be sorted in terms of movements internal to an area, along a corridor or set of corridors, or across particular zones. The Study Team quickly realized that a corridor approach would be too diffuse to be effective, given the multitude of alternatives with the grid layout of San Francisco's street network. For this analysis, the Study Team then focused on two basic approaches: area pricing; and zone or cordon pricing. With an area charge, drivers are assessed a fee for any vehicle movement inside the boundary of a designated zone, including entry, exit, and travel that is entirely within the zone. With a cordon charge, drivers are assessed a fee only for movements that cross the boundary line; internal movements are not charged. London's program is an area design, while Stockholm utilizes the cordon approach.

Early in the Study, technical considerations indicated that area charging would be extremely expensive to implement due to the necessity of equipping most intersections within a pricing area. In addition to significant startup costs, such a program, as conceived in the initial stages, would also have very significant operating costs and potentially suppress trip-making within the zone even at modest fee levels. Thus, scenarios assessed in further detail for the Study focused on cordon designs. Unless otherwise noted, the cordon designs assume congestion charges apply to automobile trips along cordon boundaries, in addition to movements across boundaries.

2.2.2 PRICING STRUCTURE

There are various considerations for designing a pricing structure, including the price level(s), the time(s) of day that charges are levied, and the nature of variation in price (if any).

Price Level. As a first step in assessing potential pricing structures, the Study Team conducted a stated preference survey of travelers in the greater downtown to assess the likely response of drivers to the introduction of a congestion charge at various price levels. This market research tested fee levels between $0.50 and $5.00 per trip. The survey data was used to develop the SF-CHAMP model's capabilities in simulating pricing sensitivity. Together, the survey and the first phase of model analysis indicated that a peak period congestion charge of approximately $3.00 would result in balanced transportation benefits and—depending on geographic design—sufficient revenues to sustain the program and provide funds to be reinvested in improvements for those traveling to and from the charged area.

Time of Day. When New York City considered a congestion pricing program for Midtown and Lower Manhattan, the proposal included a flat rate charge across daytime hours. This was due in large part to the very high traffic levels across the day in Manhattan, where congestion is not limited to the morning and afternoon "rush" hours. Congestion levels in San Francisco and much of the Bay Area are "peaked"—that is, vehicular volumes and delays are typically significantly elevated during weekday commute periods. Thus, the Study Team focused on scenarios that would charge a fee during peak periods, since this emerged as the most feasible time-of-day structure. A charge during the morning commute only—even at a somewhat higher level—was not found to be financially feasible, as total automobile volumes are significantly lower during the a.m. peak period than during the p.m. peak period. However, in the development of pilot options discussed in Section 4, below, a p.m. peak only charge was evaluated in response to technical analysis and public feedback.

Price Variation. Within charging periods, it is possible to vary the fee to further smooth peak-period congestion and encourage some motorists

Figure 2-2. Stockholm "Shoulder" Pricing Structure

	CHARGE	
TIME OF DAY	SWEDISH KRONA (SEK)	US DOLLARS ($)
12:00am–6:29am	0	0
6:30am–6:59am	10	~$1.50
7:00am–7:29am	15	~$2.00
7:30am–8:29am	20	~$3.00
8:30am–8:59am	15	~$2.00
9:00am–3:29pm	10	~$1.50
3:30pm–3:59pm	15	~$2.00
4:00pm–5:29pm	20	~$3.00
5:30pm–5:59pm	15	~$2.00
6:00pm–6:29pm	10	~$1.50
6:30pm–11:59pm	0	0

Source: Swedish Road Administration

to make trips outside of the most congested time periods. Stockholm's system utilizes a pricing schedule with such "peak-of-the-peak" or "shoulder" charging as shown in Figure 2-2, above.

Another price variation approach is to charge a higher price in one of the peaks versus the other ("tilt"). The Study Team tested a number of shoulder and tilt scenarios, however, added benefits were minimal. In order to be financially feasible, any such price variation would need to generate comparable revenues to the $3.00 flat fee scenario, and thus would require a charge greater than $3.00 in the peak-of-the-peak, or a lower but nonzero charge during the mid-day period. Public input generally favored a single price point as compared to a variable fee in order to make the pricing system more legible and straightforward.

2.2.3 TRAVEL DIRECTIONS

Travel demand management (TDM) programs and projects in San Francisco have historically focused on the "typical" commuter that travels to the greater downtown in the a.m. peak and departs in the p.m. peak. However, as noted in the baseline analysis in Chapter 1, a substantial proportion of peak-period travel in the Focus Area and San Francisco does not conform to this pattern. The growth of job centers across the region has also resulted in substantial out-commuting activity, particularly in the US-101 and I-280 Peninsula and South Bay corridors. As also previously discussed, San Francisco residents are responsible for a substantial share of peak-period traffic in the Focus Area.

A cordon pricing program can affect different groups of motorists depending not only on when automobile trips are charged, but also which trips are charged. In recognition of the diverse travel patterns that impact congestion in San Francisco, initially all scenarios tested charged the same fees to both inbound and outbound traffic. As discussed in Section 2.3 of this chapter, a potential pilot implementation could include a distinction in charge policy for outbound versus inbound automobile travel.

2.2.4 FEE AND DISCOUNT POLICIES

Congestion pricing programs in other cities have included a range of discount policies. The Study Team evaluated and received public input on a range of discount policies in order to determine those that might be appropriate for the studied scenarios. Based on technical analysis of the impact of discounts on system performance and financial feasibility, as well as extensive discussions with stakeholders and feedback from the public, the Study contemplates a limited set of discounts as part of a comprehensive pricing program. Transit vehicles would be exempt from the fee, as would taxis, which act as an extension of the transit and paratransit fleet in San Francisco. Program discounts for drivers primarily address geographic equity and income equity considerations. Each discount affects the financial performance of a pricing program in that available gross revenues are reduced both in offering and administering the discount. The recommended discount groups are as follows:

Residents. Motorists who live within a priced area are very likely to be directly affected by a congestion charge.

Bridge Toll-payers. In both the Bay Bridge and Golden Gate Bridge corridors, motorists are subject to a toll. Toll revenues are primarily used to operate and maintain bridge facilities. A portion of the revenues in both corridors is used to support transit services and projects that improve multimodal service in the corridor, through the "Regional Measure" programs in the Bay Bridge corridor and through the use of Golden Gate toll revenues to support Golden Gate Transit operations. As such, travelers in these corridors contribute to reinvestment and congestion management, and warrant consideration for a discount. The Study Team evaluated a range of discounts for bridge toll-payers, and the

Study recommends a "fee-bate" that would reduce the daily congestion charge by $1.00 for motorists who also pay a bridge toll on the same day.

Low-Income Motorists. The Study supports offering a discount to motorists of low-income households (potentially as defined by the regional "Lifeline" program). As discussed in Chapter 1, lower-income drivers are a very small portion of travelers to the Focus Area during the peak period (less than 5 percent), and the majority of low-income travelers access the Focus Area via other modes. Still, there is a need to minimize the burden on low-income households through a discount measure. The low-income discount policy could be supplemented or replaced by a programmatic investment in a means-based transit fare assistance program.

Disabled Motorists. Significant public input was received concerning a potential discount for disabled motorists. There has been noted abuse of the disabled parking placard program in San Francisco and elsewhere in California. The Study considered a discount for disabled motorists, but with program-specific eligibility and documentation requirements similar to those currently utilized by the Golden Gate Bridge, Highway, and Transit District for bridge toll discounts.

Carpools. No discount is proposed for carpool vehicles. A per-traveler discount is embedded in the carpool mode, as travel costs are shared among passengers.

Low-Emission Vehicles. No discount is proposed for low-emission vehicles. Given that the primary purpose of congestion pricing is to relieve peak-period traffic and transit congestion, extending a discount to a growing share of the vehicular fleet would substantially impair program effectiveness.

For motorists eligible for more than one discount, only the maximum discount would apply—that is, discounts would not be additive.

Daily Cap. In addition to the discounts described immediately above, the Study recommends that a pricing program include a maximum daily fee, or "daily cap," per vehicle, equivalent to twice the one-way fee, or $6.00. This would help address various concerns, particularly the needs of families with school-age children, delivery-oriented businesses, and other users who might cross the cordon several times per day. In effect, this policy shifts the program from a per crossing fee to a per period fee, which could be implemented as either a daily maximum and/or a maximum within each peak period.

Finally, the Study recommends that a congestion pricing program include a fleet program, whereby operators of multiple vehicles would have a more streamlined system to track and pay congestion charges. This would reduce the administrative burden on businesses by allowing periodic, perhaps monthly, review of charges rather than daily review. The fleet program would include businesses, rental cars, and car-share vehicles.

Figure 2-3, below, summarizes the potential discount levels and special fee categories.

Figure 2-3. Summary of Potential Discounts and Fee Categories

TYPE OF DRIVER/GROUP	LEVEL OF DISCOUNT
Transit Vehicles	Free
Taxi	Free
Zone Residents	50%
Bridge Toll-Payers	$1
Low-Income (Lifeline Value)	50%
Disabled Motorists	50%
Daily Maximum Charge	One-way fee x2
Carpool	None
Low-Emission Vehicles	None
Commercial Vehicles / Shuttles	Fleet Rate
Rental Cars, Car-share Vehicles	Fleet Rate

The discount levels presented in Figure 2-3 reflect the Study's preliminary guidance regarding fee policy. Potential future phases of analysis and program development will require more detailed assessment of discounts, including policies regarding adjustments to discounts as needed over time.

2.2.5 GEOGRAPHIC DESIGN

The Study Team considered a range of geographic areas for a pricing cordon. The priced area is the central design factor for a pricing program, as it has significant implications for capital and operating costs, transit improvements, diversionary effects, and other issues.

During the initial phase of scenario analysis, the Study Team considered four basic types of geographic design:

- **Downtown Cordon.** Given the identification of congestion as most severe in the city's core areas of the financial district, SOMA, and Civic Center, the first set of pricing scenarios were modeled as a cordon of the Study Focus Area, which (as described in Chapter 1) is bounded by Harrison Street, 13th Street, South Van Ness/Van Ness, Broadway, and The Embarcadero. Variations on this Downtown Cordon design were also analyzed, including a boundary that removed much of the more residential neighborhoods, such as the Tenderloin, from the priced area.
- **Gateway.** The "Gateway" design contemplates congestion pricing for motorists entering or exiting the city during peak periods. In practice, this would involve charge points at freeway ramps within the city, which would price drivers from the Golden Gate and Bay Bridge corridors, as well as many vehicles from the Peninsula. Additional detection points would be necessary for arterials that traverse the land-based southern border. Traffic that stays fully on the freeway through San Francisco without touching a city street (e.g., US-101 to I-80) would not be charged.
- **Northeast Cordon.** The Study Team also tested multiple scenarios that sought to strike a balance between the citywide Gateway scenarios and the much smaller Downtown Cordon scenarios. In general, these geographic designs focused on the northeastern quadrant of the city, and thus take advantage of the northeast waterfront as part of the zone boundary. The initial bounds for the Northeast Cordon design were Divisadero, Castro, and 18th streets.
- **Double Ring.** A final category of potential geographic design combined a gateway charge with further, targeted management of congestion in the Focus Area. This additional downtown management could take the form of a secondary downtown cordon (at a higher or lower rate than the gateway fee) and/or more aggressive parking regulation and pricing policies in the Focus Area.

Figure 2-4. Initial Program Design Options

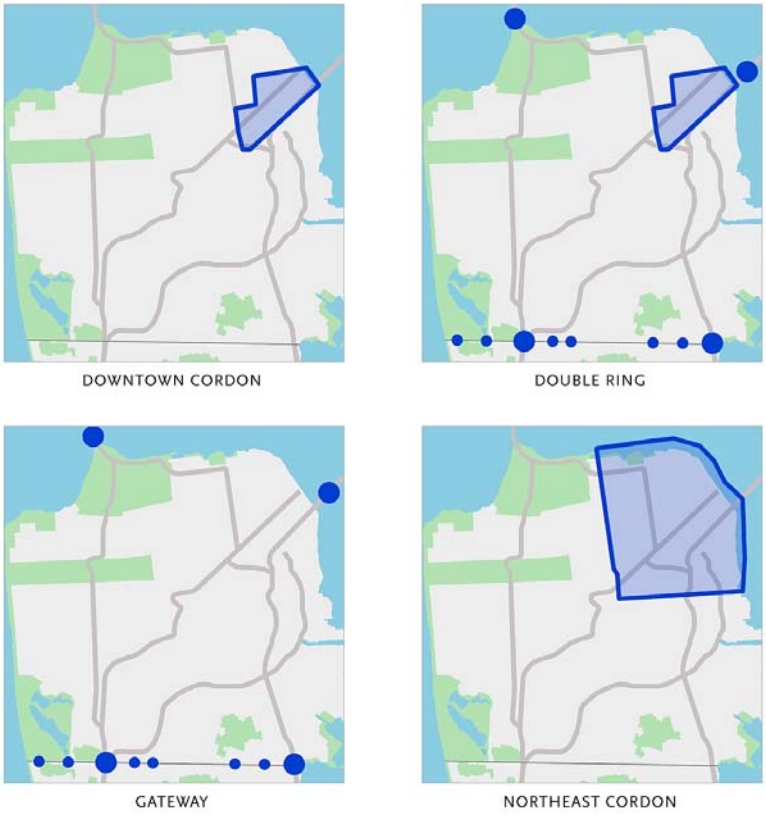


Figure 2-4, below left, compares key characteristics of the four initial program designs. The comparisons among these options led to identification of the Northeast Cordon and Double Ring design types as the most promising scenarios to emerge from the Phase I analysis, as described in the discussion of findings below and summarized in Figure 2-5, next page.

2.2.6 PHASE I ANALYSIS—KEY FINDINGS

The initial pricing analysis yielded important conclusions regarding the design of a feasible congestion pricing program for San Francisco. The key findings from the Phase I Analysis are as follows:

- **To be effective, the pricing structure must have an average level that is equivalent to a fee of approximately $3.00 across both weekday peak periods.** Depending on the size and configuration of the pricing cordon, a peak-period charge of $3.00 would reduce automobile traffic sufficiently to provide substantial congestion reduction benefits. This charge level would also present net revenues to provide for a reinvestment funding stream sufficient to deliver

Figure 2-5: Initial Program Design Options

SCENARIO	CHARACTERISTICS	ADVANTAGES	DISADVANTAGES
Downtown Cordon Zone analyzed: Van Ness – Turk – Jones – Washington – Embarcadero – Harrison – 13th St. – South Van Ness	Over 1.3 million daily trips to, from, and within area Best implemented as fee on crossings	Targets subset of congested areas Zone has best transit options	Greatest edge impacts (traffic diversions) among scenarios May be difficult to understand zone boundaries Least financially feasible
Gateway Zone analyzed: San Mateo county line; Golden Gate Bridge; Bay Bridge (excludes highway thru traffic)	Over 4.6 millions daily trips to, from, and within the area	Most legible area Minor, diffuse impacts	Minor, diffuse benefits Least able to manage internal travel Most difficult to deliver substantial benefits
Double Ring Zone analyzed: Combination of Downtown Cordon and Gateway boundaries	Over 4.6 millions daily trips to, from, and within the area Combines fee on gateway crossings with additional fee on downtown cordon	Begins to manage internal travel Reduces issues on edges of downtown cordon	May be difficult to understand multiple boundaries Higher costs
Northeast Cordon Zone analyzed: Divisadero – Castro – 18th Street – waterfront	About 3 million daily trips to, from, and within area Fee on crossings in the northeast corner of San Francisco	Targets congested areas Highest congestion reduction Most manageable impacts, particularly on edges of zone Greatest improvement in auto and transit travel times Highly legible boundaries	Includes some areas with fewer transit options than Downtown Cordon

Source: SFCTA and PBS&J

travel enhancements to those affected by the charge. The fee level is modest enough that overall daily trip-making to the Focus Area would be virtually unchanged: many motorists would continue to drive during peak periods, while some would switch their mode or the time of their trip.

- **The Downtown Cordon is too small to avoid major diversionary impacts and does not generate sufficient revenue to be financially feasible.** A $3.00 congestion fee is feasible only if the priced population is large enough to generate sufficient net revenue. The Downtown Cordon zone proved to be fatally flawed, primarily due to its small size. Many vehicular trips would be diverted around the zone, limiting the size of the priced population and causing considerable impacts to adjacent neighborhoods.
- **A Gateway charge alone is not effective at reducing peak-period traffic in the city's most congested areas.** A Gateway charge would not regulate internal San Francisco travel, which accounts for the majority of automobile trips in the Focus Area during peak periods. In addition, while this scenario would reduce automobile trips to and from regional destinations, these traffic reductions would create enough excess capacity to provide an incentive for San Francisco motorists to increase driving activity within the city. Together, these phenomena limit the efficacy of a Gateway charge that is not paired with complementary demand management strategies to reduce vehicle trips internal to the city. The Study Team also developed and analyzed Gateway scenarios that included parking pricing strategies to manage

intra-San Francisco travel but found them to fall short of the performance of other scenarios.

- **The Northeast Cordon design is a high-performer.** The use of the northeast waterfront as part of the zone boundary for much of the priced area helps this scenario enjoy reduced startup and operating costs, and also limits diversionary effects.
- **The Double Ring could potentially perform well, but is poorly perceived by stakeholders and the public.** Members of the public expressed significant concerns regarding the Double Ring scenario, even more so than other scenarios. With two pricing cordons, the design would be more complex to administer and would be less legible than other scenarios. However, a variation of the Double Ring scenario could help address concerns with the Gateway design through the combination of a Gateway charge with a robust set of Focus Area demand management strategies other than cordon pricing, such as more aggressive parking management and regulatory policies. Such a program design is contemplated in one of the pilot implementation options introduced in Section 2.4, below.

In December 2008, findings from the initial phase of analysis were presented to the Authority Board. At that time, the Board directed the Study Team to advance the more promising scenarios for further refinement and additional analysis.

2.3 Phase II Analysis—Scenario Refinement and Pilot Options

Following the Board's direction to conduct more detailed analysis of pricing scenarios, the Study Team proceeded with a second phase of scenario assessment. The Phase II analysis focused on the following areas of evaluation:

- Refinement of the geographic extent of pricing options;
- Exploration of implementation considerations, including development of pilot or demonstration approaches;
- Detailed evaluation of program benefits and impacts for the best performing scenarios, including environmental and economic effects;
- Assessment of operational issues including infrastructure and system technology design;
- Development of the approach for and components of a reinvestment program for use of generated revenues and assessment of multi-year financial performance; and
- Preliminary exploration of the potential for parking pricing and parking regulatory strategies to achieve comparable reductions in peak-period traffic in the Focus Area.

