SAN FRANCISCO
URBAN PARTNERSHIP AGREEMENT
NATIONAL EVALUATION PLAN

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URBAN PARTNERSHIP AGREEMENT
NATIONAL EVALUATION PLAN

By

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16. Abstract

This report provides an analytic framework for evaluating the San Francisco Urban Partnership Agreement (UPA) under the United States Department of Transportation (U.S. DOT) UPA Program. The San Francisco UPA projects to be evaluated focus on those related to variable parking pricing. Those projects include variable pricing of on-street and off-street parking in the City of San Francisco, enhancements to 511 to include parking information, an integrated payment system for parking and transit, and expansion of telecommuting/TDM outreach activities to support the other projects. The San Francisco UPA national evaluation plan identifies major questions to be answered through the evaluation, the evaluation analyses to be used to address those questions, and the data needed for the analyses. It also outlines the test plans that will be used to collect and analyze the required data. The evaluation plan is based on the National Evaluation Framework (NEF) prepared for the U.S. DOT. Four objective questions that were posed by U.S. DOT serve as a starting point for the NEF and San Francisco evaluation plan. These questions are how much congestion was reduced; what contributed to the reduction and what were the associated impacts; what lessons were learned about non-technical factors for success; and what were the overall cost and benefit of the congestion reduction strategies. The four objective questions were translated into twelve evaluation analyses, which in turn consist of hypotheses and questions, measures of effectiveness (MOEs), and data required for the MOEs. This document presents the plan for evaluating the San Francisco UPA projects.

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LIST OF ABBREVIATIONS

4Ts	Tolling, Transit, Telecommuting, and Technology
APC	Automatic passenger counter
ARB	Air Resource Board
AVL	Automatic vehicle location
AVO	Average vehicle occupancy
BART	Bay Area Rapid Transit
CBA	Cost benefit analysis
COTM	Contract Officer Technical Manager
CO_2	Carbon dioxide
CRD	Congestion Reduction Demonstration
CUTR	Center for Urban Transportation Research
CVO	Commercial vehicle operator
DMS	Dynamic Message Sign
DOE	Department of Environment
EJ	Environmental justice
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
GGBHTD	Golden Gate Bridge and Highway Transportation District
GPS	Global positioning system
HOT	High occupancy toll
HOV	High occupancy vehicle
ISP	Information service provider
ITS	Intelligent transportation systems
ITS JPO	Intelligent Transportation Systems Joint Program Office
MAPS	Mobility, Access and Pricing Study
MOE	Measure of effectiveness
MOVES	Motor Vehicle Emission Simulator
MTC	Metropolitan Transportation Commission
Muni	San Francisco Municipal Railway
NEF	National Evaluation Framework
NO_x	Nitrogen oxide

LIST OF ABBREVIATIONS (CONTINUED)

PM	Particulate matter
PMT	Person miles traveled
PMZ	Parking management zone
PT	Person throughput
RFP	Request for Proposal
RITA	Research and Innovative Technology Administration
SF-CHAMP	San Francisco Chained Activity Modeling Process
SFCTA	San Francisco County Transportation Agency
SFMTA	San Francisco Metropolitan Transportation Authority
SOV	Single-occupant vehicle
TAZ	Travel Analysis Zone
TEP	Transportation Effectiveness Program
TDM	Travel demand management
TRIPS	Transportation Information Planning Support
TTI	Texas Transportation Institute
UPA	Urban Partnership Agreement
U.S. DOT	United States Department of Transportation
VOC	Volatile organic compounds
VMT	Vehicle miles traveled
VT	Vehicle trips

EXECUTIVE SUMMARY

This report provides an analytical framework for evaluating the San Francisco Urban Partnership Agreement (UPA) under the United States Department of Transportation (U.S. DOT) UPA program. It identifies the hypothesis and questions to be tested and answered in the evaluation, the evaluation analyses and measures of effectiveness, and the data needed to conduct the analysis.

Background

In 2006, the U.S. DOT, in partnership with metropolitan areas, initiated a program to explore reducing congestion through the implementation of pricing activities combined with necessary supporting elements. This program was instituted through the UPAs and the Congestion Reduction Demonstrations (CRDs). Within each program, multiple sites around the U.S., including San Francisco, were selected through a competitive process. The selected sites were awarded funding for implementation of congestion reduction strategies. The applicants' proposals for congestion reduction were based on four complementary strategies known as the 4Ts: Tolling, Transit, Telecommuting, which includes additional travel demand management (TDM) strategies, and Technology.

The evaluation of the UPA/CRD national evaluation is sponsored by the U.S. DOT. The Research and Innovative Technology Administration (RITA) Intelligent Transportation Systems Joint Program Office (ITS JPO) is responsible for the overall conduct of the national evaluation. Representatives from the modal agencies are actively involved in the national evaluation. The Battelle team was selected by the U.S. DOT to conduct the national evaluation through a competitive procurement process.

The purpose of the national evaluation is to assess the impacts of the UPA/CRD projects in a comprehensive and systematic manner across all sites. The national evaluation will generate information and produce technology transfer materials to support deployment of the strategies in other metropolitan areas. The national evaluation will also generate findings for use in future federal policy and program development related to mobility, congestion, and facility pricing. The Battelle team developed a National Evaluation Framework (NEF) to provide a foundation for evaluation of the UPA/CRD sites. The NEF is based on the 4Ts congestion reduction strategies and the questions that the U.S. DOT seeks to answer through the evaluation.

The San Francisco UPA

The San Francisco UPA partners are the San Francisco County Transportation Agency (SFCTA), The San Francisco Transportation Authority (SFMTA), and the Metropolitan Transportation Commission (MTC). Other Bay Area partners identified in the agreement with U.S. DOT include Alameda-Contra Costa Transit District, Bay Area Toll Authority, Caltrans, and Golden Gate Bridge Highway and Transportation Authority, but they are not part of the projects that are the subject of the national evaluation.

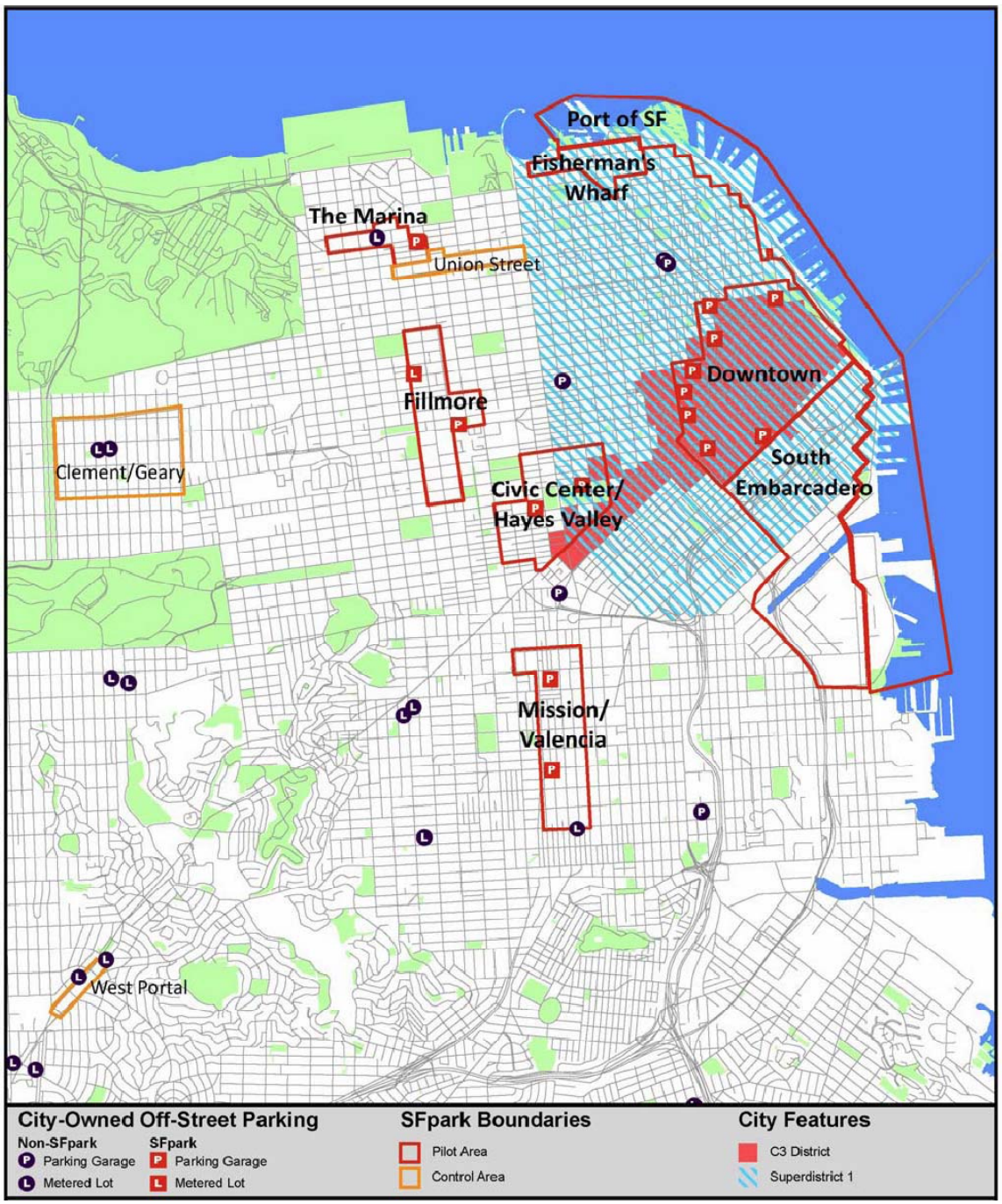
The San Francisco UPA projects that will be the focus of the national evaluation are those related to variable pricing of parking, which include the following:

- **Variable Parking Pricing in San Francisco.** SF*park* is the name given to the parking pricing system for on-street and off-street parking to be implemented by SFMTA in the City of San Francisco as illustrated in Figure ES-1. SFMTA will also disseminate information on parking availability and price on dynamic message signs, the SFMTA website and through text messaging.
- **511 Upgrades.** The 511 phone and website in San Francisco Bay Area, operated by MTC, will be enhanced to provide parking space availability and pricing information for municipal parking garages in downtown San Francisco on 511 phone and web, MY 511 and in the 511 traffic internet service provider feed.
- **TransLink® Parking Payment.** The smartcard electronic payment system being deployed for transit providers in the Bay Area by MTC will be expanded to include parking payment in SFMTA-operated garages.
- **Expansion of San Francisco Telecommuting and Alternate Commute Programs.** This effort by SFCTA will support the SF*park* and 511 enhancements through additional outreach and possible co-location of a bike-sharing station at SFMTA garages.

Other UPA funded projects unrelated to variable parking pricing that will not be included in the national evaluation are:

- **Reconstruction of Doyle Drive.** SFCTA received UPA funds to reconstruct Doyle Drive.
- **SFCTA area-wide/HOT network pricing.** SFCTA received UPA funds to further advance work conducted under the Area-Wide Value Pricing project and work with Bay Area agencies to coordinate informational initiatives that support HOV to HOT implementation in the region.
- **Improvements to regional ferry service.** The Golden Gate Bridge and Highway Transportation District received UPA funds to improve regional ferry boat service.
- **Improvements to travel forecasting in Oakland.** AC Transit received funds to develop a "simplified travel forecasting approach" for a Very Small Starts project in Grand/MacArthur BRT corridor in Oakland.
- **VII[1] test bed.** MTC will create an open architecture vehicle infrastructure integration test bed in support of a HOT lane tolling application.
- **Additional 511 Upgrades.** Additional 511 enhancements receiving UPA funds that are not part of the national evaluation include a multimodal trip planner and real-time transit information.

[1] VII (Vehicle-Infrastructure Integration) was the term current at the time of San Francisco's UPA award. Since then U.S. DOT has introduced the term IntelliDrive[SM] to replace VII.



San Francisco Municipal Transportation Agency, used with permission.

Figure ES-1. SF*park* Pilot and Control Zones

The SF*park* variable pricing will be rolled out by zone starting in April 2010. Other parking-related projects will become operational between April and December 2010.

Evaluation Analyses and Test Plans

The national evaluation of the San Francisco UPA projects focuses on 10 of the 12 analysis areas outlined in the NEF. Two of the analysis areas—transit and safety—were determined to be unnecessary for San Francisco. Since none of the transit projects using UPA funds support the parking pricing project—the focus of the national evaluation—a transit analysis is not included in the evaluation. A safety analysis is not deemed necessary, because none of the projects being evaluated is thought to have safety concerns. Plans for collecting and analyzing the data to support the 10 analyses are described in 10 test plans. Table ES-1 presents the relationship among the analysis areas and the test plans. The pricing analysis area and the data test plans supporting the pricing analysis are summarized below in Table ES-2 to provide an example of the approach used in the San Francisco UPA National Evaluation Plan.

SF*park* variable pricing is expected to have many positive outcomes on travel in downtown San Francisco. When parking supply is priced to meet demand, it is believed that travelers seeking parking spaces will locate parking more readily, traffic on the streets will be reduced by less double parking and fewer drivers circling to look for parking, and traffic will flow more freely as a result. Transit is expected to become a more attractive alternative to driving and parking, as transit travel time improves due to less traffic congestion and transit cost is more competitive when the true cost of parking is more accurately reflected in total travel costs. Table ES-2 presents, as an example of the hypothesis-driven approach used throughout the evaluation, a couple of the hypotheses that capture the expected impact of parking pricing that will be tested in the evaluation.

The first hypothesis deals with the expectation that the time a driver spends searching for parking will be reduced in zones where SF*park* is implemented. The measures of effectiveness (MOEs) include the change in the search time and the change in the variability of search time. The data for these MOEs will come from a parking search time survey to be conducted by SFMTA to measure the time it takes to locate the first available on-street parking space along a specific search route.

In the second hypothesis variable pricing is expected to cause a reduction in the average amount of time that customers park in response to higher prices. The measures of effectiveness are the change in the number of parking sessions in a zone and the average duration of the parking sessions. The data for these MOEs will come from the parking system technology. On-street parking sensors and electronic parking meters will record the data which will be stored in the SF*park* data warehouse for analysis.

Plans for collecting and analyzing data pertaining to these two hypotheses and all other evaluation hypotheses will be detailed in a series of test plan documents. Responsibility for collecting the data will reside with the San Francisco UPA partners. The national evaluation team will provide guidance to the partners on data collection and will be responsible for analyzing all the data and reporting the results.

Table ES-1. Relationship among Test Plans and Evaluation Analyses

San Francisco UPA Test Plans	Congestion Analysis	Pricing Analysis	Telecommuting/ TDM Analysis	Technology Analysis	Equity Analysis	Environmental Analysis	Goods Movement Analysis	Business Impact Analysis	Non-Technical Success Factors Analysis	Cost Benefit Analysis
Traffic System Data Test Plan	●				○		●			
Parking Data Test Plan		●		○	○	○	●	○		
Transit System Data Test Plan	○	●			○	○				
Telecommuting/TDM Data Test Plan			●							
Traveler Information Data Test Plan				●						
Surveys and Interviews Test Plan	●	●	●	●	●	○		○	●	○
Environmental Data Test Plan					○	●				
Content Analysis Test Plan									●	
Cost Benefit Analysis Test Plan								●		●
Exogenous Factors Test Plan	○	○		○						

● — Major Input ○ — Supporting Input

Table ES-2. Illustrative Excerpt from the Pricing Analysis Approach

Hypotheses/Questions	Measures of Effectiveness	Data
• Parking pricing will lead to reduced search time and variability	• Change in parking search time (by parking management zone) • Change in variability of search time	• Parking search time survey
• Parking pricing will shorten the duration of average on-street parking session	• Change in number of parking sessions over X hours • Change in duration of parking sessions	• Parking supply/activity data including duration, turnover, and price

Next Steps

The next steps in the San Francisco UPA National Evaluation include developing the detailed test plans and initiating data collection and analysis activities. The detailed test plans will be developed based on this final San Francisco UPA National Evaluation Plan. It is anticipated that the test plans will be completed by February 2010. The results of the San Francisco UPA national evaluation are expected in late-2011.

1.0 INTRODUCTION

The U.S. Department of Transportation (U.S. DOT) awarded grants in 2007 and 2008 to six metropolitan areas for implementation of congestion reduction strategies under the Urban Partnership Agreement (UPA) and Congestion Reduction Demonstration (CRD) programs. The San Francisco UPA was one of the selected sites. Based on a competitive procurement process, the U.S. DOT also selected the Battelle team to conduct the national evaluations of the UPA projects. This document presents the San Francisco UPA National Evaluation Plan developed by the Battelle team, in cooperation with the San Francisco UPA partners and the U.S. DOT. This introduction section describes U.S. DOT's congestion reduction programs and the strategies being implemented at the various sites. The organization of this report is also presented.

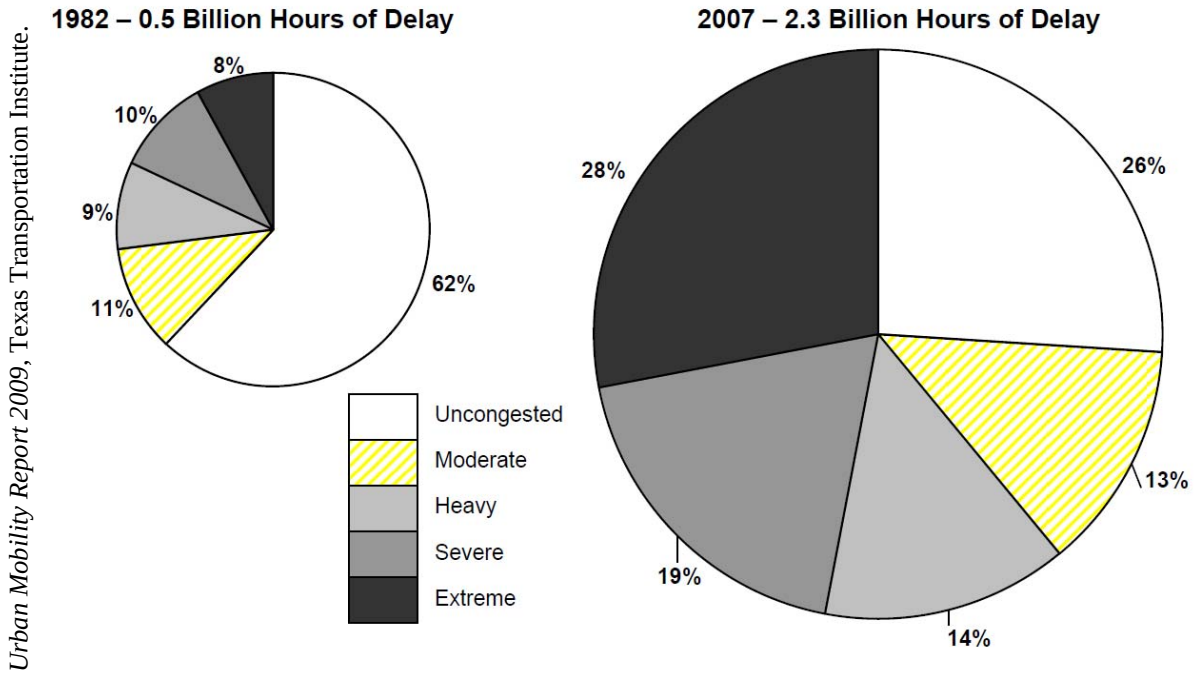
1.1 U.S. DOT Program to Reduce Congestion