This section describes the identification of the Study's three best-performing scenarios: a refined version of the Northeast Cordon design, and two options for a demonstration-based implementation. Sections 2.4 through 2.6, which follow, present the results of the detailed evaluation for the best performers, the development of a multimodal investment program, and the preliminary parking analysis. Subsequent chapters address other specific design and implementation issues in further detail, including financial performance, technology, and implementation and institutional considerations.

Figure 2-6. Geographic Design Refinement Options Analyzed

2.3.1 GEOGRAPHIC VARIATIONS

The Study Team assessed a range of variations to the Northeast Cordon, which was

identified in Phase I as the most promising pricing design. These variations were largely geographic in nature and were made in response to the initial technical results and public input. All geographic variations maintained the use of the waterfront as part of the zone boundary.

Various altered zone configurations were tested. To the west, multiple zone sizes were tested, including a zone as far east as Van Ness Avenue. To the south, variations were tested including bringing the southern border northward as far as the Mission Creek Channel (i.e., to encompass all of SOMA but nothing further south).

Figure 2-6, previous page, illustrates a range of geographic variations tested during Phase II. These scenario comparisons used consistent pricing policies, as these had been relatively well established during Phase I.

For the western boundary, analysis strongly indicated the need to encompass the Central Freeway and Octavia Boulevard. Thus, the best balance was struck with a western boundary at Laguna and Guerrero streets. To the south, the analysis revealed the importance of encompassing the entire Mission Bay area, where significant growth is underway and will continue well into the future. Thus, the southern boundary in the vicinity of 18th Street was maintained in the refined Northeast Cordon design. The refined Northeast Cordon design is shown in Figure 2-7, right.

Further design stages may reveal some flexibility on the precise location and design of the boundaries—particularly given the challenging topography and multiple neighborhoods involved to both the south and the west.

2.3.2 PILOT OPTIONS

The refined Northeast Cordon program (hereafter referred to simply as the

Figure 2-7. Refined Northeast Cordon Design

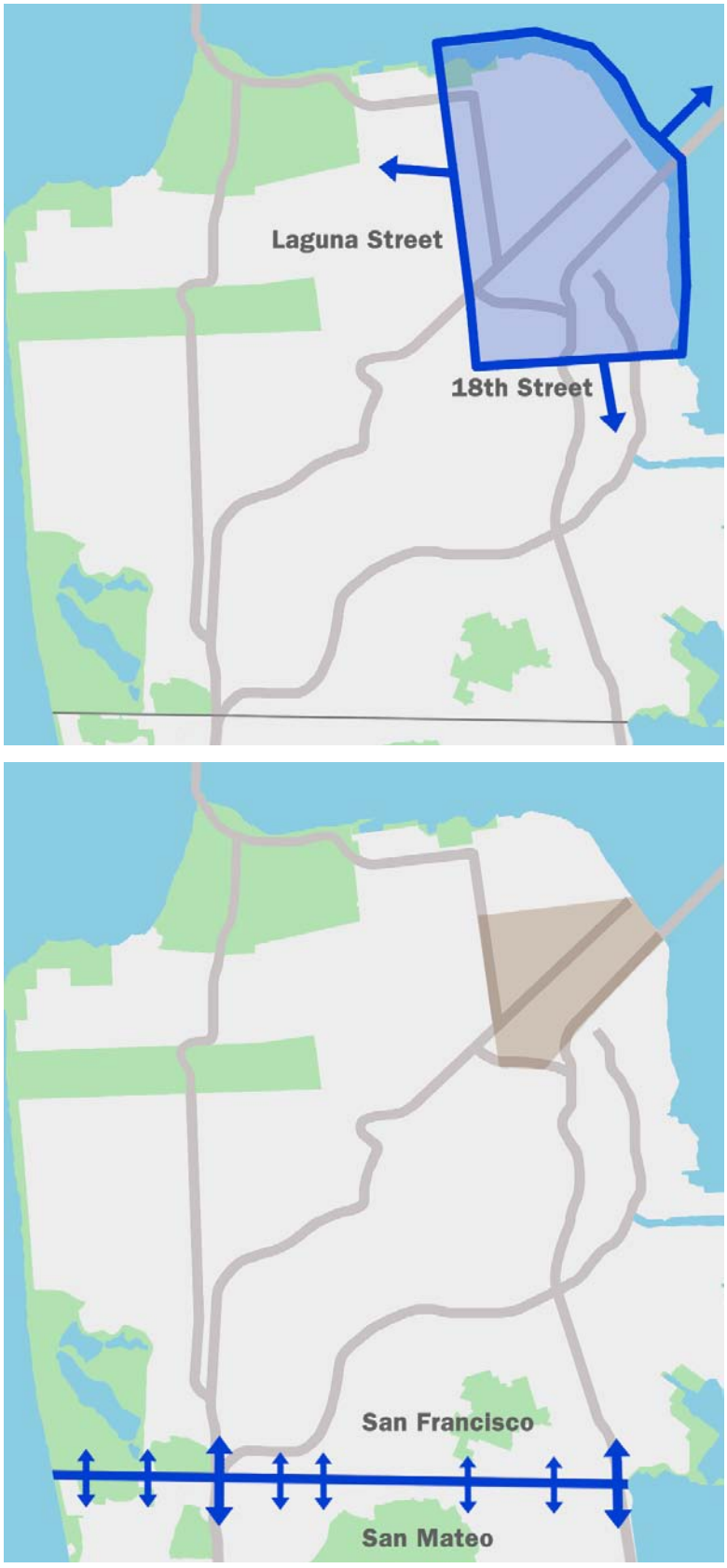
Northeast Cordon) provides the greatest congestion reduction in the city's most congested areas, while also delivering substantial additional benefits for transit performance, environmental quality, and sustainable growth. (A detailed description of program effects is presented in Section 2.4, below.)

The Northeast Cordon program design represents a mature and robust program design. During the course of the Study, there was significant public and stakeholder interest in exploring the potential for a more incremental or measured approach to program implementation. Taking a cue from Stockholm, which initially implemented its congestion pricing program on a pilot basis for seven months, the Study Team developed two options for a more modest congestion pricing program, either of which could be deployed as demonstration projects.

The two pilot options are as follows (illustrated in Figure 2-8, next page):

- **Modified Northeast Cordon.** Under this program design, charging would only be in effect during the weekday p.m. peak period, and would only apply to automobiles leaving the cordon area. As such, this option is also referred to as the "P.M. Outbound" design. The cordon area would remain the same, although the quantity of detection and charging points would be considerably reduced due to the unidirectional design. In order to deliver benefits on the same

Figure 2-8. Modified Northeast Cordon and Southern Gateway



order of magnitude as the more robust Northeast Cordon program, the single period charge would be higher, at approximately $6.00.

- **Southern Gateway.** This option is a variation of the Gateway program design initially assessed during the first phase of analysis. The Southern Gateway entails a bi-directional peak-period charge at the city's land-based approach with San Mateo County. The fee level would be the same as the full Northeast Cordon program (about $3.00 during both peak periods). A resident discount could be considered for households living with a certain distance of the county line. In order to manage internal San Francisco traffic, the Southern Gateway would be paired with more aggressive parking pricing and parking regulatory strategies within the city. The primary zone for these parking management mechanisms would be the greater downtown (i.e., the Focus Area) but such strategies could also be extended to more of the city's neighborhoods over time as warranted, to achieve program goals.

In addition to representing a more limited deployment of pricing than the Northeast Cordon scenario, the pilot designs respond directly to two of the largest areas of public feedback and concern raised throughout the Study process. These key stakeholder issues are as follows:

- **Visitors to Greater Downtown.** The northeast cordon area is home to many of the city's major cultural, entertainment, and retail destinations. Discretionary trips (i.e., trips other than for work or school) are a major component of travel to this area, and visitors have a significant economic impact on the economy of the greater downtown and the city as a whole. Various stakehold-

Figure 2-9. Comparison of Best Performing Scenarios Key Features

	NE CORDON (AM/PM)	MODIFIED NE CORDON (PM OUTBOUND)	SOUTHERN GATEWAY* (AM/PM)
Cordon Boundaries	18th Street, Guerrero, Laguna, Northeast waterfront	18th Street, Guerrero, Laguna, Northeast waterfront	San Francisco-San Mateo county line
Direction of Travel	Inbound and Outbound	Outbound Only	Inbound and Outbound
Time of Day	AM and PM	PM only	AM and PM

*This scenario assumed a 20 percent increase in parking cost for travelers to the Focus Area. Note that this varies from the scenario described in Section 2.6.

ers expressed concern that a congestion fee on trips to the northeast cordon could deter some discretionary travelers from visiting this area.

Both of the pilot options respond—in somewhat differing fashion—to this concern. The Modified Northeast Cordon design only assesses a charge on travelers leaving the northeast cordon area during the afternoon/evening commute period. As such, it would more specifically target daily commuters to the area. Inbound visitors, such as concert-goers and shoppers, would not be charged (unless they also drive out of the zone during the p.m. peak charging hours).

The Southern Gateway addresses issues concerning the greater downtown by not focusing the charging zone on this specific area, but rather using pricing to manage travel in the congested Peninsula corridor (i.e., US-101 and I-280) which experiences strong bi-directional traffic during both the morning and afternoon peak.

- **Geographic Equity.** As noted above in the discussion of the proposed bridge toll-payer "fee-bate" discount, automobile travel from the city's northern and eastern approaches is currently subject to bridge tolls. These tolls provide for some reinvestment within affected corridors and also encourage the use of alternatives to single-occupancy vehicle travel. In the case of the Bay Bridge, this incentive was recently strengthened through the introduction of elevated peak-period tolls on weekdays. At the land-based border with San Mateo County there is currently no form of pricing in effect.

As was shown in Chapter 1, the Peninsula and South Bay travel market is more dominated by automobile travel than the other regional travel corridors to and from the city. Some stakeholder groups indicated more willingness to apply pricing in this corridor than in other regional corridors, as a matter of geographic equity, while others expressed strong concerns about focusing the program on only one corridor or travel market. The Southern Gateway design would introduce congestion pricing along the peninsula corridor, as well as provide a more targeted focus for reinvestment and program evaluation.

In addition to responding to public feedback, a pilot approach would provide a test-bed for the effectiveness of congestion pricing, a proof-of-concept for system technologies and institutional arrangements, and ample opportunity to measure and monitor benefits and impacts. Reversible pilots are increasingly a preferred means of testing and evaluating transportation programs and policies in the Bay Area and other urban centers, as evidenced by pilot interventions on Market Street and the Pavement to Parks projects around the city. Both of the congestion pricing pilot options would include enhanced transit services and other transportation improvements, as discussed in Section 2.5, below.

2.4 Best Performers—Detailed Evaluation

This section presents the results of the detailed evaluation of the best performing scenarios: the Northeast Cordon (a.m. and p.m.), the Modified Northeast Cordon (p.m. outbound), and the Southern Gateway, described in Figure 2-9. These analyses were based on comparison to the 2015 Baseline (un-priced) scenario, as well as comparison across 2015 program scenarios. Each scenario included a set of representative transit service enhancements, which were developed as described in Section 2.5, below and are further detailed in an appendix to this Report.

2.4.1 TRANSPORTATION CONDITIONS AND TRIP-MAKING

Figure 2-10, next page, presents metrics relating to peak period vehicle travel for the three highest performing scenarios.

As noted above, data indicates a 12 percent reduction in peak-period vehicle trips with the Northeast Cordon scenario when the reduction in each period is weighted for the volume of motorist travel in each period,

Figure 2-10. Vehicle Travel Metrics

METRIC	2015 BASELINE	NE CORDON (AM/PM)	MODIFIED NE CORDON (PM OUTBOUND)	SOUTHERN GATEWAY (AM/PM)
		Percentage Change by Scenario		
AM Peak Vehicle Trips to/from NE Cordon	142,000	-13%	-5%	-5%
PM Peak Vehicle Trips to/from NE Cordon	229,000	-12%	-13%	-5%
AM Peak Vehicle Trips to/from S Corridor	95,000	-3%	-2%	-20%
PM Peak Vehicle Trips to/from S Corridor	122,000	-6%	-6%	-23%
AM Peak Vehicle Trips to/from SF	308,000	-7%	-4%	-6%
PM Peak Vehicle Trips to/from SF	475,000	-7%	-7%	-6%
Daily San Francisco VMT	9.8 million	-5%	-3%	-4%

Source: SF-CHAMP, 2010

Figure 2-11. Delay Metrics

METRIC	2015 BASELINE	NE CORDON (AM/PM)	MODIFIED NE CORDON (PM OUTBOUND)	SOUTHERN GATEWAY (AM/PM)
		Percentage Change by Scenario		
AM Peak VHD in Northeast Cordon	13,200	-36%	-8%	-7%
PM Peak VHD in Northeast Cordon	20,300	-37%	-38%	-7%
Daily VHD in Northeast Cordon	80,700	-21%	-10%	-4%
AM Peak VHD in Focus Area	4,400	-25%	-9%	-7%
PM Peak VHD in Focus Area	7,200	-26%	-26%	-6%
Daily VHD in Focus Area	31,300	-13%	-8%	-4%
Change in Peak Transit Speeds*	N/A	up to 20%	up to 20%	up to 15%

Source: SF-CHAMP, 2010, except as noted.

* Change in transit speeds during peak periods was estimated based on reduction in vehicle congestion in the most congested transit corridors in the downtown area. The Study Team prepared a micro-simulation model using VISSIM to estimate the travel time benefits that would accrue to transit operations from reductions in vehicle traffic, fewer conflicts between motorists and transit vehicles. These results are conservative, as they do not include assumptions of traffic signal coordination investments that would accompany a congestion pricing program, nor do they include management of on-street parking, commercial loading spaces, or wayfinding enhancements to reduce excess automobile circulation.

respectively. Across the course of the day, northeast cordon area vehicle trips are reduced 7 percent by the Northeast Cordon option (5 percent citywide decrease). Figure 2-11, above, presents key metrics pertaining to delay and transit performance.

A few observations become clear when comparing the scenarios:

- The Northeast Cordon is more effective at improving transportation network metrics in both the Focus Area and the northeast cordon area than the Modified Northeast Cordon and the Southern Gateway.
- Though the Modified Northeast Cordon is as effective as the Northeast Cordon during the evening peak period, its considerably lower performance during the morning peak period substantially reduces the overall performance across the both peak-periods and ultimately on daily metrics.
- The Southern Gateway is more effective at improving transportation network metrics for those traveling in the southern corridor, but does not deliver similar improvements to the most congested area of the city—the downtown areas. For the most part, the Southern Gateway also does not achieve comparable benefits to the Northeast Cordon when examining its performance at the citywide level.

Figure 2-12. Trip-Making and Mode Share Metrics

METRIC	2015 BASELINE	NE CORDON (AM/PM)	MODIFIED NE CORDON (PM OUTBOUND)	SOUTHERN GATEWAY (AM/PM)
AM Peak Transit Mode Share to/from Focus Area	42%	45%	43%	43%
PM Peak Transit Mode Share to/from Focus Area	33%	35%	35%	34%
		Percentage Change by Scenario		
Daily Person Trips to/from Focus Area	1.63 million	+0.4%	+0.6%	+0.9%
Daily Person Trips to/from NE Cordon	2.53 million	-0.4%	-0.2%	+0.1%
Daily Person Trips to/from SF	4.49 million	-0.4%	-0.4%	-0.7%
Daily Non-Motorized Trips to/from NE Cordon	705,000	+4.4%	+4.0%	+4.0%
Daily Transit Trips to/from NE Cordon	644,000	+4.2%	+3.4%	+2.5%

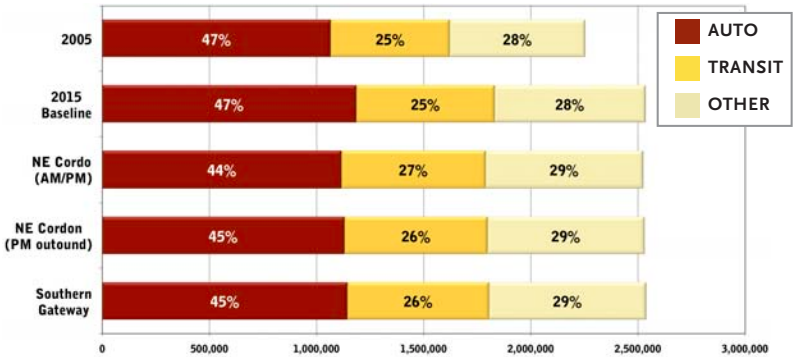
Source:: SF-CHAMP, 2010.

Figure 2-12, aboce, presents key metrics relating to trip-making and mode share for the three highest-performing scenarios.

Daily trip-making in the northeast cordon area and San Francisco as a whole is virtually unchanged with any of the best-performing scenarios. Some drivers shift their mode of travel or the time of day for their travel in order to avoid paying a congestion charge. Although peak period automobile trips across the cordon are reduced, other trips are induced due to the increased multimodal accessibility of the charging zone, including travelers with an origin within the cordon who choose to stay within the area rather than cross the charge boundary. (Section 2.4.3, below, further discusses these patterns.)

Figure 2-13, right, displays daily trip-making to, from, and within the northeast cordon area. The chart displays both mode share and total trip-making for each of the congestion pricing scenarios as well as for the 2005 and 2015 baseline scenarios. The chart shows that while mode share changes, as expected, with pricing, total daily travel levels are constant.

Figure 2-13. Northeast Cordon Travel by Mode



Source: SF-CHAMP, 2010

Travel changes vary significantly when looking at specific markets individually. Figure 2-14, next page, shows the share of total vehicle trips reduced for each scenario by specific travel market for both the northeast cordon area and all of San Francisco.

As the above figure shows, in the case of the Northeast Cordon programs, the majority of reduced auto trips represent intra-San Francisco travel. This is unsurprising given the broader availability of transit within the city, and, particularly, the relatively higher share of total travel cost that a congestion fee represents for trips within San Francisco. That is, a congestion fee would generally be a smaller proportion of total trip cost for a longer regional trip. The pattern is markedly different, as expected, for the Southern Gateway, in which two-thirds of the San Francisco vehicle trip reduction represents trips to or from the Peninsula/South Bay.

Figure 2-15, next page, shows the estimated increases in transit ridership by market during the a.m. and p.m. peak periods.[3] Muni boardings are a citywide figure, while the regional ridership gains are reported for

[3] See section 2.5 below for a discussion of investments to address shifts to the transit network, as well as other modes.

Figure 2-14. PM Peak Vehicle Trip Reduction—Share by Travel Market

NORTHEAST CORDON AREA	NE CORDON (AM/PM)	MODIFIED NE CORDON (PM OUTBOUND)	SOUTHERN GATEWAY (AM/PM)
Change in PM Pk. Vehicle Trips	-28,000	-29,000	-10,000
to/from SF	81%	76%	56%
to/from S.Bay	13%	13%	40%
to/from E.Bay	3%	7%	3%
to/from N.Bay	3%	3%	1%

ALL OF SAN FRANCISCO	NE CORDON (AM/PM)	MODIFIED NE CORDON (PM OUTBOUND)	SOUTHERN GATEWAY (AM/PM)
Change in PM Pk. Vehicle Trips	-35,000	-35,000	-30,000
to/from SF	73%	71%	31%
to/from S.Bay	12%	13%	67%
to/from E.Bay	11%	12%	1%
to/from N.Bay	3%	4%	1%

Source:: SF-CHAMP, 2010.

Figure 2-15. Transit Ridership Change by Market

		PERCENTAGE CHANGE		
	2015 BASELINE	NE CORDON (AM/PM)	MODIFIED NE CORDON (PM OUTBOUND)	SOUTHERN GATEWAY (AM/PM)
AM PEAK PERIOD	212,000	8%	6%	5%
Muni Boardings (citywide)	212,000	8%	6%	5%
East Bay (Transbay screenline)	61,000	3%	1%	1%
South Bay (SMCo. screenline)	28,000	5%	2%	9%
North Bay (GG Bridge Screenline)	6,000	17%	15%	10%
P.M. PEAK PERIOD				
Muni Boardings (citywide)	225,000	8%	8%	5%
East Bay (Transbay screenline)	59,000	5%	5%	1%
South Bay (SMCo. screenline)	25,000	5%	5%	9%
North Bay (GG Bridge Screenline)	4,000	16%	18%	9%

Source:: SF-CHAMP, 2010.

bi-directional screenlines—Transbay, San Mateo County border, and the Golden Gate Bridge—summed across operators (e.g., SamTrans plus Caltrain for South Bay).

Transit ridership gains vary by market, with San Francisco transit ridership in the peak period increasing by as much as 8 percent. Regional transit ridership gains are more modest. Although Golden Gate Transit ridership has a large relative increase in usage, absolute additional ridership is small.

2.4.2 ENVIRONMENT AND QUALITY OF LIFE

The Study Team also examined the anticipated effect of the highest-performing congestion pricing scenarios on environmental indicators of emissions and safety. Figure 2-16, next page, presents the results of this analysis.

Though the primary goal of San Francisco's congestion pricing program would be congestion management and mobility improvement, city policies and public feedback have indicated a strong desire to achieve co-benefits that can contribute to the City's aggressive goals for reducing our impact on climate change, for improving air quality, and for enhancing livability and quality of life. The GHG reduction forecast for the Northeast Cordon is equivalent to an approximate annual reduction of 100,000 metric tons citywide. Here again, the Northeast Cordon and Modified Northeast Cordon metrics indicate a greater contribution to these goals at the citywide level as well as within the greater downtown.

2.4.3 ECONOMIC AND BUSINESS EFFECTS

The Study Team conducted two types of economic analysis in order to assess the costs, benefits, and potential business effects of a congestion pricing program.

Business Impact Analysis

The first area of analysis was an assessment of the impact of area-wide pricing on San Francisco business activity. The approach built on analysis of the "footlooseness" of businesses, that is to what extent businesses might relocate outside of San Francisco in response to a change in relative transportation costs and accessibility, all other things equal.[4] The analysis pivoted off of transportation network conditions information—reflecting travel information, such as speed and user costs—from the SF-CHAMP model. For this analysis, the 2015 Baseline scenario was compared to the Northeast Cordon scenario. To estimate changes in business activity across the Bay Area region, a business activity relocation model specifically tailored to the region was developed, which links accessibility to business activity by sector based on businesses' service orientation, output market power, labor dependency, and footlooseness. The initial results of this analysis indicated a possible negative employment impact within San Francisco of up to 2 percent, with the repositioning in the region of some business activity. Appropriate investment of program revenue could mitigate this potential impact to 1 percent or less. The overall finding, however, is that business and employment impacts would be broadly neutral to positive, based on the following considerations:

1. SF-CHAMP model results show an increase of 60,000 daily non-motorized (walk and bicycle) trips in the northeast cordon, resulting from increased multimodal accessibility and transit usage to and from the area. The pricing policy would encourage travelers to the zone to conduct additional business (e.g., shopping, lunch, errands) within the zone. This is due to increased relative attractiveness of walking, transit, and bicycling as compared to an extra driving trip subject to a congestion charge, and the shift of primary trip "tours" from automobile to transit. A "tour" refers to the set of trips that includes the main trip purpose, such as a work trip, as well as the side or "secondary" trips one makes on the way to/from a destination—such as getting coffee or dropping off dry cleaning. The shift of commuting from the suburbs or from within San Francisco by car to transit, could have "co-benefits" therefore, in promoting ancillary trips to be made in the Northeast Cordon, on either end of the work trip or in the midday, by foot or transit, instead of at the "home" end by car.
2. The Authority's retail spending analysis, available as an appendix, showed that current monthly spending by transit users and pedestrians in the downtown area is comparable to or exceeds monthly spending by automobile travelers, due to the increased frequency of transit and walk trips—despite somewhat lower average spending on a per trip basis. The retail research also showed that the decision to shop or do business in downtown San Francisco reflects a demand for its unique character and attributes (mix of businesses, vibrancy, walkability), and that competitor areas in the region (Walnut Creek, Corte Madera, Serramonte) are most commonly chosen by shoppers because of their proximity to shoppers' homes. This indicates that investments in pricing area amenities—such as streetscape improvements, landscaping and power-washing—could be effective in drawing more visitors. These investments could be combined with other programmatic investments aimed at promoting business activity, supporting labor retention, and spurring visitor activity. These ongoing programs would include such elements as workplace and school-site mobility management; road resurfacing and traffic signal improvements; and transit and bicycle network investments to further increase accessibility.
3. Finally, the positive employment impact of an initial external investment of $60 million to $100 million to implement the congestion pricing system would be significant. Using a standard rate of 30 jobs[5] per $1 million of investment, 1,800 or more job-years of employment impact would be created or supported as a result of implement-

Figure 2-16. Environment and Quality of Life Metrics

		NE CORDON (AM/PM)	MODIFIED NE CORDON (PM OUTBOUND)	SOUTHERN GATEWAY (AM/PM)
On-Road Mobile Source CO_2 Emissions	NE Cordon	-16%	-9%	-7%
	San Francisco	-5%	-3%	-4%
Road-Based Mobile Source $PM_{2.5}$ Emissions	NE Cordon	-17%	-11%	-8%
	San Francisco	-5%	-3%	-4%
Collisions	NE Cordon	-12%	-5%	-3%
	San Francisco	-6%	-4%	-5%

Source: SFCTA and PBS&J, 2010, using SF-CHAMP data.

[4] It is worth noting here that Bay Area employment has decentralized over the past 30 years, with San Francisco employment staying fairly flat since 1980 while job growth in other suburban locations increased over the same period. It is unclear to what extent this has been a response to housing/land costs and business regulations in San Francisco versus transportation factors. While the price of gas, parking, and tolls have increased, transit accessibility has improved over the same period, and commute times have largely stayed the same or reduced slightly over the same period.

[5] http://www.fhwa.dot.gov/policy/otps/pubs/impacts/index.htm

ing a congestion charging system. Capital costs would likely be grant funded and represent a sizable amount of job creation or retention. This, when combined with the annual investment in programmatic improvements (capital projects and new transit services) would help to mitigate the initial employment impacts estimated above.

These considerations are the Study team's best attempt to analyze this important but challenging question. Although London and Stockholm priced areas experienced faster sales growth than non priced areas, experience from other places can only be partially relied upon given the unique characteristics of each city. It will be useful to monitor the effects of other pricing projects in the city and region, such as the Highway 680 Express Lanes, Bay Bridge variable tolls, and SFpark parking pricing demonstration, to see what effects, if any, they have on economic performance. Another possibility would be to conduct a limited six to eight month pilot pricing program and evaluate the results.

Benefit-Cost Analysis

The Study Team also conducted an economic benefit-cost evaluation. The benefit-cost approach entails monetizing the various benefits and impacts of a potential policy for a given time period, in this case a representative year of program operation. The full analysis is documented in a separate background paper.

Figure 2-17, below, presents the program effects which were included in the analysis and respective costs and benefits for both the Northeast Cordon and Southern Gateway scenarios. This analysis was not performed for the Modified Northeast Cordon scenario, but results for this scenario would be expected to be intermediate to those for the two scenarios presented herein.

The Northeast Cordon program would result in an annual social benefit of more than $350 million. The Southern Gateway's benefits would be approximately $250 million—still quite significant. The benefit-cost evaluation is conservative in a number of respects. The analysis does not certain anticipated areas of benefit such as improved health outcomes due to increased utilization of non-motorized modes, the value of improved transit reliability, and other factors.[6]

The analysis of travel time savings was disaggregated on two levels: first, with respect to San Francisco residents and residents of the other eight Bay Area counties; second, with respect to transit riders and motorists. Figure 2-18, next page, presents the results of this analysis.

[6] The "Trip Change Disbenefit" calculation is also conservative in that it assumes each reduced automobile trip is associated with a direct user cost of $3.00. This figure is in fact the maximum possible user disbenefit (monetized as a cost) for a traveler who foregoes an automobile trip due to the congestion fee; in actuality, there is a range of values for this figure among the affected population.

Figure 2-17. Scenario Benefit-Cost Analysis Summary

		NE CORDON (AM/PM)		SOUTHERN GATEWAY	
		BENEFIT (MILLIONS)	COST (MILLIONS)	BENEFIT (MILLIONS)	COST (MILLIONS)
User Benefits and Costs	Congestion Charges Paid (after discounts)		-$145		-$105
	Travel Time Savings for Motorists	+$345		+$260	
	Travel Time Savings for Transit Riders	+$70		+$55	
	Trip Change Disbenefit		-$45		-$65
	Private Vehicle Operating Cost Savings	+$30		+$35	
Social Benefits and Costs	Safety and Environmental Benefits	+$30		+$25	
	Congestion Charges Received	+$145		+$105	
	Program Costs		-$65		-$45
Totals	Annual Benefits	+$620		+$480	
	Annual Costs		-$255		+$215
	Overall Annual Program Benefit	+$365		+$265	

Notes: Figures are in 2008 $s for a typical mature year of operation. All figures rounded to the nearest $5 million. "Trip Change Disbenefit" is the user cost of a foregone automobile trip to priced area (see Footnote). Mode refers to user mode in baseline scenario.

Source: SFCTA, 2010.

Figure 2-18. Distribution of Travel Time Benefits ($ millions)

	NE CORDON (AM/PM)	SOUTHERN GATEWAY
San Francisco Residents	+$110	+$70
Other Bay Area Residents	+$260	+$180
Motorists	+$300	+$195
Transit Riders	+$70	+$55

Notes: Figures are in 2008 $ millions for a typical mature year of operation. All figures rounded to the nearest $5 million. Trip change disbenefit has been imputed into the above figures. Mode refers to user mode in baseline scenario.

Source: SFCTA, 2010.

Significant travel time savings accrue for both local and regional travelers, particularly for regional motorists. This is due in part to the longer average travel distance for automobile trips and for regional trips, as well because of network effects—reductions in congestion ripple through the regional network, allowing travelers who do not directly travel in a priced area to enjoy improvements in travel time.

2.5 Multimodal Investment Program

A key component of the Phase II scenario analysis was the conceptual development of a package of transportation improvements to accompany a congestion charge. As discussed throughout this report, reinvestment of fee revenues into a multimodal package of investments is a central element of a congestion pricing program.

The development of a potential investment strategy was an iterative process guided by technical analysis and stakeholder input. The overall approach to the investment program can be summarized as follows:

- Direct revenues to improve travelers' options as well as to benefit motorists directly.
- Target transit improvements in those corridors with the greatest ridership gains due to the charge.
- Allocate funding locally and regionally in approximate proportion to the share of travelers affected by the congestion charge in different travel markets.
- Consider multiple categories of investment, including startup elements, capital projects, transit operating contributions, and programmatic investments.
- Take into account relevant planned and programmed transportation projects that will or could be delivered in the timeframe of potential program implementation, for both fund leveraging and coordination purposes.

The primary investment package was developed for the Northeast Cordon program, with variations explored for the pilot design options. In addition, a more capital intensive program was also evaluated, as a way to reflect a more robust and mature program and its potential performance. The subsections below focus on the development of the reinvestment strategy and the key components of such a program.

As with the development of the charging system, the development of the associated investment packages resulted from a combination of technical analyses and public input, including:

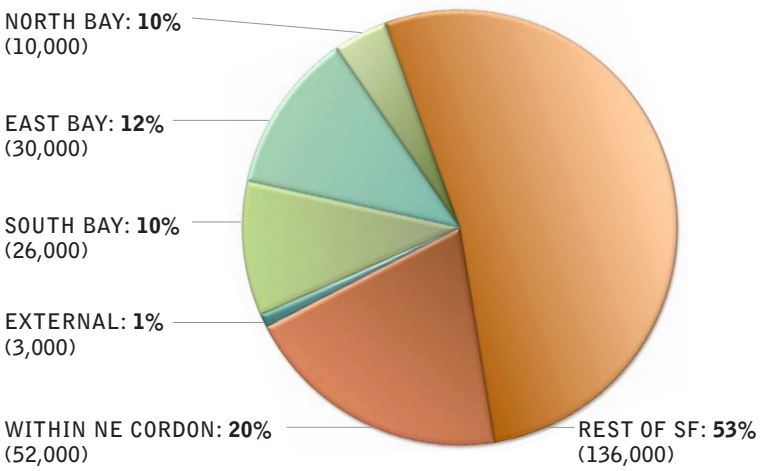
- Discussions with local and regional transit operators, through both the Technical Advisory Committee and additional agency staff, to understand opportunities and constraints that might allow or hinder enhancements for the existing system;
- Discussions with local and regional transit operators, through both the Technical Advisory Committee and additional agency staff, to understand current plans for improvements within the timeframe of the scenarios analyzed;
- Model output to estimate incremental load factors likely to result from a shift in demand by corridor and by operator as a way to determine and mitigate potential transit crowding impacts; and
- Public outreach to understand the opportunities, constraints and concerns of travelers in the range of markets that might be affected by the various congestion pricing scenarios.

Although during the first phase of scenario development the investment package was held constant, once the highest-performing scenarios emerged the Study Team iteratively adjusted the investment package to complement each scenario. The Study Team also developed high-level cost estimates for the investment packages in order to compare investments to the relative financial performance of the scenarios. This helped develop understanding of whether net revenue was sufficient to support enhanced travel options.

2.5.1 TRAVEL PATTERNS AND FUNDING DISTRIBUTION

As noted above, the investment package was designed in light of the various travel patterns that would be affected by a congestion charge. There are approximately 2.3 million daily person-trips in the northeast cordon area of San Francisco. Nearly half are automobile trips, and over 40 percent of total person-trips are made during the peak periods (a.m.

Figure 2-19. Distribution of Northeast Cordon Automobile Trips 2005 PM Peak



Source: SF-CHAMP, 2010

and p.m. peaks combined). Figure 2-19, above, illustrates the distribution of automobile trips to, from, and within the northeast cordon area in the p.m. peak by travel market.

Well over half of peak-period automobile travel in the northeast cordon area is fully internal to San Francisco. However, the geographic distribution of travelers reflects the need to invest funds both within San Francisco and regionally in key travel corridors.

The investment package has two primary components: an up-front program of improvements to be implemented at startup; and an annual funding program.

2.5.2 STARTUP PROGRAM

For a congestion pricing program to be comprehensive and effective, travel options should be improved in major affected travel corridors prior or contemporaneous to the introduction of the fee. The majority of these startup improvements would come in the form of enhanced transit service to and from the priced area, through additional and more frequent service at the local and regional level. These service improvements would continue to be funded throughout the program.

In addition to transit service increases, the investment package includes a startup program of capital transportation improvements to further improve travel options. This up-front program of improvements would rely upon projects currently planned, as well as new and accelerated investments. The investment package included in this analysis contemplates a contribution of up to $100 million to up-front improvements for a total startup program of up to $200 million, depending on fund leveraging, implementation approach, and schedule. The startup program would be competitive for external grant funding, and a financing strategy approach could be deployed to increase early project delivery through a bonding program to deliver both an initial set of capital projects and accelerate the delivery of other projects.

The startup program would include local and regional projects. In San Francisco, the program would potentially include:

- support for delivery of bus rapid transit (BRT) on Geary Boulevard;
- transit preferential streets (TPS) treatments in key transit corridors in the Rapid Network, including peak-period bus-only lanes;
- expedited delivery and/or expansion of citywide bicycle network investments;
- signage and real-time traveler information programs;
- and other investments.

At the regional level, the startup program would focus on improvements to regional transit hubs and capacity, focused on:

- BART and Caltrain station access investments such as bus bridges or shuttles;
- secure bicycle facilities and/or regional bike sharing; and
- additional parking strategies or management at park-and-ride facilities as appropriate.