Transportation system congestion is a significant threat to the economic prosperity and quality of life in the U.S. Whether it takes the form of trucks stalled in traffic, cargo stuck at overwhelmed seaports, or airplanes stuck on the tarmac, congestion costs the nation an estimated $200 billion a year. Traffic congestion in major metropolitan areas is a key part of this problem. In 2007, congestion caused urban Americans to travel 4.2 billion hours more and to purchase an extra 2.8 billion gallons of fuel. The value of time spent and out of pocket fuel costs represented a total congestion cost of $87.2 billion—an increase of more than 50 percent from a decade ago.[2] Congestion affects the quality of life in America by robbing time that could be spent socializing with families and friends, participating in civic life, and pursuing recreational activities. As indicated in Figure 1-1, which reflects conditions in 14 of the nation's largest urban areas representing 54 percent of the population, the total hours of traffic delay grew approximately 340 percent from 1982 to 2007 and the miles traveled under extreme congestion more than tripled, from 8 percent to 28 percent.

1.1.1 Urban Partnership Agreement/Congestion Reduction Demonstration Program Overview

U.S. DOT entered into UPAs with cities, pursuant to their commitment to implement "broad congestion pricing." In December 2006, the U.S. DOT issued a Federal Register Notice soliciting cities to apply for Urban Partnership status by April 30, 2007. For the cities that were selected, this Urban Partnership status would confer priority for available federal discretionary funds of approximately $1 billion across about a dozen programs. The applicants' proposals for congestion reduction were to be based on four complementary strategies known as the 4Ts: Tolling, Transit, Telecommuting, which includes additional travel demand management (TDM) strategies, and Technology.

[2]David Schrank and Tim Lomax, "Urban Mobility Report 2009." Texas Transportation Institute, The Texas A&M University System, July 2009.



Urban Mobility Report 2009, Texas Transportation Institute.

Figure 1-1. Percentage of Vehicle Miles Traveled by Congestion Level in Very Large Urban Areas, 1982 versus 2007

In August 2007, the selection of five urban partners was announced—Miami, Minnesota, New York City, San Francisco, and Seattle—along with a total of $853 million in federal discretionary grants for these partners. On April 7, 2008, the New York State Assembly declined to take a formal vote to provide needed legislative authority to implement the proposed New York City congestion-pricing project. The U.S. DOT announced that the UPA funds previously targeted for New York would be made available to other areas for implementing congestion pricing and supporting strategies.

In 2007, the U.S. DOT announced a follow-up to the UPA Program, called the Congestion Reduction Demonstration Initiative. The November 13, 2007, Federal Register notice set a December 31, 2007, deadline for applications. Subsequently, the U.S. DOT announced a $210.6 million CRD award to the City of Los Angeles and a $153 million award to the City of Chicago. Chicago was subsequently removed from the program when deadlines for pricing legislation were not met. Atlanta was selected for a CRD grant in November 2008 and will become part of the national evaluation.

A wide range of strategies and projects are being implemented at the UPA/CRD sites using the 4Ts. Table 1-1 highlights the strategies being deployed at the various UPA/CRD sites. Many of the San Francisco UPA projects focus on pricing of parking as a strategy for managing congestion in the city of San Francisco, and these will be the subject of the national evaluation. Parking-related projects include variable pricing of on-street parking and city-owned garages, real-time parking information disseminated by phone, websites, and dynamic message signs, an integrated payment system for parking and transit, and use of outreach for telecommuting and alternate commute programs to support the parking pricing program. Other UPA-funded projects in San Francisco not being evaluated include a multimodal trip planner, real-time transit information, a demonstration of vehicle-infrastructure integration, a road re-construction project,

ferry improvements, travel forecasting, and development of information for HOV to HOT conversion in the region.

Table 1-1. Summary of UPA/CRD Strategies by Site

UPA/CRD Strategies	Site				
	MN	SF	Sea	Mia	LA
Convert HOV lanes to dynamically priced high-occupancy tolling (HOT) lanes and/or new HOT lanes	X			X	X
Priced dynamic shoulder lanes	X				
Variably priced parking and/or loading zones		X			X
Variably priced roadways or bridges (partial cordon)			X		
Increase park-and-ride capacity (expand existing or add new)	X		X	X	X
Expand or enhance bus service	X		X	X	
Implement new, or expand existing, Bus Rapid Transit	X			X	X
Transit on special runningways (e.g., contraflow lanes, shoulders)	X			X	
New and/or enhanced transit stops/stations	X		X	X	X
Transit traveler information systems (bus arrival times, parking availability)	X	X	X		
Transit lane keeping/lane guidance	X				
Transit traffic signal priority	X			X	X
Arterial street traffic signal improvements to improve transit travel times	X				
Ferry service improvements		X	X		
Improved transit travel forecasting techniques		X			
Pedestrian improvements				X	X
“Results Only Work Environment” employer-based techniques	X				
Work to increase use of telecommuting	X	X	X	X	
Work to increase flexible scheduling	X		X	X	
Work to increase alternative commute programs, including car and van pools	X	X	X	X	X
Vehicle infrastructure integration test bed		X			
Active traffic management	X		X		
Regional multi-modal traveler information (e.g., 511)	X	X	X		
Freeway management (ramp meters, travel time signs, enhanced monitoring)	X			X	
Enhanced traffic signal operations	X				
Parking management system		X			X
Integrated electronic payment for parking and transit		X			

1.2 Organization of this Report

The remainder of this report is divided into four sections. Chapter 2.0 discusses the San Francisco UPA. An overview of the transportation system in the San Francisco metropolitan area is presented first, followed by a description of the San Francisco UPA partners and the UPA projects, funding, and deployment schedule. Chapter 3.0 provides an overview of the national evaluation organizational structure, the national evaluation process and framework, the U.S. DOT guiding questions and evaluation analyses, and the San Francisco UPA evaluation process. Chapter 4.0 presents the San Francisco UPA evaluation plan. The chapter discusses 10 evaluation analyses and describes the preliminary evaluation test plans. The report concludes with a discussion of the next steps in the San Francisco UPA national evaluation process.

2.0 SAN FRANCISCO URBAN PARTNERSHIP AGREEMENT

This chapter describes the San Francisco UPA. An overview of the transportation system in the San Francisco region is provided first. The San Francisco UPA partners and the local organizational structure are highlighted next. Finally, the San Francisco UPA projects, funding, and deployment schedule are described.

2.1 The Transportation System and Congestion in San Francisco

Bounded by the Pacific Ocean to the west and the San Francisco Bay to the north and east, the City and County of San Francisco occupies almost 50 square miles on the northern San Francisco Peninsula. The city is a leading financial, cultural, and transportation center both in California and internationally. The city and region boast a number of top-tier research centers and universities. It is also home to several Fortune 500 firms and more than 60,000 small businesses.

As with other metropolitan areas in the country, the San Francisco region continues to experience growth in population and employment. This growth has resulted in significant roadway congestion. According to the Texas Transportation Institute's Urban Mobility report,[3] currently about 82 percent of auto travel and 60 percent of lane miles are congested during peak periods.

The estimated population for the city and county of San Francisco is currently about 809,000. According to San Francisco County Transportation Agency (SFCTA), the city expects to add 19,000 more households and 110,000 new jobs by 2025. This future growth will further increase traffic and travel times. Overall trip making in the city is expected to increase by 12 percent from 4.5 to 5.0 million trips per day and 65 percent of those trips are expected to be internal trips as opposed to trips to and from areas outside the city.

An effective and efficient transportation system is critical to the economic health, vitality and quality of life in San Francisco. The city's dense and diverse land uses and its mature grid street system make it a very pedestrian-friendly city. The city also offers a variety of public transit travel options including light rail (streetcars), heavy rail (subways), commuter rail, trolleybuses, diesel buses, cable cars, and ferries. San Francisco's roadways include bicycle routes and facilities, two major freeways, and two major regional toll bridges (Golden Gate Bridge and the Bay Bridge) with priority for high occupancy vehicles. According to SFCTA, the current mode share for all travel is 62.1 percent for autos, 17.2 percent for transit, 19.3 for walking, and 0.9 percent for bike. In the future, mode shares are expected to shift increasingly from auto to transit.