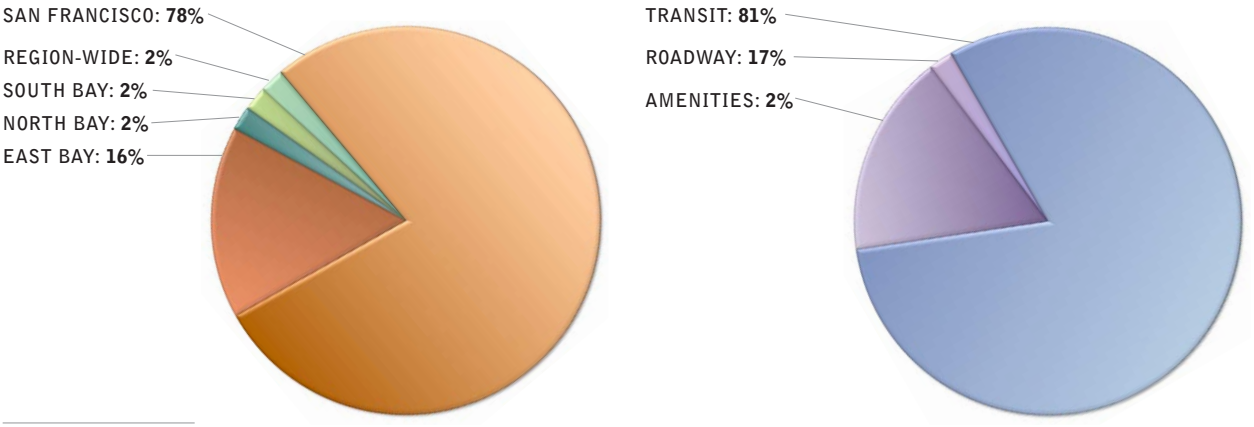
In addition, corridor management efforts, particularly in the US-101 corridor in the North Bay and Peninsula would be supported. The startup program would also include investments in local area traffic calming measures, as warranted to address circulation issues and concerns in areas immediately adjacent to the pricing cordon. See Figure 2-20, next page, for a breakdown of start-up investments by mode and by market.

2.5.3 ANNUAL FUNDING

On an annual basis, net revenues would be directed to three primary categories of investment:

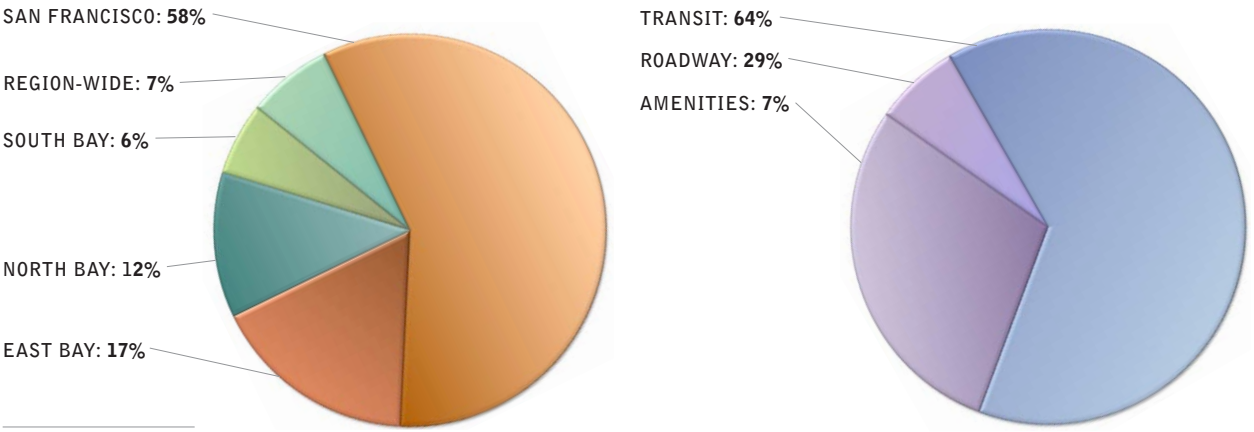
- transit service contributions;
- multimodal improvement projects;
- and programmatic initiatives.

Figure 2-20. Start-up Program by Market (left) and by Mode (right)



Source: SFCTA and PBS&J, 2010

Figure 2-21. Investment Program—Annual Funding by Market (left) and by Mode (right)



Source: SFCTA and PBS&J, 2010

Total annual funding availability for the annual investments under the Northeast Cordon program would be up to $60 million. The amount would depend on the financing and capital delivery approach: if a larger initial capital program is pursued, less funding would be available an annual basis for regular contributions to operations and programmatic improvements. The investment package assumes that congestion pricing would make a contribution (at differing levels) to each category, leveraging various other funding sources.

Figure 2-21, above, displays the annual investment by travel market and by mode resulting from the package of improvements. The charts reflects the improvements considered in the investment package, based on the shift in demand to the various modes of travel and programmatic improvements that were developed in response to public feedback.

The annual funding categories are summarized as follows:

- **Transit Service.** The investment program would provide support for transit operations at the local and regional level. Many cities utilize service warrants that establish performance standards to be met by transit providers, ensuring that fees are dedicated to services sufficient to accommodate any demand shift. Service warrants can be structured in a way that allows the program operator to seek alternate or innovative delivery methods if performance standards are not achieved, such as contracting for supplementary service to the priced area. More detail on this approach is included in Chapter 6.
- **Multimodal Improvements.** On an annual basis, the funding program would include contributions to ongoing investments in the transportation system, including street resurfacing and repair in the priced area, bicycle and pedestrian projects, transit priority investments,

and other similar areas of investment. The annual program could be administered in a fashion similar to the programmatic investment categories of the Authority's Prop K transportation sales tax program that relies on an expenditure plan for improvements.

- **Programmatic/Supporting Elements.** This final category of annual funding includes supporting programs that would complement the congestion charge and the capital and service-oriented transportation investments. This category would support transportation demand management (TDM) programs for workplaces and schools, in order to ease the impact of a pricing program on families and small businesses, as well as a contribution to a means-based fare assistance program to help address transit affordability. This funding category would also support parking management and enforcement efforts to address potential parking issues in neighborhoods adjacent to the priced area. Finally, this category could provide for streetscape maintenance programs within the priced area to provide services such as power-washing of sidewalks in high-activity areas.

2.5.4 CONSIDERATIONS FOR PILOT IMPLEMENTATION

With a pilot implementation, most of the considerations for developing and delivering an investment program as described above would also apply. There would be a number of different issues at work, however.

The primary focus of the investment package for a demonstration approach would be to provide additional transit service in conjunction with the demonstration of the congestion charge. Given the reversible design of the pilot options, the use of private delivery options for certain transit markets would need to be explored and potentially pursued. In addition, a pilot would rely on more flexible transit projects that can be delivered in a short timeframe such as bus operations, management, and small-scale capital improvements, rather than capital-intensive rail projects that would require substantial time for implementation and considerable external funding to deliver through road pricing. More detail on potential public and private roles is discussed in Chapter 6.

2.6 Parking Policy and Congestion Management

The Study focused principally on the feasibility of areawide congestion pricing strategies for San Francisco. However, the Study Team did conduct a preliminary assessment of the potential for parking pricing and parking regulatory strategies to achieve reductions in peak-period traffic in the city's most congested areas. This section discusses this initial investigation of parking policy and suggests areas for further Study and analysis.

2.6.1 VARIABLE PARKING PRICING AND AREAWIDE CONGESTION PRICING

The San Francisco Municipal Transportation Agency (SFMTA) is currently implementing a federally-funded demonstration project of variable parking pricing through the SFpark program. The SFpark pilots will utilize new pricing approaches and technology to improve the management of City-controlled parking in multiple neighborhoods. It is anticipated that demand-responsive parking pricing will have some congestion management benefit, as drivers will have less need and incentive to circulate excessively in search of available curbside parking. This benefit is especially important in numerous surface-running transit corridors where Muni vehicles navigate constrained local commercial corridors with high levels of parking demand. The comprehensive evaluation of the SFpark pilot projects should yield valuable findings regarding these effects.

The Authority has evaluated the role of pricing and complementary strategies in the improved management of the city's on-street (curbside) parking supply through the San Francisco On-Street Parking Management and Pricing Study, which was approved by the Authority Board in September 2009.[7] While they are related tools, on-street parking pricing and areawide congestion pricing address two different challenges. The central objective of demand-responsive (i.e., variable) pricing of on-street parking is to address curbside parking shortages and improve availability. Areawide road pricing combats peak-period congestion by reducing single-occupancy vehicle travel, particularly commute trips.

The distinction between variable parking pricing and areawide congestion pricing stems from the different markets that each strategy targets. The focus of the SFpark program is metered parking and City-owned garages, meaning that it primarily affects short-term, non-work trip purposes. In contrast, peak-period congestion is more largely associated with work and other long-term parking purposes—travel readily affected by a cordon charge.

2.6.2 PARKING POLICY —KEY CHALLENGES

There are three central challenges to deploying parking-based strategies to achieve congestion management benefits comparable the 10–15 percent reduction in peak-period vehicle trips anticipated with

[7] http://www.sfcta.org/parking

a Northeast Cordon program. First, the areas most affected by chronic peak-period congestion in San Francisco are the areas with the largest proportion of commuter-serving parking provided by the private sector—supplies for which effective and enforceable regulations are difficult to design and implement.

Second, parking costs may not affect the daily travel decision-making of routine drivers such as higher-income commuters. Employers and retailers frequently subsidize parking costs for individual users: data collection completed for initial development of the SF-CHAMP model indicated that about one-third of automobile commuters to downtown San Francisco do not pay anything their parking, and an even larger percentage pay only a fraction of the true parking cost.[8] Even where a subsidy is not present, parking cost may be masked by monthly (rather than daily) rates, and other factors, such as the incorporation of parking spaces into lease agreements.

Finally, parking pricing strategies have typically focused on non-residential parking supplies. Cordon pricing is agnostic as to the parking supply type at a charged trip's origin or destination. To be most effective, comprehensive parking pricing and regulatory policy should consider the full range of private and public parking supplies and their relationships to the daily behavior of individual travelers.

2.6.3 PARKING PRICING SCENARIO ANALYSIS

The Study Team conducted preliminary analysis of a parking pricing scenario representing a more extensive and homogeneous policy than either historical conditions or the current SFpark pilot project. This sketch-level analysis, which utilized the CHAMP model, was performed with an understanding of the above outlined policy challenges and of the limitations of the current CHAMP model's capabilities with respect to the representation of parking pricing.

The parking pricing scenario, referred to as the Focus Area Parking Charge scenario, was designed to roughly mirror the pricing policies of the best-performing cordon charge scenarios. The scenario entailed assessing an additional $3 parking cost on all vehicles driving to or from (i.e., both origins and destinations) the Focus Area during the a.m. and p.m. peak periods. Through trips were not priced. The uniform parking charge was in addition to the baseline parking cost represented in CHAMP, which varies from zero to market-rate (reflecting the range of subsidies and price-bundling currently in existence for parking charges). The Parking Charge scenario targets congestion in the Focus Area by pricing the large off-street supply, whereas SFpark targets only on-street supply and City-controlled off-street stocks.

Figure 2-22. Comparison of Parking Charge and Northeast Cordon Scenarios

	NORTHEAST CORDON	FOCUS AREA PARKING CHARGE
Total Daily Charged Trips	250,000	145,000
	Change vs. 2015 Baseline	
Total SF Daily Person Trips	—	-3%
AM Peak Vehicle Trips to/from Focus Area	-14%	-22%
AM Peak Vehicle Trips to/from NE Cordon	-13%	-12%
Daily Non-Work Trips to/from Focus Area	—	-4%
Daily VMT, Focus Area	-10%	-9%
Daily VMT, SF	-5%	-3%
Peak Transit Trips to/from Focus Area (AM and PM)	+12,000	+15,000
Peak Walk and Bike Trips to/from Focus Area (AM and PM)	+6,000	—

Source: SF-CHAMP, 2010

Figure 2-22, above, compares key evaluation metrics for the Parking Charge scenario with the Northeast Cordon scenario.

As discussed in the earlier presentation of evaluation results, the Northeast Cordon program result in a negligible net change (less than 0.5 percent) in daily overall tripmaking in San Francisco, as well as non-work (i.e., "discretionary") travel in the Focus Area. The Parking Charge scenario, largely owing to the assessment of a fee on all automobile trips originating in or destined to the Focus Area including fully internal patterns, results in a somewhat more significant reduction in peak-period vehicle trips; however, it also is associated with a non-negligible, if modest, reduction in overall and non-work trip-making.

[8] SFCTA, October 2002. *San Francisco Travel Demand Forecasting Model Development—Data Development.*

Because the charged area is the area that is the most well-served by transit in the city, the Parking Charge is also associated with a more significant increase in transit ridership to and from the Focus Area; the increase is conservative as the Parking Charge scenario does not include transit improvements warranted to mitigate the mode shift effect. Combined with fewer toll-payers as compared to the Northeast Cordon, this presents a challenge in terms of funding availability to accommodate this growth in transit ridership. Finally, the Parking Charge does not result in a significant increase in nonmotorized travel in the Focus Area. In contrast, the Northeast Cordon scenario, by charging inbound and outbound automobile trips, effectively encourages travelers within the zone to choose closer destinations, which are more conducive to the pedestrian and bicycle modes.

2.6.4 HIGH-LEVEL FINDINGS AND FUTURE PARKING POLICY DIRECTION

Despite the preliminary and exploratory nature of the parking pricing scenario analysis, the results are instructive at an overall level. Moreover, the Parking Charge scenario—a flat fee levied in a simplistic way—should not be substituted for the robust analysis that should be forthcoming once the SFpark demonstration project has been in operation long enough to pursue evaluation of further parking management and pricing opportunities. Despite these caveats, the substantial effect of parking cost on traveler behavior, it reasonable to expect that a homogeneous parking-based charge comparable to the Northeast Cordon charge could have significant congestion reduction benefits, if it were possible to implement such a charge to affect all automobile trips leaving or entering a specific area. The modeled reductions in overall travel and increases in transit demand are issues of concern warranting further analysis and assessment of potential mitigating measures.

Even more challenging are the issues associated with developing and implementing the policy tools and functional mechanisms that would be needed to use parking pricing and regulatory strategies to meaningfully affect daily traveler behavior. In other words, while comprehensive parking pricing policies—across the city's full range of publicly and privately controlled on- and off-street stocks—have significant technical merit, advancing such a policy will be complex and will require significant changes to long-standing parking provision, pricing, and enforcement practices.

Despite these hurdles and uncertainties, there are various promising potential parking management strategies that warrant inclusion in a more robust evaluation of parking policy opportunities. These concepts include, but are not limited to:

- Parking cashout, including improved enforcement of the existing state statute and development of new, more effective local and/or statewide policies;
- Unbundling of parking provision from all property leases and sales, for both commercial and residential properties, including monitoring and enforcement measures;
- Regulatory and/or impact fees assessed on a per-space;
- Parking requirement changes, such as elimination of minimums, reduced ratios, and use of maximums; and
- Neighborhood parking reform to address demands for curbside space in residential areas through expanded market-based parking pricing, benefit districts, flexible use of public space, and other measures.

In the near- to medium-term, none of these strategies would be anticipated to be sufficient to provide the same peak-period traffic reductions as a congestion pricing program or the theoretical Parking Charge scenario—particularly in isolation. Still, potential future phases of congestion pricing analysis should examine these policy challenges, opportunities, and tradeoffs in further detail. Doing so will require improved data regarding off-street parking supply, price and subsidy practices, and user characteristics.

2.7 Conclusion—Scenario Analysis Findings

This Chapter has summarized the Study Team's analysis of potential congestion pricing scenarios, with a focus on the evaluation of the highest-performing scenarios. Various elements of program design were also reviewed, including pricing policy and the use of net revenues for various categories of investment.

The central findings of this analysis are summarized as follows:

- **A congestion pricing program for San Francisco is technically feasible and would be effective in advancing San Francisco's goals for transportation system management, GHG reduction, and sustainable economic growth.** The Northeast Cordon program would reduce vehicle trips to and from the Focus Area during peak periods by more than 15 percent, decreasing daily citywide VMT by approximately five

percent. Total daily travel, as measured by person-trips to the priced area, would be virtually unchanged: many peak-period motorists would continue to drive, while others would modify their behavior by shifting the time period in which they travel or by utilizing a different mode.

The program would result in a net positive annual social benefit, with the fees paid offset by travel time savings accruing to both drivers and transit riders. Additional benefits would include health and environmental effects, including fewer vehicular collisions and reduced greenhouse gas and criteria pollutant emissions of approximately five percent citywide.

- **The Northeast Cordon program would provide $60 to 80 million in annual net revenue, which would be reinvested in the transportation system with special emphasis on enhancements to transit service.** These funds would be invested in a transparent manner, both locally and regionally, for a range of multimodal improvements. The investment program would include capital projects supported by a bonding program. For ongoing funding, the emphasis would be on delivering faster and/or more frequent transit services, focused on key corridors affected by the charge. To be successful, the program would require and include the deployment of additional transit services prior to or simultaneous with the introduction of a congestion charge.

  With the provision of improved alternatives to private vehicular travel, the program is forecast to result in an approximately 10 percent increase in peak-period transit mode share to the Focus Area. There is the potential to utilize innovative and flexible service delivery methods, such as contracting, as part of the program, particularly if it is implemented on a pilot basis.

- **A pilot implementation is a practical first step to demonstrate and evaluate a comprehensive area-based pricing approach.** The pilot approach is increasingly a preferred means of testing and evaluating transportation programs and policies in San Francisco and other urban centers. In the case of congestion pricing, a six to eight month pilot could provide a test-bed for the effectiveness of proposed strategies, a proof-of-concept for system technologies and institutional arrangements, and ample opportunity to measure and monitor benefits and impacts in a real-world environment.

  A pilot approach would also be responsive to public concerns and feedback. The economic downturn has increased skepticism of congestion pricing as a demand management strategy. Still, some support exists for pricing peak-period commute travel, particularly travel to and from land-based approach to the south, as a way to minimize impacts to downtown business activity and as a matter of geographic equity. The pilot programs would demonstrate electronic pricing and payment technology, real-time information systems, and other cost-effective ITS elements.

The chapters that follow present additional areas of Study analysis, as well as a summary of Study outreach activities.

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3 Outreach and Feedback

Over the course of the Study, the Study Team conducted robust technical analysis of the concept of congestion pricing in San Francisco, but the technical analysis is only one component of evaluating this new and innovative concept. Despite the familiarity with transportation fees—transit fares, bridge tolls, and parking pricing, for example—the concept of road pricing is relatively new.

There are relatively few—though increasingly more—examples nationally of road pricing, and peak-period pricing on toll bridges or toll roads is quite new to the Bay Area. The Study Team committed to discussing the concept and technical analysis of congestion pricing with a variety of resident, business, and stakeholder groups to gain an understanding of not only potential benefits and impacts, but also to help assess whether scenarios could be designed that address or minimize key concerns.

Outreach for the Study took many forms, reaching well over 1,000 individuals throughout the course of the Study's development. Four series of public workshops in Fall 2007, Summer 2008, Fall 2008, and Summer 2010 acted as the core public outreach events both to announce key milestones in the Study and to kick-off outreach meetings with a variety of neighborhood, business, civic, and advocacy organizations and groups. In addition, the Study Team actively conducted a variety of supplemental outreach efforts to engage stakeholders and encourage public involvement in Study activities. Authority staff have given presentations regarding the Study to numerous groups, including neighborhood associations, professional organizations, business groups, and government agencies. Throughout the Study, the Study Team periodically convened multiple advisory committees and conducted targeted thematic workshops, focus groups, and direct outreach meetings with community groups and stakeholders.

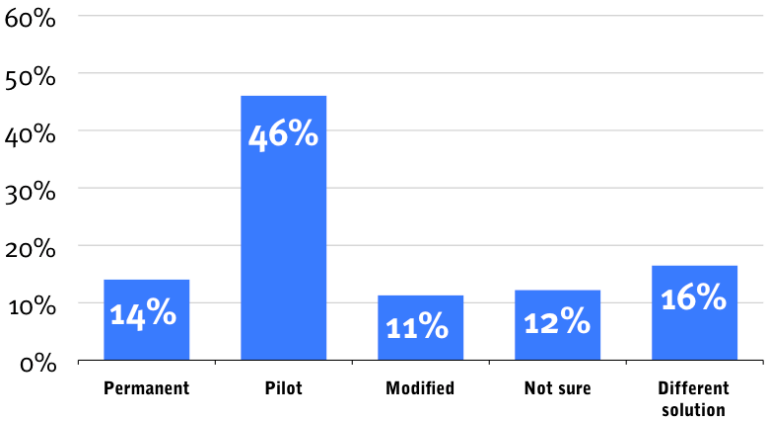
This chapter summarizes outreach activities conducted since the Study's initiation. The chapter is organized as follows. It begins with a brief examination of key feedback messages raised during outreach and public involvement. Then the Study's public workshops and direct outreach efforts are described. Next, a description of market research activities is provided. The chapter concludes with a description of high-level findings regarding public views and reactions to congestion pricing and the Study's progression in light of these public perceptions.

3.1 Key Feedback Messages

Feedback on congestion pricing, and on the Study overall, has varied across the different interests, sectors, and locations in which outreach has been conducted. In addition, the Study has been challenged in several ways, not the least of which was the onset of a severe economic downturn. At the outset of the Study, support for evaluating congestion pricing was fairly high. Despite changes in the economic conditions, the Authority was committed to completing the evaluation of this concept for two reasons. First, as a conceptual feasibility study, it does not necessitate or trigger further immediate action. Second, given the timeframe

for implementing projects in San Francisco, a feasibility study of this scope can be useful should the concept of congestion pricing become more attractive at a future date. With San Francisco's ambitious goals for sustainable growth and substantial reduction in climate change impacts, it is useful to have completed an evaluation of congestion pricing as one of the few available policies that can manage congestion, improve mobility, provide for system reinvestment, and combat climate change.

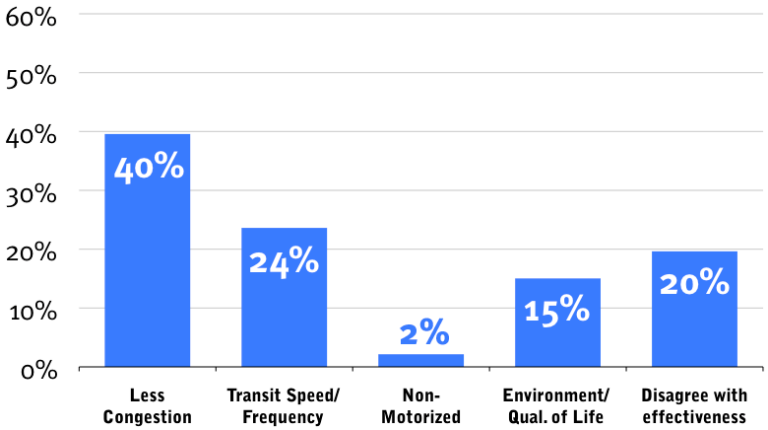
Figure 3-1. What is your opinion about a potential congestion pricing project for San Francisco in the next 3–5 years?



Permanent: I support implementing a permanent program
Pilot: I prefer taking a pilot approach
Modified: I could support congestion pricing with modifications
Not sure: I'm not sure yet/undecided/need more information
Different Solution: I prefer another solution

Source:: SFCTA Summary of Public Outreach, Summer 2010.

Figure 3-2. The top benefit of a potential charging program is:



Less congestion: Reduced auto congestion/travel time
Transit speed/frequency: Improved transit speeds, frequency, and reliability
Non-motorized: Improved bicycling/walking downtown
Environment/Quality of life: Improved the environment/quality of life
Disagree with effectiveness: Disagree with the effectiveness, prefer another solution

Source:: SFCTA Summary of Public Outreach, Summer 2010.

Feedback received during the most recent phase of outreach suggests support for continued evaluation of congestion pricing. Figure 3-1, left, shows responses of nearly 400 individuals participating in online webinars and electronic town halls conducted during the most recent round of outreach during the summer and fall of 2010.

Of outreach participants, 60 percent would support implementing either a permanent or pilot program in the next three to five years. This reinforces findings from previous rounds of outreach and market research findings, where regional polls found substantial support for studying congestion pricing. Some of the benefits expected of a potential congestion pricing program include reduced congestion resulting in faster travel times for motorists and transit riders alike; improved transit speeds, reliability and frequencies; and environmental, health, and quality of life benefits.

In the words of some electronic town hall participants who support continuing study:

> "it's beneficial to have a congestion pricing project for San Francisco because the traffic … keeps me from going there…This keeps my dollars out of San Francisco's businesses and your taxes… other people I know have expressed similar thinking."

> "Congestion pricing seems like a good step to take. We in the South Bay definitely need better access to transit, such as Caltrain, and better pricing too."

Figure 3-2, left, shows the distribution of perceived benefits that could be realized by a congestion pricing program if implemented in San Francisco, as expressed by participants in the most recent round

of public outreach events, conducted in Summer 2010.

By contrast, statements against congestion pricing include:

> "When you add in all costs of coming to the city: parking, BART, buses, you are beginning to out-price yourselves."
>
> "People don't trust lock boxes, especially when the state seems to raid local government boxes these days."

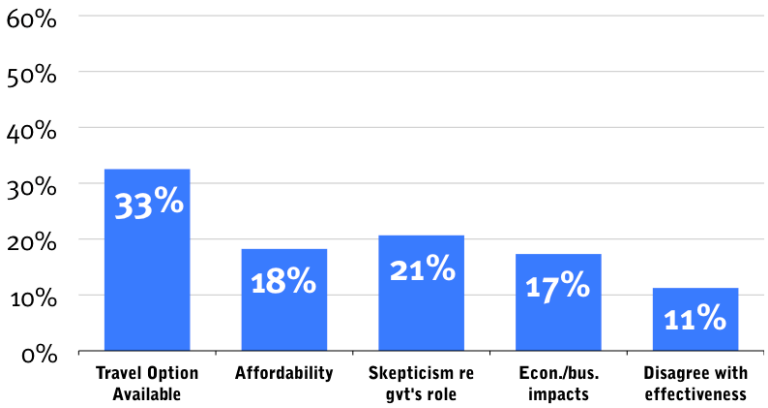
Figure 3-3, right, shows the distribution of perceived concerns that could be realized if a congestion pricing program were implemented in San Francisco, as expressed by participants in recent outreach events.

Despite support for congestion pricing, congestion pricing is a new, controversial idea, and substantial opposition exists. Throughout the various outreach events conducted, as little as 11 percent and as much as 50 percent of participants in a variety of public meetings expressed a desire to discontinue evaluation of congestion pricing altogether. Whether raised by opponents or proponents, the following paragraphs describe the dominant concerns with a congestion charging program and the way the Study Team responded to this feedback, whether with additional analysis of the data, by refining existing scenarios or introducing new scenarios, or by collecting additional data.

- **Feedback Area:** Potential economic impacts—whether by fiat or perception San Francisco may seem off-limits to travelers, particularly drivers. The perception that most customers drive to businesses, or that drivers contribute more to the bottom line than other travelers, was dominant enough to cause worry of losing driving customers.

  Study response: collect additional data.

Figure 3-3. My top concern about a potential charging program is:



Travel option available: Availability of travel options

Affordability: Affordability, including for low-income travelers

Skepticism re gvt's role: Skepticism about government's role in providing congestion/mobility improvements

Econ./bus. impacts: Economic/ business impacts

Disagree with effectiveness: Not sure it will be effective, prefer another solution

Source:: SFCTA Summary of Public Outreach, Summer 2010.

In December 2007 and April 2008, the Study Team conducted a survey of 1390 visitors to San Francisco's downtown areas to understand how people travel to downtown businesses, how often they travel and how much they spend. Though drivers do in fact spend more when they visit these retail areas, this survey indicates that transit riders and pedestrians visit more frequently so over the course of a month, they spend slightly more than drivers do[1]. The survey also indicated that cost of travel is not a dominant factor in customers' choice to visit downtown San Francisco. Travelers to downtown retail areas cited the range and character of restaurants and shops as the top reasons they travel to San Francisco for retail/recreational purposes. The survey is described further in Section 3.2.3.

Study response: refine scenario design. The scenarios are designed to reduce congestion and also minimize potential impacts, including business or economic impacts. The focus on charges for peak-period travel help to minimize impacts on recreational or retail activities.

Study response: develop a new scenario. Each pilot scenario was developed in direct response to public feedback. The Modified Northeast Cordon pilot, a scenario where drivers are only charged traveling in the outbound direction in the PM peak period, was designed to limit impacts to entertainment and retail destinations downtown.

- **Feedback Area:** Geographic equity—many residents of the East Bay and North Bay correctly note that their entry into San Francisco and downtown areas is already controlled by bridge toll fees. Travelers further note that a portion of these fees are invested in transit improvements to some degree.

  Study response: refine scenario design. The discount policy would provide a $1 rebate of the congestion fee for drivers who also pay a bridge toll.

[1] Survey of 1390 visitors to San Francisco's Downtown retail areas. See Section 3.2 Market Research for more information.

Study response: develop a new scenario. Each pilot scenario was developed in direct response to public feedback. The Southern Gateway pilot scenario is one way to address regional equity by only charging crossings between San Francisco and San Mateo counties. However, because about 70 percent of those who drive to the greater downtown area are San Francisco residents, this scenario would not reduce congestion in the downtown areas as well as the Northeast Cordon scenarios.

- **Feedback Area:** Affordability for families—those who drive their children to school on their way to their workplace must sometimes cross the cordon area more than once to make their trips. These families are concerned that multiple crossings would amount to multiple charges.

  Study response: alter scenario design. The Study recommends a $6 daily cap to not unfairly burden those needing to make multiple trips during peak periods, such as families or businesses making multiple deliveries.

- **Feedback Area:** Affordability for low-income travelers.

  Study response: refine scenario design. One of the discounts the Study recommends is a 50 percent discount for low-income drivers. This discount might also be developed as a means-based fare for transit, to make transit a more affordable option for low-income travelers.

  Study response: detailed data analysis. Most low-income peak-period travelers are already taking transit. In fact, less than 5 percent of peak-period travelers in the Study Focus Area are low-income drivers.

- **Feedback Area:** Other pricing solutions, particularly parking pricing—Some business stakeholders are not against pricing, but have urged studies on achieving similar benefits to the road pricing scenarios by charging through parking, rather than through a cordon charge. Because San Franciscans are already accustomed to paying for parking, some stakeholders feel a change in parking fees would be more palatable to San Francisco visitors than a new type of fee that has never been collected before.

  Study response: A preliminary analysis has indicated that such a parking-based alternative warrants further analysis, supporting data collection, and comparison in a subsequent phase of work. See Section 2.

3.1.1 PUBLIC WORKSHOPS AND OTHER MAJOR PUBLIC EVENTS

Direct outreach is an essential element of the public involvement process. Direct outreach efforts focus on identifying and utilizing opportunities to introduce the project and initiate conversations with a broad set of stakeholders and interest groups. Authority staff have presented to numerous groups at regularly scheduled or specially convened meetings, by invitation or request. Typically, the presentation provides an overview of the Study scope, objectives, and activities, followed by ample time for questions and discussion.

Figure 3-4, next page, lists the four public workshop series and the accompanying activities. During each public workshop series, at least one workshop was held in the downtown or financial district. To publicize each series, the Study Team circulated information through the Authority's mailing list and eventually through a Study-specific mailing list. In addition, announcements were distributed through traditional media outlets, advisory committee members, partner agencies, and distribution of flyers or postcards at other agency events or in public areas. For the final public workshop series, the Study Team was able to distribute Study updates and event information through social media channels (Twitter and Facebook) as well.

In addition to the various outreach events and stakeholder meetings, the Study Team relied on its Advisory Committees (see Figure 3-5, below) for feedback on key issues throughout the technical analysis, along with guidance on potential outreach venues. The Study Team also provided periodic updates to a few key groups, including the Transportation Authority Board and its Plans and Programs Committee, as well as the Authority Citizens Advisory Committee.

Figure 3-5. Advisory Committees

STUDY ADVISORY COMMITTEES
Business Advisory Committee – various large and small business organizations
Stakeholder Working Group – various community and advocacy groups
Policy Working Group*—executive level staff of transportation agencies, planning agencies, congestion management agencies, etc.
Technical Advisory Committee – technical staff of transportation operators, planning agencies, etc.
PERIODIC UPDATES TO AUTHORITY COMMITTEES
Authority Citizens Advisory Committee
Authority Plans & Programs Committee
Transportation Authority Board
Authority Technical Working Group

* Updates and meetings with the Policy Working Group were later replaced by updates and discussions with the Directors Working Group on transportation issues.

3.1.2 DIRECT OUTREACH TO NEIGHBORHOOD AND COMMUNITY GROUPS

Neighborhood groups have raised a diversity of issues as residents have learned about the Study. Improvements to transit reliability and speed are important to many. A frequently raised concern is that sufficient transit improvements be implemented prior to any pricing implementation. Other key neighborhood issues include management of parking and traffic diversions that could be associated with a program.

Many residents view congestion pricing as potentially providing environmental benefits and traffic reduction. Others have expressed skepticism of government's ability to successfully deliver such a program. Residents are also concerned with designing a system that does not unfairly punish those who need to drive, whether regularly or periodically.

Neighborhood views, of course, vary widely based on location and demographics. Residents near a potential border of a congestion pricing zone are interested in analysis and mitigation or management of diver-

Figure 3-4. Public Workshops and Accompanying Activities

MAJOR PUBLIC EVENTS	PURPOSE
First Public Workshop Series (Fall 2007) Public meetings in Downtown San Francisco (over 70 attendees) Presentations at regular meetings of community and business groups citywide and regionally	Describe study goals and methodology Document congestion and growth conditions in San Francisco Understand travel needs in each corridor or travel market in the region Describe the concept of congestion pricing
Second Public Workshop Series (Summer 2008) Public meetings (over 85 attendees): in Downtown San Francisco and a "non-downtown" neighborhood (the Sunset District) in the South Bay, East Bay, and North Bay Presentations at regular meetings of community and business groups citywide	Review constraints and opportunities in each travel market Discuss transportation improvement priorities Discuss concerns with potential impacts of congestion pricing Present case studies of congestion pricing in other cities
Third Public Workshop Series (Fall 2008) Public meetings in Downtown SF and Civic Center (about 100 attendees) Lunchtime webinar (about 40 participants) Presentations at regular meetings of community and business groups citywide	Document feedback to date, along with study response Present initial scenarios, preliminary benefits and impacts Discuss benefits and tradeoffs of scenarios and investment packages Discuss possible scenario refinements and future analysis areas
Fourth Public Workshop Series (Summer 2010) Public meetings in Downtown SF and Civic Center (about 50 attendees) Lunchtime webinars (about 50 participants) Regional electronic town halls (about 300 participants) Presentations at regular meetings of community and business groups citywide	Document feedback to date, along with updates on study response Present final scenarios, range of benefits and impacts Discuss economic evaluation, refined financial analysis Discuss institutional/regulatory considerations Gather feedback on potential recommendations for next steps, if any

sion impacts. Within communities, opinions and issues of focus are also often diverse. For example, some residents of the most congested areas may anticipate traffic reduction benefits. Other residents of the same community may be more concerned with how charges might be assessed for persons living within (or traveling solely within) a priced area.

Figure 3-6, right, indicates neighborhood and community group meetings where the Study Team presented information on the Mobility, Access, and Pricing Study for discussion and comment. On average there were 15–25 people at each meeting, with some meetings having as few as 5 attendees and others having as many as 70 attendees.

3.1.3 DIRECT OUTREACH TO BUSINESS OWNERS AND BUSINESS INTERESTS

The Study Team has sought input from major property owners and various sectors of the business community. In addition to meetings of the Business Advisory Council, the Study Team's direct outreach has included presentations to the Building Owners and Managers Association (BOMA) of San Francisco, the San Francisco Chamber of Commerce; the Small Business Commission, and groups, such as merchants associations.

Figure 3-7, next page, indicates meetings of business organizations or merchant groups where the Study Team presented information on the Study for discussion and comment. On average, business meetings were smaller than neighborhood meetings, with 10–20 people at each meeting, with some meetings having as few as 3 attendees and others having as many as 45 attendees.

These groups' top concerns include impacts to business operations, such as commercial and delivery vehicles, and economic vitality and competitiveness, particularly in the downtown financial and retail districts. Additionally, smaller neighborhood merchants raise concerns that their businesses may be less able to manage potential impacts of congestion pricing than larger businesses.

Some persons among these stakeholder groups perceive congestion pricing as a purely punitive policy that will discourage travel to San Francisco and negatively impact business. The high cost of locating and operating a business in San Francisco is seen as an existing competitive disadvantage that could be exacerbated by a congestion charge.