[3] David Schrank and Tim Lomax, "Urban Mobility Report 2009." Texas Transportation Institute, The Texas A&M University System, July 2009.

2.2 The San Francisco UPA Local Partners

For the purposes of the national evaluation, the San Francisco local UPA partners consist of three public agencies. Two of the partners represent the City of San Francisco--the San Francisco County Transportation Authority and the San Francisco Municipal Transportation Agency (SFMTA). The third partner is the Metropolitan Transportation Commission (MTC), the metropolitan planning organization for the Bay Area. Figure 2-1 depicts the San Francisco UPA partners. (Other Bay Area partners identified in the agreement with U.S. DOT include Alameda-Contra Costa Transit District, Bay Area Toll Authority, Caltrans, and Golden Gate Bridge Highway and Transportation Authority. As described in Section 2.3, they are not partners in the projects included in the national evaluation, and, therefore are not shown in Figure 2-1.)

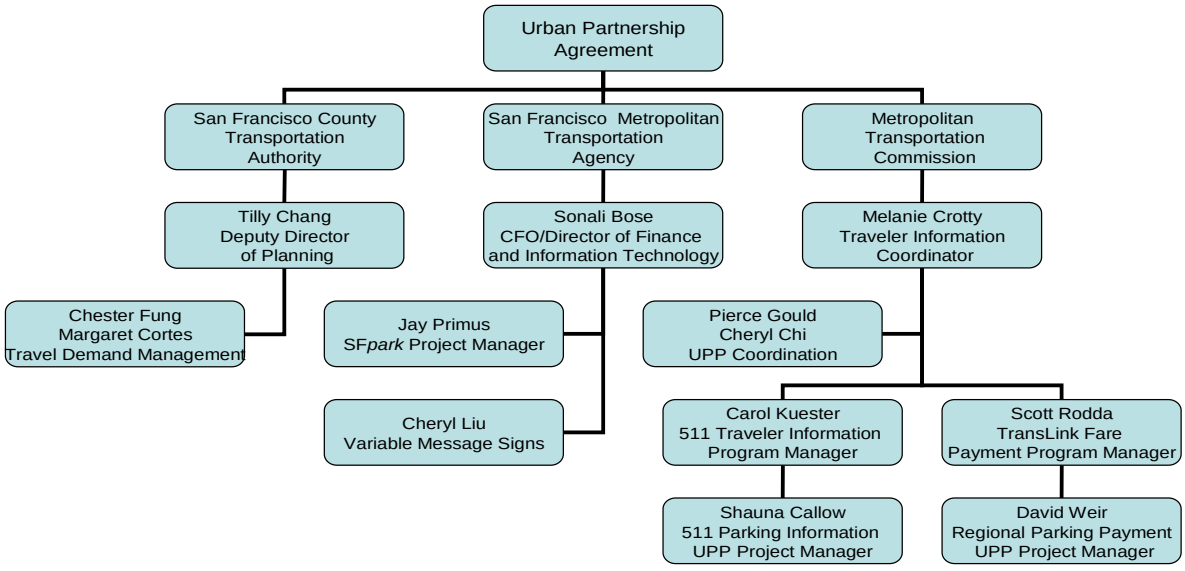


Figure 2-1. San Francisco UPA Team

SFMTA's role in the UPA is the deployment of SF*park*, a variable parking pricing system to improve management of the City's parking assets and reduce congestion on City streets. SFMTA is composed of the San Francisco Municipal Railway (Muni) transit system, the Division of Parking and Traffic (DPT) and the Division of Taxis and Accessible Services (DTAS). The Muni is the largest transit agency in the Bay Area carrying more than 200 million riders annually in a diverse fleet of vehicles. The DPT manages 40 City-owned garages, metered parking lots, and on-street parking. It also manages all traffic engineering functions within San Francisco, including the placement of signs, signals, traffic striping, curb markings, and parking meters.

SFCTA's Urban Partnership role is to plan and manage the telecommuting/TDM portion of the San Francisco UPA program. The SFCTA was created in 1989 to administer the city's transportation sales tax. It also has an oversight role in many of the city's transportation improvements as well as coordinating transportation enhancements with other agencies and is

responsible for leading studies for future projects identified in the San Francisco Countywide Transportation Plan. As the Congestion Management Agency (CMA) for San Francisco, SFCTA is responsible for developing and administering the Congestion Management Program (CMP). The Authority also serves as the San Francisco program manager for the Transportation Fund for Clean Air program, which supports some TDM efforts. In the area of TDM, the SFCTA works with the City of San Francisco's Department of Environment (DOE). The City's TDM program was originally developed for municipal employees, but has expanded to include downtown businesses and commuters. The City's program, called "Driving Alternatives" includes the promotion of ridematching, commuter tax benefits and offers a guaranteed ride home benefit. The City's program also provides assistance to employers needing to comply with the City's recent Commute Benefits Ordinance that requires employers with 20 or more employees to offer their employees certain commute benefits, such as subsidized transit passes or vanpool assistance.

The MTC's role will be to enhance its existing 511 traveler information system and TransLink® payment system to support the SF*park* system. The MTC was established in 1970 as the transportation planning, coordinating and financing agency for the nine-county San Francisco Bay Area. MTC functions as both the regional transportation planning agency — a state designation – and, for federal purposes, as the region's metropolitan planning organization. MTC updates the Regional Transportation Plan and ensures that local agencies' requests for transportation funds are compatible with the plan.

2.3 San Francisco UPA Projects and Deployment Schedules

The San Francisco UPA originally included congestion pricing on traffic entering San Francisco from the Golden Gate Bridge. The partners abandoned that strategy when the Golden Gate Bridge Highway and Transportation District, the tolling authority for the Golden Gate Bridge, decided not to support the variable tolling approach. U.S. DOT and the partners restated the UPA in October 2008 so that the pricing strategy would focus on implementing another element of the original application—variable parking pricing—to manage the availability of parking in parts of San Francisco where the search for parking was viewed as a major contributor to traffic congestion.

Table 2-1 shows the project components and federal funding in the restated agreement. The focus of the national evaluation is on a subset of these projects consisting of the parking pricing project in San Francisco and the other projects that support the parking program: the 511 upgrades, parking payment and the telecommuting/TDM projects. Each of these projects that will be considered in the national evaluation is discussed below.

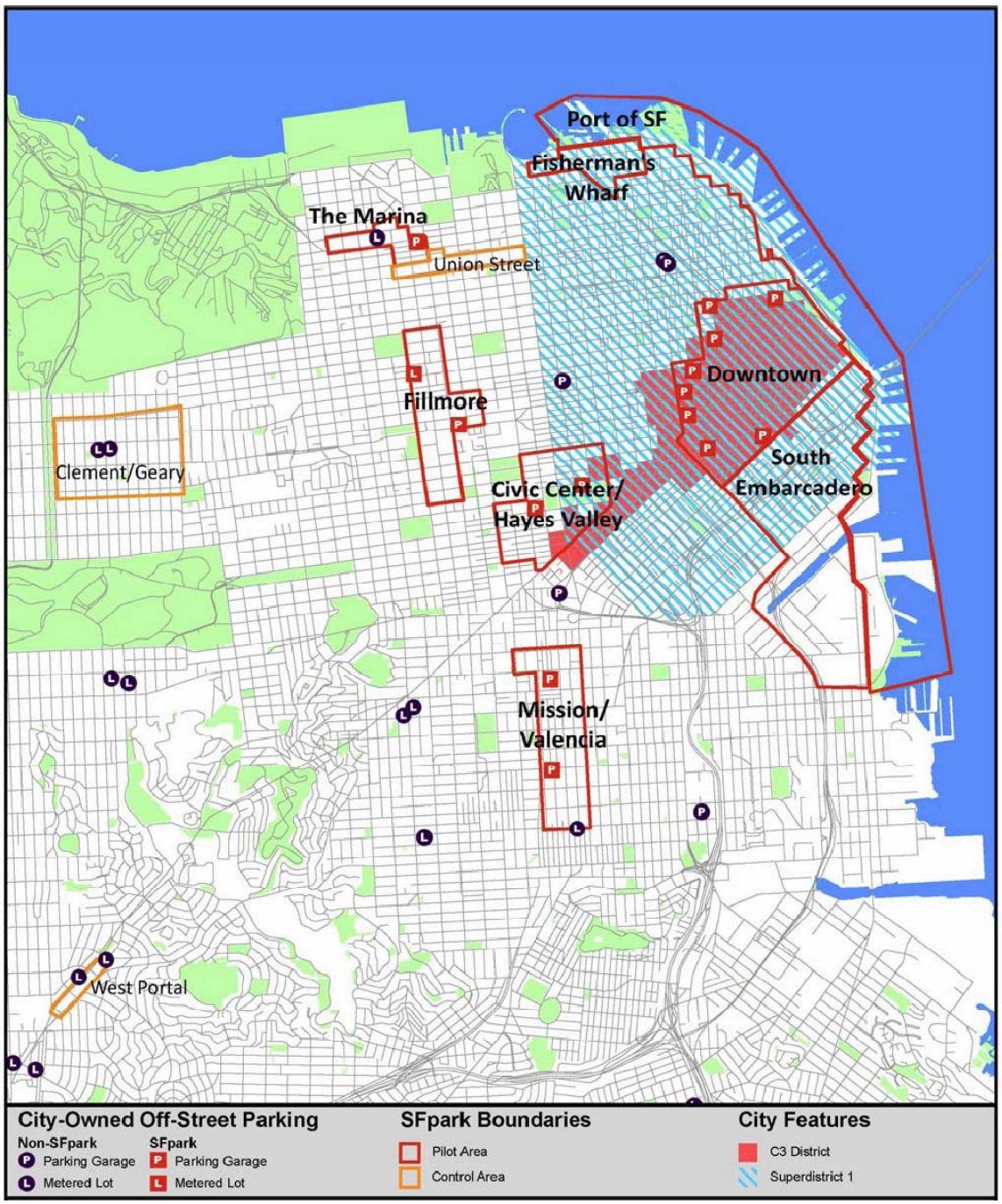
Table 2-1. San Francisco UPA Projects and Funding