Some in the business community do not view current congested conditions in San Francisco as a problem necessitating a pricing program. In fact, they may interpret congestion as a broadly positive indicator, which necessitates only modest measures, such as improved enforcement or a bridge toll increase. Some have simply accepted congestion impacts as a cost of during business while others feel that they already account for the impacts of congestion—for example, florists charging higher delivery costs in congested areas during peak times. However, there is broader recognition that congestion will worsen in the coming years as the city experiences population and employment growth.

Businesses are skeptical about the program for different reasons, however. They raise concerns that the marginal congestion the city experience could be best addressed by better managing streets and curb space, through technology like improved traffic signal coordination. Several

Figure 3-6. Neighborhood and Community Group Meetings

NEIGHBORHOOD ORGANIZATIONS AND GENERAL MEETINGS
Chinatown Community Development Corporation
Coalition of San Francisco Neighborhoods
District 2 Together
Eastern Neighborhoods Citizens Advisory Committee
Hayes Valley Neighborhood Association
Japantown Task Force
Marina Community Association
Mission Dolores Neighborhood Association
North Beach Neighbors
Potrero Boosters
South Beach/Rincon Hill Neighbors
San Francisco Planning and Urban Research Association (SPUR) Lunchtime Forum
Sunset District Neighborhood Association
Upper Noe Neighbors
Western SOMA Task Force
NEIGHBORHOOD COMMISSIONS OR STAKEHOLDER GROUPS
Mayor's Office of Neighborhood Services
Transportation Authority Citizens Advisory Committee

Figure 3-7. Business and Merchant Group Meetings

BUSINESS ORGANIZATIONS
Building Owners & Managers Association, Environment Group
Building Owners & Managers Association, Government Affairs Group
Chinatown Community Development Corporation
Council of District Merchants
Fisherman's Wharf CBD
Hayes Valley Neighborhood Association
Japantown Task Force
Market Street Association
Marina Community Association
Potrero Boosters
Rincon Hill Redevelopment
SF Chamber of Commerce, Public Policy Committee
SF Chamber of Commerce, Board
Silicon Valley Leadership Group
South Beach/Mission Bay Businesses
Union Square Association/Business Improvement District
Yerba Buena Alliance/Yerba Buena CBD
BUSINESS–ORIENTED COMMISSIONS AND STAKEHOLDER GROUPS
San Francisco Planning and Urban Research Association (SPUR)
San Francisco Small Business Commission

businesses also suggested removing on-street parking in some corridors to create more street space or allocate more space for loading and unloading commercial vehicles or tour buses. While both approaches are reasonable—and currently being pursued through other City initiatives, such as SFgo—some acknowledge that growth might eventually surpass technology's ability to manage and deliver adequate mobility.

There is considerable concern about any program with a charging structure similar to the London program, which charges a relatively high flat fee (£8/$13) throughout the day. In addition, businesses that serve tourists and visitors are concerned with the legibility and understandability of a congestion pricing program.

Many business stakeholders have expressed interest in the potential reinvestment of congestion pricing revenues. Retail interests are especially interested in investment in improved streetscape facilities. Transit and traffic flow improvements are frequently cited as well. Large employers are particularly concerned with improvements to regional transit in order to keep tourists and regional travelers patronizing their businesses.

Focused Sector Business Meetings: A series of four business outreach focus group sessions were also held in June 2008. These groups were arranged with specific sector focuses in partnership with several members of the Business Advisory Council: retail, restaurant, hospitality, and commercial transportation. These focus groups helped the Study Team better understand how different sectors respond to congestion impacts today, and how these sectors might respond to congestion pricing if it were implemented. These were the smallest, most focused of all outreach meetings with as few as 3 attendees in one case and up to 15 attendees in another. (See Figure 3-8, next page.)

3.1.4 DIRECT OUTREACH TO STAKEHOLDER AND ADVOCACY GROUPS

The Study Team has engaged in a variety of ways with interested stakeholder and advocacy groups. These groups have provided feedback on a variety of issues. (See Figure 3-9, next page.) Environmental justice advocates have concerns about potential impacts to lower-income commuters, while also emphasizing the critical role of transit in providing mobility for vulnerable populations.

Stakeholder groups included in outreach during the Study are shown in Figure 3-10, next page. Like the business focus groups and outreach meetings, on average stakeholder meetings were smaller than neighborhood meetings, with 5–10 people at each meeting, some meetings having as few as 3 attendees and others having as many as 15 attendees.

Environmental groups have been interested in the potential of a congestion pricing program to reduce tailpipe emissions and the effects of such reductions on air quality and air pollution, as well as improvements to alternative modes, including bicycling, transit, and pedestrian facilities.

Government: Outreach to government agencies has taken place both as agenda items at regular public meetings and as coordination meetings with appropriate agency staff. Agencies are generally interested in being periodically apprised of Study activities, with special attention to relevancies to their own functions.

Coordination with many relevant projects at the Authority and other agencies continued throughout the Study. See Figure 3-11, next page, for a list of key projects tracked by the Study Team. The Team has also conducted in-depth interviews with staff from transit agencies operating in San Francisco.

Professional Associations: Many professional groups have tracked the progress of the Study. Presentations to these groups are a valuable forum in which to exchange information and discuss key issues and best practices. See Figure 3-12, next page. These groups are typically interested in the design of an effective and efficient program appropriate to San Francisco. Individuals also are interested in how congestion pricing might support multiple objectives, such as system management, transportation equity, and greenhouse gas emission reduction.

The Study Team stayed abreast of other congestion pricing initiatives through the Transportation Research Board (part of the National Academies of Science) and other groups, such as the C40 Cities Climate Leadership Group. There is a great deal of interest in potential U.S. appli-

Figure 3-10. Stakeholder Groups

STAKEHOLDER/ADVOCACY GROUPS
Breathe California
Environmental Defense
International Council on Clean Transportation
Regional Transportation Justice Working Group
Sierra Club of San Francisco
San Francisco Planning and Urban Research Association (SPUR) Transportation Policy Committee
TransForm
Urban Habitat

Figure 3-8. Feedback: Focused Sector Business Meetings

KEY BUSINESS FEEDBACK	RELEVANT STUDY COMPONENT(S)
Congestion pricing will discourage travel to San Francisco.	Regional travel demand analysis with pricing sensitivity
	Intercept surveys
London-style program is inappropriate.	Right-sized program design
	Targeted pricing at most congested times
Cost of doing business already too high in SF.	Economic analysis to assess potential effects of congestion charge and background trends
Congestion is not as substantial as cities with congestion pricing; it's just not bad enough yet.	Document current and future costs of congestion
	Targeted business outreach
	Commercial/business transportation benefits

Figure 3-9. Feedback: Stakeholder and Advocacy Groups

KEY STAKEHOLDER FEEDBACK	RELEVANT STUDY COMPONENT(S)
Impacts on low-income travelers should be minimized/ mitigated.	Equity impacts analysis
	Mitigation strategies (lifeline toll, etc.) and potential discounts
Transit improvements should not come at expense of service elsewhere.	Financial and service analysis
	Coordination with transit providers
	Strategic plan for use of revenues
Pricing raises fears of transportation system privatization.	Pricing as tool for local system management and reinvestment
	Leveraging and improving existing public transportation assets in San Francisco
Congestion pricing should be supportive of climate change goals.	Assessment of current and projected VMT
	Coordination with SF Climate Action Plan
	Performance monitoring and reporting

Figure 3-11. Key Projects

STUDY	AGENCY(IES)
Muni Transit Effectiveness Project	SFMTA
BART Travel Demand Study	BART
Bay Area Urban Partnership Program	SFCTA/SFMTA/ MTC/GGBHTD
SFpark	SFMTA
Van Ness & Geary Bus Rapid Transit	SFCTA/SFMTA
Parking Management and Pricing Study	SFCTA
Regional HOT Lane Study	MTC
Regional Transportation Plan	MTC
San Francisco Transportation Plan	SFCTA
Bay Bridge Corridor Study	AC Transit

Figure 3-12. Organizations and Conferences

PROFESSIONAL ORGANIZATIONS AND CONFERENCES
American Planning Association, Bay Area Chapter
American Planning Association, Summer Legal Conference
Conference of Minority Transportation Officials
Institute of Transportation Engineers, SF Bay Area Section
Transportation Research Board, Annual Meetings
Women's Transportation Seminar, SF Bay Area Chapter

cations of congestion pricing. City officials in various parts of the world are increasingly interested in studying and/or implementing congestion pricing as they confront challenges such as emissions reduction mandates and infrastructure provision.

3.1.5 SOCIAL MEDIA

In order to reach out to new segments of the population, the Authority used social media tools to publicize the Study. A project page was created on Facebook (www.facebook.com/sfmobility), providing an overview of the Study, photo albums displaying maps of the scenarios under considerations, and a "wall", where updates linking to news articles, events, and other information pertinent to the Study were frequently posted. Since the Facebook page's launch in July 2010, over 90 individuals have "liked" the page, opting in to receiving an update whenever new information on the Study is posted on the page. Similarly, the Authority created a Twitter account (www.twitter.com/sanfranciscota) to help publicize the Study, through posts of no more than 140 characters. Although the Authority's Twitter account is used to provide updates on all Authority projects and studies (not just the Study), it was launched in anticipation of the Study's final phase of outreach and has resulted in over 140 followers since its launch in July 2010, opting in to receiving updates whenever a new update, or "tweet", is posted.

3.2 Market Research

Several market research activities have been completed in order to support the study, whether to develop study tools such as understanding travelers' potential responses to price cues, or in response to public requests for additional information on travel and spending patterns of visitors to downtown retail areas. In some cases, such as the stated preference surveys and the retail area surveys, the Study Team worked with advisory committee members and stakeholders to design survey questions, select survey locations, and/or disseminate the surveys.

3.2.1 STAKEHOLDER FOCUS GROUPS

Focus groups targeting transit users and motorists were conducted at the outset of the Study in May 2007. These focus groups were aimed at understanding how travel needs and experiences change across different types of travelers, and from different areas of the San Francisco Bay Area.

3.2.2 PUBLIC OPINION POLLS

A public opinion poll of 600 Bay Area residents was conducted in August 2007 by JD Franz Research. This poll assessed public awareness and perception of congestion pricing, travel behavior, and transit availability, among other issues. Key findings include[2]:

- Majority of travelers (over 65 percent) think San Francisco should explore congestion pricing.
- About 80 percent of travelers have viable transit options available to them for trips to downtown San Francisco.

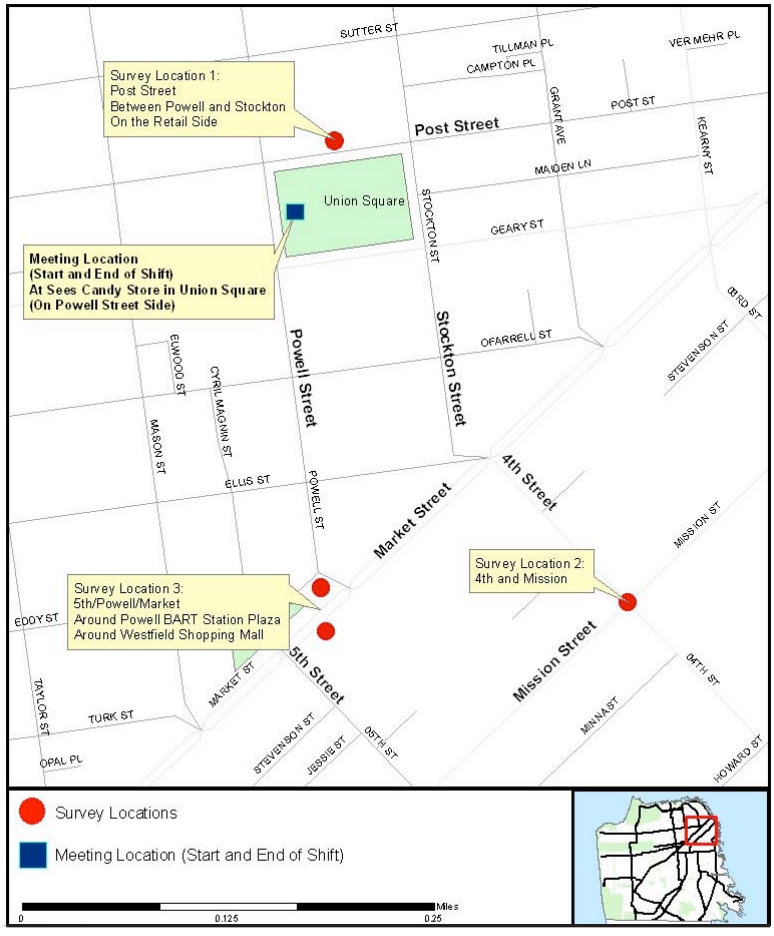
[2] For complete poll results, see *Congestion Pricing Poll Report*, JD Franz Research, Inc., August 2007.

3.2.3 RETAIL AREA INTERCEPT SURVEYS

As described above, the Study Team conducted surveys of persons in select retail areas in the Bay Area. The surveys evaluated the spending levels, travel patterns, and location preferences of those randomly selected to be surveyed. A first set of surveys was conducted in December 2007, followed by an additional set of surveys in April 2008 (See Figure 3-13 for locations). A total of nearly 1400 surveys were completed in downtown San Francisco. At the request of several business stakeholders, the Study Team also administered surveys at an expanded set of retail areas including Walnut Creek; Stonestown Galleria, Village at Corte Madera, and Walnut Creek. More than 200 responses were collected at each of these expanded locations.

A commonly-held conviction among retail interests is that commercial activity is principally dependent on access via private automobile. The intercept survey effort provides useful information to assess travelers' spending patterns and the differences among regional locations with varying levels of multimodal accessibility. Results indicate that motorists spend more on a per-trip basis than transit users, for example; however, transit riders and pedestrians travel to retail destinations more frequently. When aggregated over the course of a month, the result is transit riders and pedestrians spend approximately the same level as drivers, if not slightly greater. This finding has been consistently supported even in similar studies of neighborhoods outside of the downtown area, including the Authority's Columbus Avenue Neighborhood Transportation Plan.

Figure 3-13. Survey Locations in Downtown San Francisco



Source: SFCTA, 2008

3.3 Outreach, Public Views, and Study Progress—Analysis and Findings

In considering the body of public input received over the course of the Study, a number of high-level issues related to public awareness and perception became prominent:

- **Public understanding of congestion pricing remains variable.** Despite media coverage of the Study and multiple local and regional transportation value pricing initiatives, many individuals are unfamiliar with or misinformed about the concept of congestion pricing. Thus, a basic level of education will continue to be a key component of additional outreach on the Study results and any subsequent phases of analysis.

  Nonetheless, awareness is steadily increasing. Key factors include the regional discussion on the Bay Area Express Lane Network, including the opening of the new 580 and 680 HOT lanes. Additionally, the upcoming update to the Regional Transportation Plan (RTP), and the Sustainable Communities Strategy (SCS) required by SB 375, has sparked discussions of the potential for pricing strategies to address greenhouse gas emissions, as has greenhouse gas emissions reduction locally mandated in 2007's Proposition A.

- **Subtle yet crucial characteristics of value pricing are often not well understood.** The two central components of congestion pricing—motorist user fees and transportation system investment—

are easily communicated and generally understood by members of the public. Yet, significant challenges remain after a basic level of information is imparted. Details such as time-of-day price variation and electronic detection/payment have important implications for addressing key stakeholder concerns, yet are a challenge to communicate in a straightforward fashion. For example, a regional traveler's initial reaction to a San Francisco congestion pricing program may be that he or she will simply stop coming to the city to shop or be entertained. However, if this traveler makes such trips at typically uncongested times, he or she would not be affected by a peak-period pricing program. Furthermore, in analyzing support of opposition before and after outreach events or education, it becomes clear that greater understanding of the program analyzed leads to greater support, as much as a 25% shift.

- **The Study's purpose and scope has sometimes been misunderstood and/or mischaracterized.** The Study has been mischaracterized by some as an implementation plan being conducted without the appropriate level of public debate. As outreach efforts have expanded and press coverage of the Study increased, this misinformation has been less of an issue. Nonetheless, it was important for the Study Team to continue to stress that the Study's purpose as a feasibility assessment of a comprehensive congestion pricing program for San Francisco. Although this Final Report outlines a potential implementation path, the milestone marks only a starting point for potential further planning and program design.
- **Some do not perceive congestion as a pressing concern in San Francisco.** Certain business interests, for example, may view congestion as an inescapable negative impact associated with the positive concentration of economic activity. Or a transit user may not perceive the direct link between traffic congestion and unreliable transit performance. The Study Team was challenged to communicate the impacts of current congested conditions, as well as future transportation system performance.
- **Equity issues are multi-dimensional.** Affordability of a congestion pricing program is consistently raised by pricing skeptics. Other important dimensions of equity[3]—such as modal and geographic equity—are rarely raised in media reports. A somewhat more nuanced discussion of equity is at times found in discussions of transportation costs—for example, discussions of the tradeoffs between congestion charges and other transportation revenue mechanisms, such as transit fare increases.

  Environmental justice stakeholders and advocacy groups have raised a wide range of equity considerations. For example, these stakeholders are aware of the central role that transit plays in the mobility of vulnerable populations, and thus were more likely to be interested in the implications of pricing for the quality and spatial distribution of transit services, as well as in the mitigation of direct impacts of pricing on low-income motorists.
- **Potential impacts of congestion pricing on San Francisco's economic competitiveness continue to be a pervasive concern of many stakeholders.** Some business stakeholders have suggested that congestion pricing might be more palatable if the congestion charges were complemented with tax credits or tax breaks for local businesses. While this was not analyzed during this feasibility study, it is a concept that may warrant evaluation in potential future phases of analysis.
- **As expected, design of a "right-sized" San Francisco program has been a crucial Study focus.** The Study Team shared varied models of congestion pricing from other cities, such as London, Stockholm, and Rome—each of which have adopted programs with quite different characteristics. These case studies were invaluable in many respects, but such points of comparison had to be followed by an analysis and evaluation approach tailored to San Francisco's unique context. Still, the case studies offer opportunities to take valuable lessons regarding benefits and impacts, data collection, outreach methods, and system design.
- **There is some skepticism of government's ability to successfully deliver a congestion pricing program.** These issues were raised frequently, often as kneejerk reaction to an unfamiliar concept. This is unsurprising in regards to a type of program (cordon pricing) not yet implemented elsewhere in the United States. A host of additional issues fuel this skepticism, however, such as state government raids of local funding sources and recent transit service reductions.