Project	UPA Federal Funding
Reconstruction and Variable Pricing Projects	
Reconstruction of Doyle Drive. The Urban Partner (SFCTA) will reconstruct Doyle Drive.	$47.3 M
Tolling (Congestion Pricing) Projects	
Downtown parking pricing (on-street and off-street). The Urban Partner (SFMTA) will implement variable pricing and management of on-street and off-street parking in downtown San Francisco.	$19.8 M
SFCTA area-wide/HOT network pricing. The Urban Partner (SFCTA) will further advance work conducted under the Area-Wide Value Pricing project and work with Bay Area agencies to coordinate informational initiatives that support HOV to HOT implementation in the region.	$ 0.6 M
Transit Projects	
Improvements to regional ferry service. The Urban Partner (GGBHTD) will carry out a number of projects to improve regional ferry boat service, as described in applications filed by the Golden Gate Bridget Highway and Transportation District for funding under FHWA's Ferry Boat Discretionary Program.	$12.8 M
Improvements to travel forecasting in Oakland. The Urban Partner (AC Transit) will develop a "simplified travel forecasting approach" for a Very Small Starts project in Grand/MacArthur BRT corridor in Oakland.	$ 0.35 M
Technology Projects	
511 upgrades. The Urban Partner (MTC) will upgrade the regional 511 system to provide real-time parking pricing and availability, transit, and trip planning information.	$6.44 M
Parking payment. The Urban Partner (MTC with support from SFMTA) will upgrade TransLink® to support parking payment and demonstrate its use at up to five San Francisco garages.	
VII test bed. The Urban Partner (MTC) will create an open architecture vehicle infrastructure integration test bed in support of a HOT lane tolling application.	
Evaluation. The Urban Partner (SFMTA) will evaluate the impacts of the parking pricing project.	
Telecommuting/TDM Projects	
Local project to be implemented by Urban Partner. In connection with the implementation of the Federal Projects, the Urban Partner (SFCTA) will expand the technical and promotional aspects of San Francisco's telecommuting and related alternative commute programs.	No UPA funding
Total Funding	$87.29 M

SF*park* Variable Pricing. SF*park* is the name given to the parking pricing system to be implemented by SFMTA. The primary goal of SF*park* is to use intelligent parking management technology and techniques, in particular demand-responsive pricing, to manage the on-street and off-street parking supply and demand. SFMTA expects this approach to reduce the number and duration of vehicle trips and reduce double parking and, thereby, reduce congestion. SFMTA views the UPA-funded project as a pilot to test a system that will be more widely deployed throughout San Francisco in the future. The parking technologies to be tested include networked parking meters, parking occupancy sensors, and parking information systems. SF*park* is expected to improve SFMTA's effectiveness in meter maintenance, enforcement, and parking management and provide travelers with better information about parking location, availability, and price to help them make more informed travel choices.

The pilot areas for SF*park* are highlighted in red (or dark lines) in Figure 2-2. The new system will consist of approximately 6,000 metered on-street parking spaces (about one-quarter of the city's total supply) and 12,250 parking spaces in fifteen city-operated garages and one lot. Control areas, highlighted in yellow (or light lines) in Figure 2-2, will be equipped with traffic sensors for monitoring use of the parking supply where variable pricing is not implemented.

SFMTA's approach to variable pricing is to adjust parking prices gradually and periodically to achieve targets for parking availability rather than dynamically adjusting pricing based on moment-to-moment changes in parking demand. SFMTA expects that drivers will be able to gradually adjust travel behaviors and choices to respond to new price information over time, whereas dynamic pricing could be potentially confusing for drivers, difficult for SFMTA to administer, and technically too complex. Instead, SFMTA seeks a pricing regime that will balance supply and demand over time and provide drivers with a predictable pricing environment in which to adjust their travel choices.



San Francisco Municipal Transportation Agency, used with permission.

Figure 2-2. SF*park* Pilot and Control Zones

San Francisco Municipal Transportation Agency, used with permission

Figure 2-3. Dynamic Message Signs Will Guide Drivers to Available Parking in San Francisco

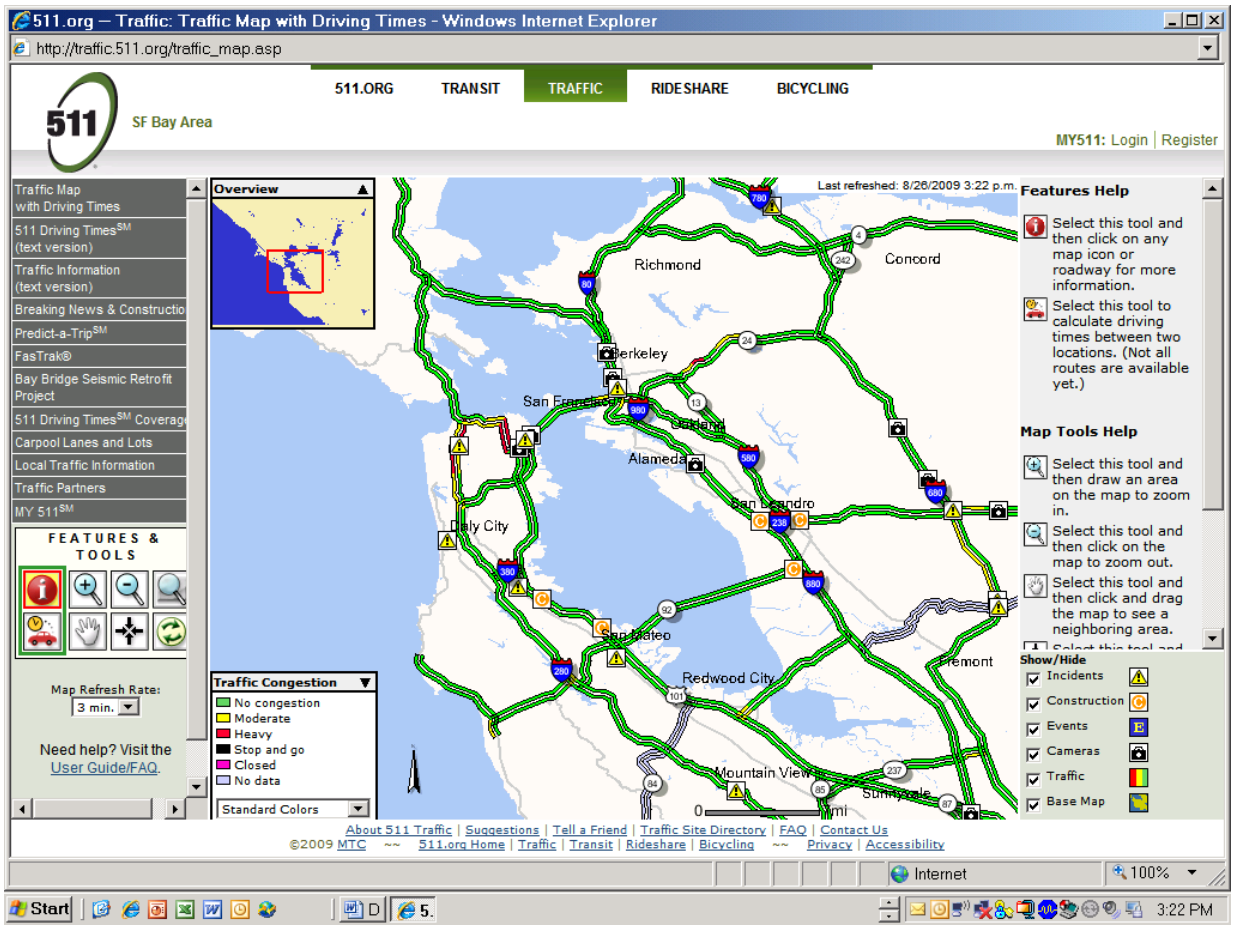
To assist travelers in making choices about parking pre-trip and en-route, SFMTA will disseminate parking information in various ways. Strategically placed dynamic message signs will show parking availability in city-operated garages, as shown in Figure 2-3. Parking availability and pricing information will also be displayed on SFMTA's website and by text messaging to mobile devices.

511 Upgrades. The 511 phone and website in the San Francisco Bay Area, operated by MTC, is one of the most advanced in the country, including a variety of multi-modal information. Figure 2-4 illustrates some of the real-time traffic congestion information available on www.511.org. However, at the present time, the parking information on 511 is limited to static information about park and ride lots and rail stations (on the web) and airport parking (on the phone). The planned upgrades will provide parking space availability and pricing information for selected parking facilities in downtown San Francisco by 511 phone and web, by a user-customizable feature called MY511, and by information service providers (ISPs) in the region who receive a feed of 511 data from MTC. The system will be designed to allow expansion to include information about parking facilities throughout the region. The expected impact of having parking information on 511 is a reduction in surface street congestion as drivers' parking search time is reduced and the ability for drivers to make more informed decisions about the best place to park or possibly even choose an alternative to driving.

MTC will receive a real-time data feed of parking availability and pricing data for parking garages managed by SFMTA. The user interfaces on 511 phone, website, and MY511 will be enhanced to disseminate the parking information to 511 customers.

TransLink® Parking Payment. MTC is in the process of deploying its TransLink® smartcard electronic payment system on transit systems in the Bay Area. SFMTA, the operator of the Muni transit system in San Francisco, is a charter member of the TransLink® program and is interested in expansion of TransLink® to SFMTA parking garages. This will allow SFMTA customers to use a single smart card to pay for both transit and parking. This pilot could provide the foundation for expanding TransLink® as a parking payment option throughout the region.

The TransLink® card will be piloted at five SFMTA garages in downtown San Francisco. MTC will work with its TransLink® vendor to decide how best to design the electronic purses, or e-purses. One issue is how to separate the value for employer-furnished pre-tax transit benefits, per Internal Revenue Service Code, from other value loaded on the card for transit rides or parking charges.



Metropolitan Transportation Commission, used with permission.

Figure 2-4. Real-Time Traffic Congestion Information on www.511.org

Expansion of San Francisco Telecommuting and Alternate Commute Programs. Under the direction of the SFCTA, the telecommuting and alternate commute programs will be undertaken by the City of San Francisco's Department of the Environment (DOE). In support of the SF*park* and 511 enhancements, DOE and SFCTA plans include three activities: promotion of SF*park* at DOE outreach events; promotion of 511 enhancements at outreach events; and co-location of a bike-sharing station at a SF*park* facility (e.g., parking structure). Through the outreach efforts, downtown workers will be better informed about the UPA initiatives and can better use the parking, bike-sharing and information resources available to them. The bike-sharing component is contingent on pending grant activities and the timing of implementation of the city's bike-share system.

Schedule for the UPA Projects. Table 2-2 presents the dates at which each of the San Francisco UPA projects that are part of the national evaluation are expected to be in operation. It should be noted that the SFMTA will be implementing variable pricing in SF*park* zones as equipment installation is completed in each zone, and thus the operational period stretches over several months.

Table 2-2. UPA Project Schedules

Projects	Operational Date
SF*park* Pricing	April 2010 for initial zones
Real-time Parking Information on SFMTA Website and Text Messaging	April 2010
511 Phone Real-time Parking Information	April 2010
Real-time Parking Information on Dynamic Message Signs	December 2011[4]
Real-time Parking on 511 Website and MY511	December 2010
TransLink® Parking Payment Pilot at SFMTA Garages	December 2010
Expanded Outreach and Alternate Commute Program	On-going

[4] The deployment of the DMS has been delayed to December 2011, placing them a year behind the other UPA projects. Rather than delay evaluation of the rest of the projects, the decision was made not to include them in the national evaluation.

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3.0 NATIONAL EVALUATION OVERVIEW

This chapter summarizes how the national evaluation of the UPA sites is being organized and carried out and identifies the steps in the San Francisco UPA evaluation process.

3.1 National Evaluation Organizational Structure

The evaluation of the UPA/CRD national evaluation is sponsored by the U.S. DOT. The Research and Innovative Technology Administration's (RITA) ITS JPO is responsible for the overall conduct of the national evaluation. Representatives from the modal agencies are actively involved in the national evaluation.

Members of the Battelle evaluation team include:

- Battelle Memorial Institute – Prime;
- Texas Transportation Institute (TTI), The Texas A&M University System;
- Center for Urban Transportation Research (CUTR), University of South Florida;
- Hubert H. Humphrey Institute of Public Policy and Center for Transportation Studies (CTS), University of Minnesota;
- Eric Schreffler, ESTC; and
- Susan Shaheen and Caroline Rodier, University of California, Berkeley.

As highlighted in Figure 3-1, the Battelle team is organized around the individual UPA/CRD sites. A site leader is assigned to each site, along with specific Battelle team members. The site teams are also able to draw on the resources of 4T experts and evaluation specialists.

The purpose of the national evaluation is to assess the impacts of the UPA/CRD projects in a comprehensive and systematic manner across all sites. The national evaluation will generate information and produce technology transfer materials to support deployment of the strategies in other metropolitan areas. The national evaluation will also generate findings for use in future federal policy and program development related to mobility, congestion, and facility pricing.

The focus of the national evaluation is on assessing the congestion reduction realized from the 4T strategies and the associated impacts and contributions of each strategy. The non-technical success factors, including outreach, political and community support, institutional arrangements, and technology will also be documented. Finally, the overall cost benefit analysis of the deployed projects will be examined.

Members of the Battelle team are working with representatives from the local partner agencies and the U.S. DOT on all aspects of the national evaluation. This team approach includes the participation of local representatives throughout the process and the use of site visits, workshops, conference calls, and e-mails to ensure ongoing communication and coordination. The local agencies are responsible for data collection, including conducting surveys and interviews. The Battelle team is responsible for providing the local partners direction on the needed data, formats and collection methods and for analyzing resulting data and reporting results.

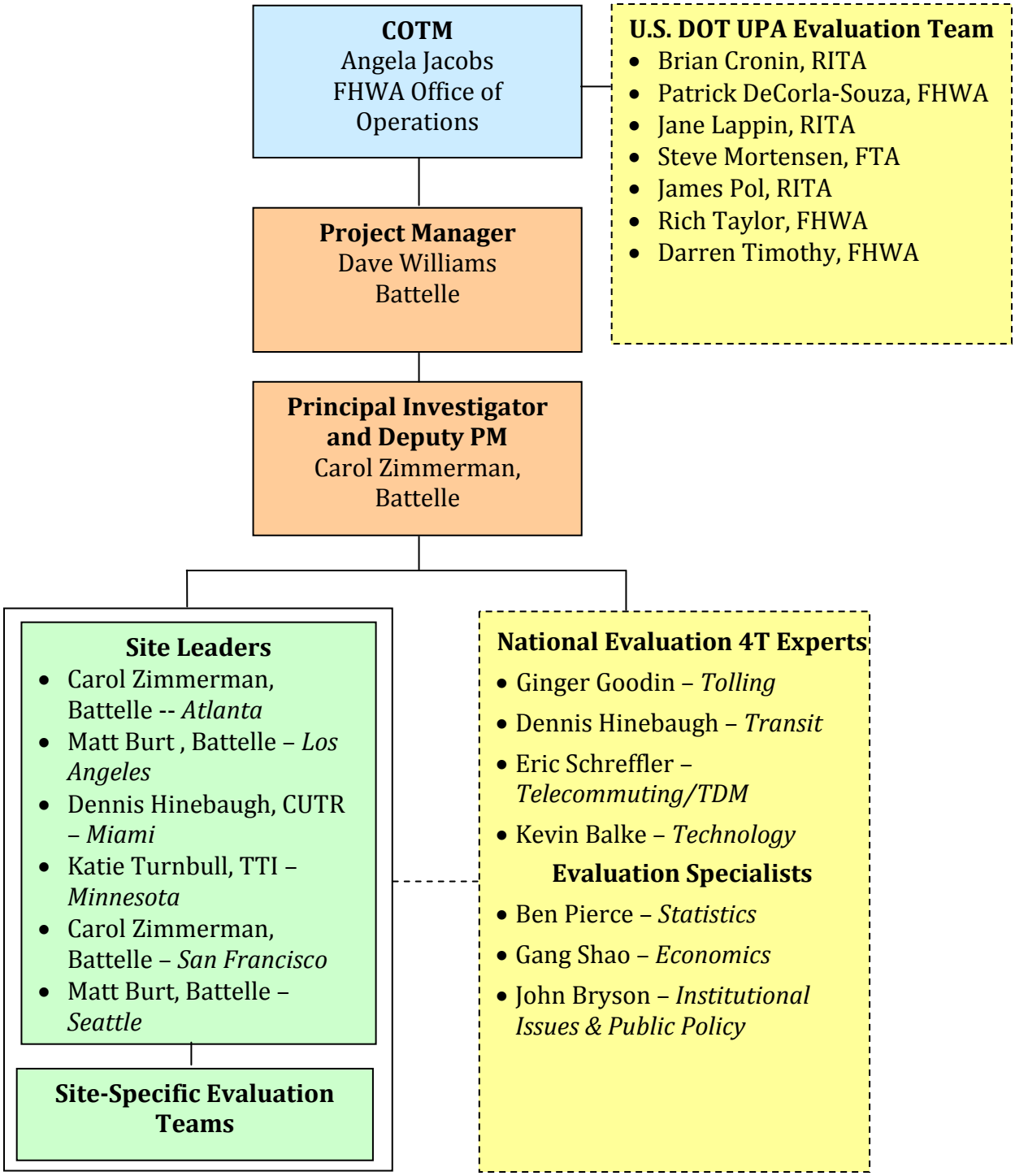

Figure 3-1. Battelle Team Organizational Structure

3.2 National Evaluation Process and Framework

The Battelle team developed a National Evaluation Framework (NEF) to provide a foundation for evaluation of the UPA/CRD sites. The NEF is based on the 4Ts congestion reduction strategies and the questions that the U.S. DOT seeks to answer through the evaluation. The NEF is essential because it defines the questions, analyses, measures of effectiveness, and associated data collection for the entire UPA/CRD evaluation. As illustrated in Figure 3-2, the framework is a key driver of the site-specific evaluation plans and test plans and will serve as a touchstone throughout the project to ensure that national evaluation objectives are being supported through the site-specific activities.