In sum, extensive Study outreach has revealed that public opinion regarding the advisability of congestion pricing ranges widely, but there is generally willingness to continue to study the concept. Still, sub-

[3] For a discussion of the multiple dimensions of transportation equity, as applied to a value pricing study, see ***Assessing the Equity Implications of HOT Lanes,*** Asha Weinstein and Gian-Claudia Sciara, November 2004 (Report prepared for the Santa Clara Valley Transportation Authority).

stantial public concerns clearly remain, for example among Peninsula residents and officials, as well as San Francisco's business community. This is understandable and consistent with the experience of London and Stockholm, which also utilized a long planning and outreach period to conduct comprehensive technical studies and to engage stakeholders, educate the public, and obtain input prior to advancing a congestion pricing program.

4 Financial Analysis

This Chapter summarizes the Study Team's analysis of the financial feasibility of a potential congestion pricing program.

4.1 Overview

One of the primary indicators of the feasibility of a project is its financial performance and sustainability. Establishing a congestion pricing program would likely require an initial investment of public grant funds, but thereafter should be able to generate the funds needed to cover its total ongoing and financing costs and result in a reasonable "payback" period/return on investment. To be considered feasible, a pricing program should generate sufficient revenue to cover:

- its operating and maintenance costs;
- any financial obligations incurred for capital expenditures; and
- a relevant package of improvements to offer enhanced options for those traveling to, from, and within the area.

The analysis conducted within this conceptual study is not meant to be a definitive statement of financial feasibility in the investment sense; it should not be used for underwriting, bond issuance, or financing. Rather, the analysis seeks to demonstrate high-level viability for purposes of establishing feasibility. The subjects covered in this chapter include a summary of the financial performance of various alternatives, a full cash flow analysis of the highest-performing scenario, and a preliminary sensitivity analysis of key inputs and assumptions.

The analysis summarized in this chapter leads to several key conclusions. First, as noted in the Scenario Analysis (Chapter 2), initial analysis of potential revenue demonstrated that the low number of transactions from small cordons focused on the immediate downtown area would not generate enough revenue to cover costs and deliever improvements necessary to offset impacts or enhance travel options. Second, the cash flow analysis showed that medium to large cordons of the northeastern quadrant of the city could generate net revenues sufficient to cover both costs and improvements. The highest performing-scenarios could generate up to $60 to $80 million in annual net revenue.

While initial capital investment for a pilot program would certainly rely upon an external infusion of grant funds (most likely Federal grant funds), in the case of a permanent project, a portion of initial investment funds also could be obtained by bonding against the future fee revenue stream, thereby enabling the provision of significant transportation improvements[1] at the outset of the program. Finally, preliminary sensitivity analysis indicates that if a pricing program were to be pursued, several assumptions and policies would need to be carefully assessed and managed in subsequent phases of study and project development in order to manage financial risk. These include revenue risk

[1] A description of up-front capital improvements and annual or ongoing services that were analyzed as part of the three high-performing scenarios is summarized in Chapter 2.

stemming from fee structure and increase policies as well as demand growth projections. In addition, provisions would need to be put in place to better assess or manage cost-related risks such as those associated with the size of eligible populations for program discounts as well as cost-inflation related to program investments and services.

4.2 Financial Performance of Alternatives

The year 2015 was selected for the analysis of alternatives.[2] As described above in the scenario analysis chapter, many scenarios were initially developed and reviewed to evaluate different geographies, times of day, and travel directions, as well as different price points and fee structures. The primary consideration in screening these options was the impact of a particular pricing program on transportation outcomes. However, financial viability was also an important criterion. Part of the initial financial analysis focused on generating a high-level "snapshot" of the financial performance of a subset of the initial scenarios—those with promising transportation performance:

This snapshot (order-of-magnitude) calculation included the following:

- **Toll Transactions:** vehicle-trips adjusted for discounted groups, such as bridge-toll payers.
- **Maximum Potential Revenues:** based on the number of tolled transactions and fee levels.
- **Estimated Revenues:** adjustments for any discounted populations were calculated off-model. A small penalty was also applied to account for "uncollectible" trips, such as emergency vehicles; this penalty was consistent across all scenarios.
- **Annual Expenses:** high level cost estimates to build and operate each scenario. A small portion of initial construction costs was added to routine operations and maintenance amounts to determine total annual expenses to capture ongoing capital replacement of technology needed to administer the congestion pricing program.
- **Net Revenues:** the difference between Estimated Revenues and Annual Expenses leads to the Net Revenues available for debt service and transportation improvements.
- **Transaction Metrics:** normalized metrics were computed for the net revenue per transaction and the operations and maintenance (O&M) cost per transaction.

These calculations were extremely preliminary and conceptual in nature, with estimates used as proxies for many of the input values. In cases where inputs were highly variable, the most conservative available value was used. For example, operating expenses can vary because the cost to process payments is affected by the share of enrolled accounts versus one-time transactions as well as the effectiveness of the software used to process video images. To be financially conservative, the maximum likely O&M expenses were used in all calculations. As such, net revenues could be higher than the initial calculation indicated. However, from the standpoint of program design, it is more appropriate to conduct planning at this stage using such conservative forecasting, especially given the need to develop a preliminary financial and investment approach based on strong assurances that anticipated revenues will materialize.

Order-of-magnitude financial results varied greatly across alternatives, and helped to complement the transportation performance metrics discussed in Chapter 2. This snapshot further confirmed that the downtown-only cordon scenarios should be dropped from consideration due not only to their poor to modest performance on transportation metrics, but also due to snapshot results that demonstrated revenues vastly insufficient to support complementary network improvements. Specifically, as configured in this analysis the Downtown Cordon scenarios produced:

- net annual losses of $6 million to net annual revenues of just $2 million; and
- transaction costs between $1.40 per transaction and $2.90 per transaction at the $3 fee level.

The Gateway scenarios and Northeast Cordon scenarios showed promising results with both reasonable transaction costs ranging between $0.80 and $1.20, and annual net revenue ranging between $38 million and $80 million. These findings, combined with the promising transportation performance metrics, suggested that additional refinement and iteration of scenarios should focus on the gateway crossings as well as the northeast cordon area.

4.3 Cash Flow Model and Related Assumptions

Based on the Scenario Analysis, the best-performing scenarios were identified as the a.m./p.m. peak-period Northeast Cordon, the p.m.-outbound (Modified) Northeast Cordon, and the Southern Gateway with

[2] For purposes of the financial analysis, this was assumed to represent a year of established operations. While this is actually closer to the earliest likely opening year of operations, this also facilitated comparisons between the priced program outcomes and the 2015 baseline forecast.

downtown area parking pricing. Figure 4-1, below, describes the financial characteristics of each of the three highest-performing scenarios, the peak-period Northeast Cordon, the evening-only/Modifed Northeast Cordon, and the Southern Gateway.

As the best performer, the peak-period Northeast Cordon scenario approximately bounded by Laguna/Guerrero and 18th Street was selected for more detailed financial analysis. This included incorporation of refined estimates for capital and operating expenses, consideration of cash outlays for start-up costs, and requirements for any potential debt issuance. In addition to the components of the snapshot model, the following components were further developed in the full cash flow model:

- **Analysis timeframe:** 30 years, to evaluate long-term system cash flow including potential bond financing.
- **Cost estimates[3]:** roadside equipment; startup costs (capital and soft costs); periodic renewal and replacement of capital cost elements; performance and accuracy of detection and transaction processing; operating costs including leased communications and IT maintenance; variable expenses; and an additional contingency of 25 percent of variable operating expenses.
- **Toll transaction estimate:** For this secondary analysis, growth in travel demand and associated revenues is approximately linear. Risk analyses and sensitivity tests were conducted at a sketch level to bookend impacts of potential fluctuation in travel demand (and therefore revenue) due to inflation, policy changes, etc.
- **System revenue estimate:** It was assumed that the initial charge in the opening year (2012) would be $3 (in 2012[4] dollars), and that over time, the price of the toll would keep up with inflation through periodic adjustments (e.g., every few years). It is also assumed that the relative price of transportation alternatives remains constant over time. This assumption is further discussed below in the summary of the analysis of risks from the sensitivity tests.
- **Discount program parameters:** Developed via another Study task, the discount policy was informed by local considerations, public feedback, and international case study experience. In order to represent this policy in the financial analysis, the number of travelers subject to each discount was determined based on model run outputs, observed field data, or computed estimates. In some cases, the Study Team made assumptions about the size of eligible communities, based on available demographic data.[5] In addition, to maintain a financially conservative approach it was assumed that each popula-

[3] The key cost assumptions include: operating & maintenance costs stabilize after year 7, once system operations and saturation rates stabilize; and incremental costs to pursue violators are recovered from fines & penalties.

[4] This year was used only for analysis purposes, and does not reflect an anticipated timeline for implementation after considering all planning and design factors including legal and regulatory requirements, the procurement process, and environmental review.

[5] Should pricing plans advance to further analysis, a more refined estimate of the size of discounted groups should be pursued.

Figure 4-1. Financial Characteristics of the Highest-Performing Scenarios

	NE CORDON (AM/PM)	NE CORDON (PM OUTBOUND)	SOUTHERN GATEWAY (AM/PM)
Annual Revenue (before discounts)	$185M	$145M	$125M
Discounts	$40M	$30M	$20M
Annual Revenue (after discounts)	$145M	$115M	$105M
Operations and Maintenance	$45M	$25M	$30M
Amortized Capital Cost	$20M	$20M	$15M
Net Operating Revenue	$80M	$70M	$60M

Source: PBS&J and Transportation Analytics

Figure 4-2. Discount Policy Modeling Inputs

	DISCOUNT LEVEL (% OFF FULL PRICE)	SHARE OF ALL TOLLED TRIPS*	SHARE OF MAX POTENTIAL REVENUE
Bridge Toll Payers	$1 fee-bate	29%	8%
Disabled (permanent)	50%	2%	1%
Zone Resident	50%	15%	8%
Lifeline	50%	11%	6%
Other (taxi, fleet, etc.)	Varies	28%	6%
TOTAL All Discounts			28%

* Proportions in this column are overlapping, not additive, in order to produce conservative estimates and should not be totaled.

tion of discounted drivers is completely independent. This leads to a maximum (and thus conservative) amount of revenue foregone to the discount policy. This is a reasonable assumption for a conceptual study; however, in practice it would be more prudent and more realistic to reflect the actual policy under which travelers would only receive the single largest discount for which they are eligible. Figure 4-2, previous page, describes the Study's assumptions about discount levels and the size of discounted groups. Note that the largest amount of foregone receipts for discounts are for bridge-toll payers and residents of the charging zone, resulting in a combined decrease of approximately 16 percent of revenue for these populations.

- **Inflation:** all financial inputs were converted to year-of-expenditure dollars, using a 3.5 percent inflation rate,[6] so that net revenue calculations will be meaningful in future years.
- **Bond financing:** the bonding analysis assumed bi-annual payments over a 30-year term with a fixed interest rate at 6.75 percent per year and a cost of issuance at 2.5 percent of the face amount. In addition, the median value of 2.25 times was used when considering the extent available revenues exceed debt obligations in order to achieve and maintain a favorable credit rating. It should also be noted that toll facility bonds are typically subject to a Maximum Annual Debt Service (MADS) test. As such, debt service remains level throughout the bond repayment period, even when net revenues are forecast to increase over time.

In addition, the detailed cash flow model revealed potential payback periods of five to eight years depending on the structure of the fee level policy and potential operating ratio between 20 percent and 35 percent[7] depending on the scenario and various other inputs. These findings should be weighed in combination with the transportation performance of each scenario and the risk analysis described below.

4.4 Sensitivity Analysis Findings

A preliminary risk analysis was conducted to assess the relative importance of key assumptions and policies to the financial performance of a potential pricing program. Many of the inputs to the financial model discussed above can be adjusted in order to provide an illustration of how financial results are affected by alternative scenarios and policies. Several of the key sources of risks, related to both revenue- and cost-related parameters or policies, are described here:

Fee Structure and Fee Increase Policy: The structure of congestion charging fees as well as the ability for tolls to keep pace with inflation directly affects the amount of net revenues available each year. For this reason, while there may be multiple structures that achieve congestion management goals, only a subset may meet revenue generation and stability requirements. Similarly, revenue risk can be reduced by indexing toll rates to the rate of inflation within the general economy and managing the frequency with which toll rates are reconsidered or re-set.

Demand Risk: Revenue estimates assumed linear growth of all demand inputs based on two milestone years, 2015 and 2030. Although these residential and employment levels were taken from official regional growth projections, it is common for adjustments to be made in light of new information. These, combined with the actual pace of development compared with projected rates of growth, contribute to demand-based revenue risk. Any future evaluation should incorporate sensitivity tests that evaluate the level to which the feasibility of congestion charging depends on the pace of background growth in San Francisco and the region.

Program Costs: As stated earlier, in the base model all costs were inflated at a constant rate relative to each other. However, in practice, there can be a substantial risk involved should programmatic costs, such as transit operating costs or the size of discount programs, increase faster than fees or simply faster than demand grows. If program costs, whether operating elements of the system or program investments, increase at a faster rate than net program revenues they can substantially endanger the feasibility of the program. The decrease in net revenues could make it very difficult to deliver ongoing travel improvements and potentially threaten the attractiveness of this type of program to investors. One way to minimize this risk is to set financial performance standards within operating agreements with program contractors or service providers, such as service warrants, or to create cost-management incentives within service agreements.

[6] The inflation rate used in this analysis was 3.5% per year, based on historical values of the Consumer Price Index (CPI). Specifically, this is the mean value of all 30-year rolling averages of CPI since 1913. The same inflation rate is used for all financial inputs.

[7] Expenditures/gross revenue after discounts.

5 Technology, System Design, and Management

This chapter summarizes research and analysis conducted by the Study Team related to current domestic and international tolling best practices, both in terms of physical technology and relevant design and procurement considerations.

The following topics are briefly addressed here:

- Essential Elements of a Congestion Pricing System
- Relevance of Existing Technologies
- System Design Criteria

This chapter also contains a summary of the conclusions from the Study Team's technology working paper regarding system components that might be most appropriate for the San Francisco context. Specifically, Study analysis revealed that a video-tolling system with back-office processing to be closely integrated with existing Bay Area toll operations infrastructure and related customer service systems would best suit the needs of the congestion pricing scenarios identified in the Study. This infrastructure may also be augmented by transponders at specific locations, particularly where options may require detection at highway on- or off-ramps. Such technology is best able to meet the program goals while leveraging existing systems, keeping costs down so that fee revenue can be directed to delivering improvements for the traveling public.

If implemented, operation of a congestion pricing system would—at a minimum—require close coordination with the Bay Area Toll Authority (BATA) and Metropolitan Transportation Commission (MTC) as operators of FasTrak, Clipper, and 511. This coordination would help maintain clarity for customers and achieve needed interoperability of complex back-office systems. Although some system design decisions could be limited by the existence of legacy systems in the region, there is an opportunity to leverage existing information technology architecture, which could reduce development and/or operating costs. These operators have developed models for acceptable secured procedures for handling and processing user funds and financial information together with interoperability protocols. They also establish precedents for contractual basis of exchange of information, transactions, reconciliation, and ultimately for settling accounts and cost sharing.

Finally, these agencies' near-term project plans could offer the opportunity to co-develop the next generation of tolling infrastructure in the region. BATA is in the process of investigating a transition to new video tolling hardware. Santa Clara County and Alameda County have developed pilot Express Lanes (HOT) Lanes, as part of MTC's planned 800-mile regional network. In addition, the launch of SFpark offers opportunities for greater coordination and integration within San Francisco systems if congestion pricing is implemented.

5.1 Essential Elements of a Congestion Pricing Technology System

Every congestion pricing program is designed differently from a technical perspective, reflecting the unique policy priorities and political and legal contexts of the agencies involved, as well as the local environment and congestion conditions to be addressed. The most basic function of a congestion pricing system technology is to recognize vehicles on the road and determine whether and how to charge a responsible party the appropriate fee for travel. Any such system should be designed to:

1. enforce a specific pricing program by…
2. carrying out primary and supporting business processes and…
3. using the most appropriate technology components.

The most fundamental attribute of any congestion pricing program is the development of the specific congestion charging policy. As described in Chapter 2, the congestion charging policy defines both the geographic structure of the pricing option (the specific roadways within a cordon, area, or corridor concept) and any variability in the price by time of day, traffic performance, and user discounts.

As congestion charging rules become more complex, the technical solution is impacted in several ways. With flat fees, communicating charge amounts to customers is relatively simple, using simple signage and marketing. With prices that vary, more sophisticated roadside infrastructure is required, such as variable message signs to communicate current prices. This has meaningful cost considerations, but can also impact other areas such as the aesthetics of a system. Moreover, the need to distinguish between different user groups for discounts can lead to more complex technical rules due to additional back office requirements, issues of potential fraud, and the necessity for roadside verification.

In addition to the congestion charging policy, another key consideration is the payment policy, which typically follows one of two models:

- **Enforcement-based:** the onus is on the driver to initiate payment before or during the charging day (or soon thereafter). Once the deadline has passed for payment, any vehicles detected in the zone for which no payment was initiated are subject to a fine. The detection infrastructure acts as a deterrent, rather than as a direct charging mechanism. This is the method used in London.
- **Detection-based:** the onus is on the program operator to detect a vehicle and initiate a charge. Drivers can look up charges and pay within an allotted deadline, or have charges automatically taken from an account. The detection infrastructure is the basis for charging in this case. This is the method originally used in Stockholm and Singapore, as well as most U.S. toll facilities.

Congestion pricing and tolling systems vary in the time between detection of a vehicle passage and the charge transaction against the account. In addition to the core charging and payment transactions, a comprehensive set of management and support processes are required to keep the system running well. The overall set of processes is represented in Figure 5-1, below, with more detail in the technology working paper.

The infrastructure required to execute these business processes typically can be classified into five different categories:

- on-board equipment (for vehicle identification);
- roadside detection/enforcement infrastructure and data communications;
- central information technology system capabilities;

Figure 5-1. Typical Business Processes for Congestion Pricing

PROCESS VEHICLE PASSAGES	PROCESS PAYMENTS	MANAGE ACCOUNTS	PURSUE VIOLATORS	MANAGE BUSINESS	MANAGE SYSTEMS
Detect passages	Process auto payments	Establish/update account	Identify vehicle owner	Manage finances	Support IT systems and applications
Identify vehicles	Process one-off payments	Register exemptions	Generate notices	Support external stakeholders /partners	Monitor systems
Rate passages	Initiate reciprocity transactions	Setup auto payment	Convert violators to customers	Support enforcement	Manage maintenance
Generate invoices		Manage AVI media	Refer cases to collections/courts	Marketing and public inquiries	

Source: PBS&J and IBM

- back office operations and storefront capabilities; and
- external integration.