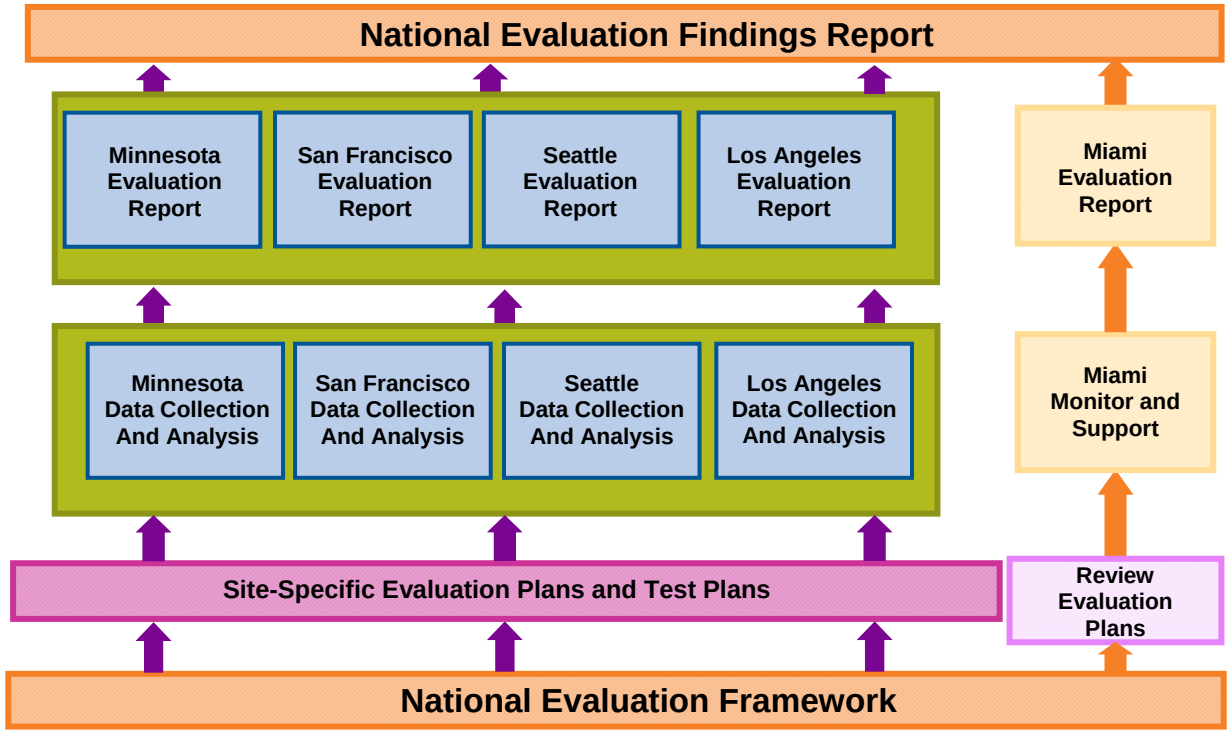

Figure 3-2. The National Evaluation Framework in Relation to Other Evaluation Activities

The evaluation of each UPA/CRD site will involve several steps. With the exception of Miami, where the national evaluation team is serving in a limited role of review and support to the local partners, the national evaluation team will work closely with the local partners to perform the following activities and provide the following products:

- a site-specific strategy guided by the NEF;
- a site-specific evaluation plan that describes the strategy and provides a high-level view of all the test plans needed, the roles and responsibilities, and the schedule;
- multiple site-specific test plans that provide complete details on how the data collection and analysis activity will be implemented;

- collection of one year of pre-deployment and one year of post-deployment data;[5]
- analysis of the collected data; and
- site-specific evaluation reports and a National Evaluation Findings Report.

The NEF provides guidance to the local sites in designing and deploying their projects, such as by identifying the need to build in data collection mechanisms if such infrastructure does not already exist. To measure the impact of the congestion strategies, it is essential to collect both the "before" and "after" data for many of the measures of effectiveness identified in the NEF. Also important is establishing as many common measures as possible that can be used at all of the sites to enable comparison of findings across the sites. For example, a core set of standardized questions and response categories for traveler surveys will be prepared. Questions may need to be tailored or added to reflect the specific congestion strategies and local context for each site, such as road names or transit lines, but striving for comparability among sites will be a goal of the evaluation.

A traditional "before and after" study is the recommended analysis approach for quantifying the extent to which the strategies affect congestion in the UPA/CRD sites. In the "before," or baseline condition, data for measures of effectiveness will be collected before the deployments become operational. For the "after" or post-deployment period, the same data will be collected to examine the effects of the strategies. The analysis approach will track how the performance measures changed over time (trend analysis) and examine the degree to which they changed between the "before" and "after" periods. Whenever possible, field-measured data will be used to generate the measures of effectiveness.

3.3 U.S. DOT Four Questions and Mapping to 12 Analyses

Table 3-1 shows the four "Objective Questions" that U.S. DOT has directed the national evaluation team to address.[6] The analyses present what must be studied to answer the four objective questions. Table 3-2 identifies the 12 evaluation analyses described in the National Evaluation Framework and shows how they relate to the four objective questions. These 12 analyses form the basis of the evaluation plans at the UPA/CRD sites, including San Francisco.

[5] While one-year each of pre- and post-deployment data are desirable, the operational data for specific projects within the overall evaluation schedule may result in more or less than a year's data being collected either pre- or post-deployment.

[6] "Urban Partnership Agreement Demonstration Evaluation – Statement of Work," United States Department of Transportation, Federal Highway Administration; November 29, 2007.

Table 3-1. U.S. DOT National Evaluation "Objective Questions"

Objective Question #1	How much was congestion reduced in the area impacted by the implementation of the tolling, transit, technology, and telecommuting strategies? It is anticipated that congestion reduction could be measured by one of the following measures, and will vary by site and implementation strategy: • reductions in vehicle trips made during peak/congested periods; • reductions in travel times during peak/congested periods; • reductions in congestion delay during peak/congested periods; and • reductions in the duration of congested periods.
Objective Question #2	What are the associated impacts of implementing the congestion reduction strategies? It is anticipated that impacts will vary by site and that the following measures may be used: • increases in facility throughput during peak/congested periods; • increases in transit ridership during peak/congested periods; • modal shifts to transit and carpools/vanpools; • traveler behavior change (e.g., shifts in time of travel, mode, route, destination, or forgoing trips); • operational impacts on parallel systems/routes; • equity impacts; • environmental impacts; • impacts on goods movement; and • effects on businesses.
Objective Question #3	What are the non-technical success factors with respect to the impacts of outreach, political and community support, and institutional arrangements implemented to manage and guide the implementation?
Objective Question #4	What are the overall costs and benefits of the deployed set of strategies?

Table 3-2. U.S. DOT Objective Questions vs. Evaluation Analyses

U.S. DOT 4 Objective Questions	Evaluation Analyses
#1 – How much was congestion reduced?	#1 – Congestion
#2 – What are the associated impacts of the congestion reduction strategies?	**Strategy Performance**
	#2 – Strategy Performance: Tolling #3 – Strategy Performance: Transit #4 – Strategy Performance: Telecommuting/TDM #5 – Strategy Performance: Technology
	Associated Impacts
	#6 – Associated Impacts: Safety #7 – Associated Impacts: Equity #8 – Associated Impacts: Environmental #9 – Associated Impacts: Goods Movement #10 – Associated Impacts: Business Impacts
#3 – What are the non-technical success factors?	#11 – Non-Technical Success Factors
#4 – What is the overall cost and benefit of the strategies?	#12 – Cost-Benefit Analysis

The analyses associated with Objective Question #2 are of two types. The first four analyses focus on the performance of the deployed strategies associated with each of the 4Ts. These analyses will examine the specific impacts of each deployed project/strategy, and, to the extent possible, associate the performance of specific strategies with any changes in congestion. The second type of analysis associated with Objective Question #2 focuses on specific types of impacts, e.g., "equity" and "environmental."

The 12 evaluation analyses were further elaborated into one or more hypotheses for testing. In some cases, where the analysis is not guided by a hypothesis, per se, such as the analysis of the non-technical success factors, specific questions are stated rather than hypotheses. Next, measures of effectiveness (MOEs) were identified for each hypothesis, and then required data for each MOE.

3.4 San Francisco UPA National Evaluation Process

Figure 3-3 presents the San Francisco UPA national evaluation team. The team includes the Contract Officer Technical Manager (COTM) who serves as the U.S. DOT National Evaluation leader, the U.S. DOT evaluation team, the FHWA point of contact for the site, and the Battelle team. The national evaluation team works with representatives from the partnership agencies, shown previously in Section 2, in development of the UPA evaluation for San Francisco.