Whether choosing specific technology infrastructure or designing business processes, the selection from available alternatives often presents tradeoffs. For example, the type, location, and orientation of detection equipment will influence the accuracy of vehicle identifications, which in turn determines whether an account can be successfully charged for possible payment. On-board equipment for vehicle identification is commonly either a transponder or the license plate. The transponder requires higher procurement costs and lower operating costs, while the relationship can be reversed when using license plate recognition. Similarly, the use of more sophisticated roadside detection equipment has higher upfront costs, but it improves detection accuracy, reducing the ongoing costs of manual review and pursuit of violators.

5.2 System Design Criteria

From a technology perspective, there are four primary system design criteria relevant to congestion pricing systems:

- **Cost,** including expenses related to development, capital, operating, maintenance, and management of the system;
- **Performance,** including detection accuracy, relative cost of collection, and the fraction of revenue lost to violations;
- **Reliability,** including both robustness of hardware and software and an overall program design which delivers consistent results;
- **Equity,** both in crafting a pricing structure that creates fair burdens on different groups and in selecting a set of technologies to ensure that everyone who should pay, can and does pay.

In addition to these design considerations, a few basic guidelines should be kept in mind:

- **User simplicity:** as more systems are deployed, travel in general becomes more complex.
- **Accurate information:** accurate, clearly presented and timely information on congestion pricing rates, zones, and payment information would help achieve the desired behavior change.
- **Limited aesthetic impacts:** leverage existing infrastructure or otherwise minimize size or proliferation of structures that substantially change the fabric of existing neighborhoods.
- **Effectiveness measures:** measure and report the effectiveness of the program—in terms of improved operations for all modes of transportation as well as the range of co-benefits and impacts—such that the public may see the benefits of their own fee payments as well as public improvements.
- **Revenue handling:** public acceptance depends on accurate, proper, and secure handling of user data and personal information—as well as reasonable costs for the overall project.

These design criteria are discussed in more detail in the technology working paper.

5.3 Relevance of Existing Technologies

As noted above, the Bay Area already has a set of mature operating toll facilities, managed by two agencies, interoperable with toll agencies throughout California; these agencies are further investigating options for national interoperability. These agencies have established a market presence and operating standards and have cultivated a customer base already familiar with non-stop toll collection, including over 700,000 drivers who already possess toll accounts. In addition, cities and regional leaders have invested in several information technology systems to support local travel needs and related financial services.

The most relevant incumbent travel technology providers in the region are:

- **BATA,** the toll operator for seven state-owned Bay Area bridges including the San Francisco-Oakland Bay Bridge, and also manages electronic toll collection (ETC) accounts for the Golden Gate Bridge.
- **FasTrak®,** the California statewide ETC program which establishes ETC technology and interface standards.
- **311** (City and County of San Francisco) resident information and automated city services.
- **511** (MTC) travel information systems for drivers in the City and the surrounding Bay Area.
- **Clipper,** the regional integrated transit payment system administered by MTC.

5.4 Conclusions

Based on the considerations summarized in this chapter, the Study Team made the following conclusions regarding system technology for a potential San Francisco congestion pricing system.

- **Payment Media:** Video capture of license plates would provide a good universal basis for detection at all detection points. FasTrak® is fairly widely present in the region, but many likely users of the congestion pricing concept are not existing FasTrak® customers and would need robust education and marketing to enroll in FasTrak if a program were implemented.
- **Roadside Detection:** Drivers relying on video-tolling could be detected by license plate at any location. Drivers relying on their FasTrak® transponders would be detected by ETC at the major roadways and freeway ramps, and would be detected by their license plates at other locations. For street and arterial locations where it is possible to simply mount equipment on poles alongside, a video-only approach would be preferable.
- **Accounts and CSC**: BATA's Customer Service Center (CSC) system and infrastructure could provide the fundamental account management and financial integration infrastructure necessary for a congestion pricing program. For such a program, expansion would be required not only in activity volume, but also in the provision of additional payment channels and other services for San Francisco residents and other drivers in the congestion charging zone. The congestion pricing program would not have to use BATA's CSC, but it would be reasonable to require at a minimum reciprocity between the congestion pricing program and BATA.
- **Payment channels:**
  - » The operator should provide at least one CSC "storefront" similar to the BATA CSC where the public can address payment issues directly. In case BATA were to provide the CSC service for congestion pricing, a supplemental CSC storefront could be warranted.
  - » Web, e-mail, and phone services as provided by BATA for its customers are a good model.
  - » The BATA model should be augmented with additional payment channels such as retail outlets and other one-off channels.
  - » The congestion pricing system would preferably be tied into the San Francisco 311 system for information outreach and payment channels, and real-time information should also be fed into the regional 511 system.
  - » The Study Team has developed high level cost estimates for the type of system described above. These have been incorporated into the financial analysis described elsewhere this report.

6 Institutional and Implementation Considerations

This chapter presents the Study Team's assessment of institutional and regulatory arrangements and implementation options for implementing a congestion pricing program in San Francisco. Relevant considerations and issues include the necessary legislative authority and approvals; operational agreements and business models; potential funding sources for a pilot or permanent project; and the general potential implementation timeline in general terms.

6.1 Institutional Arrangements and Governance

The implementation of a congestion pricing program requires the establishment of a lead agency, to carry out the following functions:

- Administer and collect congestion pricing fees, including setting tolls and discount policies;
- Apply for, accept, and administer state, federal, local agency, or other private or public grant funds for purposes of implementing the charging system;
- Issue bonds to finance large capital expenditures such as improved travel options and periodic major investments;
- Enter into contracts, cooperative agreements, and direct funding agreements with private parties and governmental agencies, including City departments and regional agencies, in order to implement the charging program and deliver the associated mobility improvements; and
- Monitor performance and re-set the fee level, as well as modify contractual relationships and investment program as necessary and appropriate over time to achieve program objectives.

6.1.1 PROJECT OPERATIONS AND OVERSIGHT

An operating/managing entity with all of the above policy-setting and operational functions does not currently exist in San Francisco, but one could be designated (or a process for designating one could be authorized) through enabling legislation. There are several Bay Area models for such an entity, including the Bay Area Toll Authority (BATA) and the Alameda County Congestion Management Agency/Santa Clara County Valley Transportation Authority Joint Powers Board, which oversee and operate the region's toll bridges and initial Express Lanes, respectively. Locally, the Treasure Island Management Act (AB 981) authorized the San Francisco Board of Supervisors to designate a board or agency to act as the transportation management agency that would recommend a fee structure for congestion pricing fees at Treasure Island's access to the Bay Bridge—a concept developed to manage impacts on the transportation network generated by growth on Treasure Island. Per AB 981, imposition of such fees requires two-thirds approval of both the Board of Supervisors and the Authority Board.

6.1.2 REGIONAL FRAMEWORK FOR SERVICES AND CAPITAL IMPROVEMENTS

This Study has explored and anticipated a set of regional agreements that would likely need to be executed to implement any potential area-wide congestion pricing program in San Francisco. These agreements would lay out performance requirements and standards, and other provisions to ensure the reliability of key services on which the program would depend.

These agreements would include:

- Operating Agreements with the Metropolitan Transportation Commission (MTC)/BATA for: electronic payments through the FasTrak system; video tolling technology; Clipper integration; real-time information about congestion charges and travel times, and travel options via the 511 system; and coordination with other regional road pricing and discount policies.
- Operating Agreements with the San Francisco Municipal Transportation Agency (SFMTA) and relevant regional transit operators for: provision of incremental transit services; and other capacity improvements (e.g., bicycle/car parking or bus bridges to/from regional rail stations with parking capacity).
- Operating/Funding Agreements with San Francisco Department of Public Works (DPW), SFMTA, and the California Highway Patrol (CHP) for: traffic management and enforcement; traffic calming; bicycle network, pedestrian safety, and streetscape projects; signal coordination, signage, and other real-time and static wayfinding; street resurfacing and repair; and other projects and activities funded or supported by program funds.

6.1.3 OPERATING CONCESSIONS/PUBLIC-PRIVATE PARTNERSHIPS

In addition to operating agreements with government entities, the implementing agency would likely consider various forms of contracting for the implementation and operation of the charging system itself, similar to the London or Stockholm experience. These could encompass a few or many stages of the project lifecycle including: detailed system planning and integration; design and construction; operations and maintenance; and marketing of the charging system. There are many possible operating and business models that would leverage the technical expertise and capital of the private sector and combine these advantages with the policy-setting and regulatory role of the public sector, with provisions to appropriately manage risks, costs, and revenues.

6.1.4 FEDERAL PARTNERSHIP

Under any scenario, the implementation of a demonstration project or permanent project of this magnitude and level of innovation would rely upon significant financial support from the Federal government. This approach would trigger the need for applicable Federal approvals, chiefly National Environmental Policy Act (NEPA) clearance. This is necessary due to the high initial cost of the program and limited "bankability" of the project for lenders and investors, particularly in the case of a six to eight month pilot that would have no ability to attract traditional forms of project finance. The U.S. Department of Transportation (USDOT) has already indicated its interest in exploring and supporting demonstrations of congestion pricing through its Value Pricing Pilot (VPP) program, which funded this Study, and through its Urban Partnership Program (UPP), which offered New York City over $350 million to implement a demonstration program in 2008.[1] Continued partnership and collaboration with the USDOT would be an important area of focus for San Francisco if the next stage of study is pursued.

6.2 State Legislative Authority, Local Approvals

Existing state law (California Streets and Highways Code) provides that a local agency may not impose a new tax, permit fee, or other charge for the privilege of using streets and roads on or after June 1, 1989, except a permit fee for extra-legal loads. Therefore, any congestion pricing program, whether conducted on a pilot or permanent basis, would require authorizing legislation to provide that this prohibition does not apply to the authorized program.

The authorizing legislation would set out the purpose and need for the program, the authorized functions of the implementing entity, and the period of time for (or process to determine the term of) the authorized activity. The legislation would need to address how revenues are directed, toll modification policy, and the governance structure. As discussed above, the governance of such a program could be explicitly established through the designation/empowerment of an existing entity or entities vested with the necessary authority to implement the program. Alternatively, the legislation could establish a process

[1] Ultimately the congestion pricing program proposed in New York City did not advance to implementation. Although the 45-member City Council voted to implement congestion pricing, authorizing state legislation was not approved.

for designating the implementing agency. Such a process may also address the local approval process, as was the case for Treasure Island's enabling state legislation.

At a minimum, a local agency would need to environmentally clear the project pursuant to the California Environmental Quality Act (CEQA). It is also likely that authorizing legislation would rely upon or call for local approvals to establish the congestion fee policy and related program parameters, including discounts and the use of revenues. Finally, it is possible, though not required, that either the voters of San Francisco, the Board of Supervisors, or the Mayor could place a local initiative on the ballot to approve a pricing program. Such a ballot measure could potentially follow an initial short-term trial.

In November 2010, California voters passed Prop 26 ("Stop Hidden Taxes" initiative) with 52.5 percent of voters approving the measure. Prop 26 increases the approval threshold to a two-thirds supermajority vote of State Legislature for the approval of certain State fees and two-thirds of local voters in order to enact certain local fees. Guidance from the Legislative Analyst's Office (LAO) will be instructive in resolving the applicability of Prop 26 to congestion pricing if the program advances to implementation. However, it appears that the question would depend upon how the fee is structured since user fees require only simple majority approval, even under Prop 26.

6.3 Environmental Review and Alternatives Analysis

As discussed above, a congestion pricing program would require both NEPA (Federal) and CEQA (State) environmental clearance.

6.3.1 INITIAL STUDY/ENVIRONMENTAL ASSESSMENT

While the congestion charging/mobility improvement programs evaluated in this study would be expected to significantly improve environmental quality on several fronts, any potential permanent or pilot project would need to undergo an "initial study" per CEQA and an Environmental Assessment (EA) per NEPA to identify potential significant impacts of the project and whether these could be mitigated to a degree that would warrant a (Mitigated) Negative Declaration (per CEQA) or a Finding of No Significant Impact (FONSI) per NEPA. These initial study and EA analyses are undertaken in cases where significance of impacts of a transportation project proposal is uncertain. In the case of an EA, the FHWA must approve the document before it is made available to the public. If it is found that significant impacts would result, the lead agency for the project would prepare an environmental impact report and statement (EIR/EIS).

6.3.2 EIR/EIS AND ALTERNATIVES ANALYSIS

A purpose of the environmental review process is to facilitate the public's consideration of various project alternatives through an alternatives analysis. This combined environmental review/alternatives analysis would lead to either the selection of a Locally Preferred Alternative (LPA), or no project at all. If a joint CEQA/NEPA document were pursued, lead agencies for both CEQA and NEPA review would need to be confirmed. The process would begin with a project description and statement of the purpose and need for the project. This would be included in the Notice of Intent/Preparation (NOI/NOP) and initiation of the scoping process to survey the public about environmental issues of concern and importance for the evaluation of alternatives, and ideas about the various alternatives that could respond to the project's purpose and need. The evaluation of alternatives would follow, and result in the selection of an LPA (and certification/approval of the EIR/EIS by lead agencies) or the selection of the no project alternative.

It is estimated that a full EIR/EIS as described above would take 18 months to two years to complete, depending on the range of alternatives considered and feedback on technical analyses included in the evaluation.

6.4 Procurement, Financing, and Management Options

Among the innovative features of a congestion pricing program is the opportunity to leverage public and private collaboration in implementing the project. As discussed above, there are a number of procurement, financing, and management options involving both public and private funding for implementing the project with pros and cons associated with each. These options are as follows:

- **Design-Bid-Build.** This is the traditional path for public transportation infrastructure and large systems projects. Under this model, the public sector manages the design, construction, and operation of the congestion pricing system, with varying degrees of assistance from private sector sources. Private sector resources are procured using well-established procurement methods that follow the traditional model of buyer/seller. For intelligent transportation systems (ITS) or toll systems, this approach is typically considered unsatisfactory,

as the process does not enable contractors to employ their intellectual property and best practices in what is a small market. It would require long, laborious design which may become outdated by the time a procurement process would be completed. The time required simply to develop background knowledge and the detailed specifications would be significant, but design responsibility would lie with a party other than the system and service provider.

- **Design-Build or Design-Build-Maintain Systems Development Approach.** Contracting models that combine detailed system design with implementation and possibly system maintenance could be considered the traditional way to deliver traditional toll systems and would be one approach that could potentially be applied in this case. The balance between assignment of responsibility to the contractor on the one hand, and control over details of the system on the other, would be determined in details of the contract and how the design and testing would be specified.
- **Design-Build-(Finance)-Operate-Maintain (DB[F]OM) Approach.** A further level of project development approach would include operations of the system and could also include some degree of private-sector financing. This may be considered a Public-Private Partnership (P3), as the prospective contractor assumes some risk in the success of the program—except for revenue risk as in a concession model (see below). This type of approach or model would enable the managing agency to enter into a contractual arrangement whereby a price per transaction or per vehicle or per notice would be the sole basis of compensation, leaving all other development work to the contractor. While demand risk is left to the system owner, these P3 models harness the development and financing resources of the private sector to develop a project, and only require compensation according to a relatively simple model over time, from the contracting entity in this case. The contractor does not take on the revenue risk, which for this type of program would be difficult to estimate. In practice, the compensation model would probably require some floor and ceiling compensation levels to protect the contractor if inadequate traffic materialized, and to protect the lead agency if the project turned out to be a windfall. This is the model closest in conceptual form to the Presidio Parkway (Doyle Drive) P3.
- **Concession Model Approach.** This is similar to the DBOM model above, except the prospective contractor would also assume some ownership responsibility (like a capital lease) and would assume revenue risk as its compensation would come directly from congestion pricing revenues. This model has worked successfully for some concession operations such as the Chicago Skyway and the Indiana Tollroad, but it is not a clear fit in this case because as contract terms place more responsibility and risk on the contractor, the conditions must become more rigid. This could be quite a disadvantage should the business rules or public policies change from those presented at the time of reaching a contract, for example if detection zones change, more discounted trips are allowed, or more account options are required.

In any contracting arrangement, experience shows that the key considerations include the appropriate assignment of risk (particularly demand risk) and reward, financing and funding roles and costs, and the degree of control and flexibility particularly for areas of public policy concern such as toll policy. Based on a preliminary examination of these, more detailed consideration of these options should be explored in the next stage of analysis if such study should move forward.

6.5 Potential Implementation Path

San Francisco is still in the early stages of exploring congestion pricing and there are many steps before a decision could be made as to whether or not to implement or demonstrate a program. The potential next steps for moving forward with a pilot or permanent congestion pricing project include the following activities, over an approximately five-year period, are shown in Figure 6-1, next page.

Figure 6-1. Potential Timeline of Next Steps

2011	Monitor Bay Area pricing projects including Bay Bridge variable tolling (Summer 2010), Highway 680 Express Lanes (Fall 2010), and SFpark implementation (early 2011) and incorporate findings into Authority's SF-CHAMP travel demand model update
	Develop SF-CHAMP capabilities, including parking analysis sub-model
	Seek funding for/start-up initial environmental studies, EIR/EIS phase of work
	Continue conducting public outreach, education and consultation
2012	Conduct environmental review/alternatives analysis
	Refine technical parameters of program, alternatives (discount polices, boundaries, parking management component of "gateway" alternative etc.)
	Coordinate with local and regional public agencies regarding potential inter-agency partnerships
	Continue conducting public outreach, education, and consultation
2013	Complete environmental review/select locally preferred alternative or not; if decision is to move forward, then:
	Seek funding and legislation for system design of LPA
	Research procurement methods/models for implementation
	Continue conducting public outreach, education and consultation
2014	Seek funding for implementation
	Finalize procurement strategy, establish requirements/bid documents, conduct procurement
	Finalize program policies and governance
	Initiate construction, provision of charging system, and mobility improvements
2015	Complete construction/implementation of mobility improvements, conduct testing
	Conduct pre-launch marketing and education
	Launch system
	Conduct real-time monitoring and evaluation