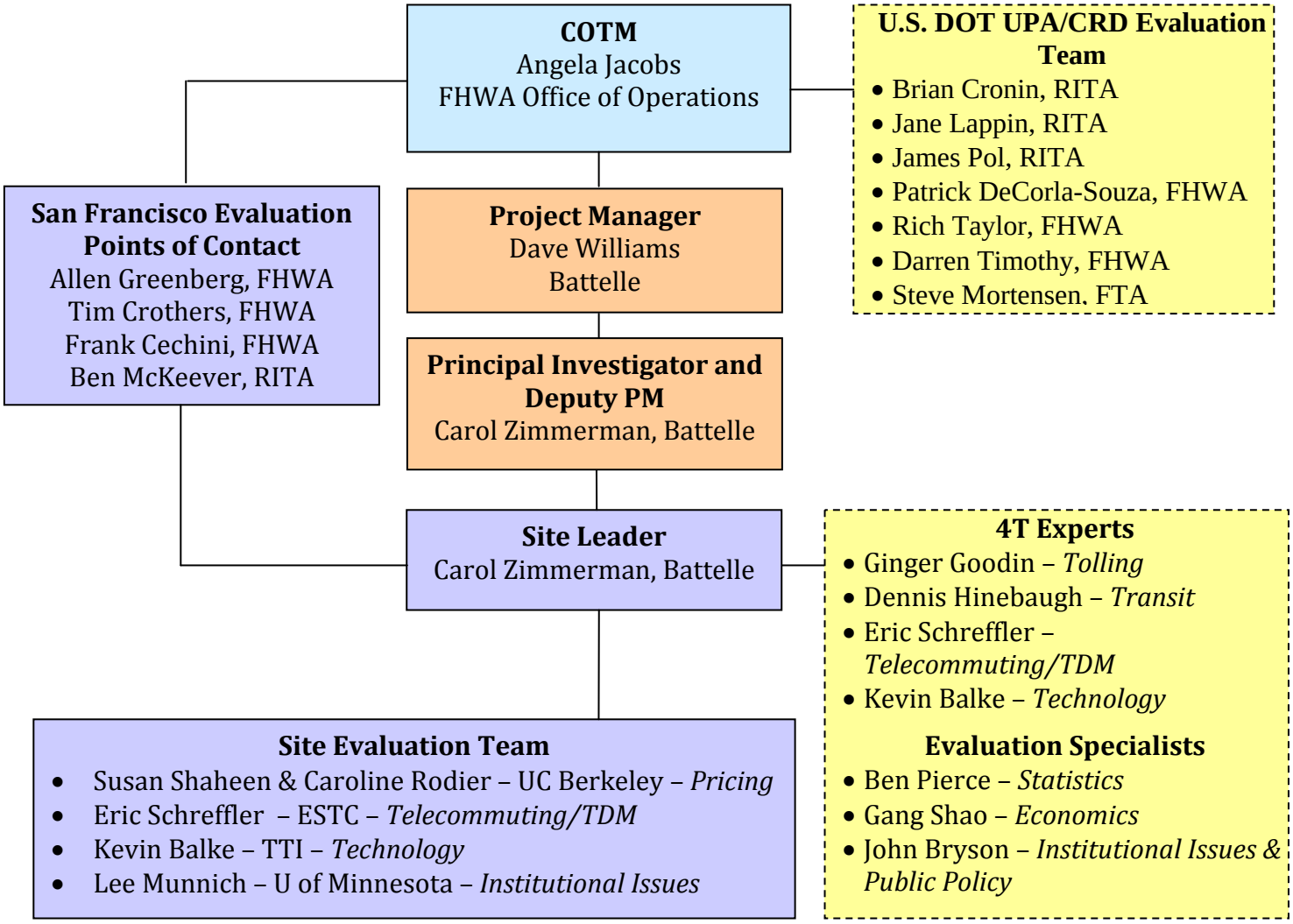

Figure 3-3. San Francisco UPA National Evaluation Team

Figure 3-4 presents the process for developing and conducting the national evaluation of the San Francisco UPA projects. The major steps are briefly discussed following the figure.

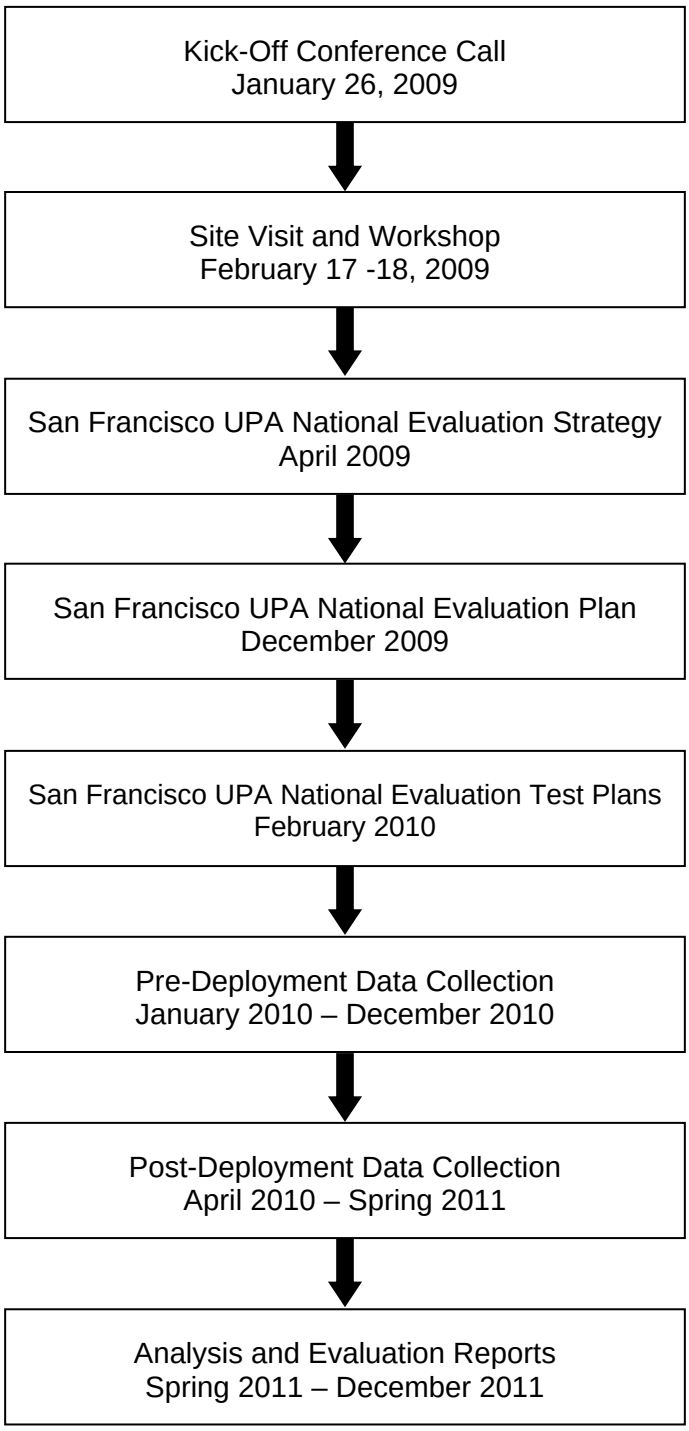

Figure 3-4. San Francisco UPA National Evaluation Process

Kick-Off Conference Call. The kick-off conference telephone call, held on January 26, 2009, introduced the San Francisco partners, the U.S. DOT representatives, and the Battelle team members. The San Francisco UPA projects and deployment schedule were discussed, and the national evaluation approach and activities were presented. A PowerPoint presentation and various handouts were distributed prior to the conference call.

Site Visit and Workshop. Members of the U.S. DOT evaluation team and the Battelle team convened with the San Francisco partners in the Bay Area on February 17 and 18. The first day was used by the partners to brief the evaluation team on the UPA projects. SFMTA provided a tour of selected SF*park* zones. A day-long evaluation workshop was held on the second day. Members of the U.S. DOT, Battelle, and local agency teams discussed potential evaluation strategies, including analyses, hypotheses, data needs, and schedule. A PowerPoint presentation containing the preliminary evaluation strategy, analysis, data needs, and other information was distributed prior to the workshop. A summary of the workshop discussion was prepared and distributed to participants after the workshop.

San Francisco UPA National Evaluation Strategy. The San Francisco UPA national evaluation strategy was revised based on the discussion at the workshop and the completion of the National Evaluation Framework. The San Francisco UPA evaluation strategy included the hypotheses/ questions, measures of effectiveness, and data needs for the analysis areas. The strategy also included a preliminary pre- and post-deployment data collection schedule, possible issues associated with the evaluation, and approaches for addressing exogenous factors. The San Francisco UPA national evaluation strategy was presented in a PowerPoint presentation, which was distributed to representatives of the U.S. DOT team and the San Francisco partners and a conference call was held on April 24 to review and discuss the evaluation strategy. There was agreement among all parties on the San Francisco UPA evaluation strategy and formal approval from the U.S. DOT was subsequently received to proceed with development of the San Francisco UPA national evaluation plan.

San Francisco UPA National Evaluation Plan. This document constitutes the San Francisco UPA national evaluation plan. The report provides a background to the U.S. DOT UPA, describes the San Francisco UPA projects, and presents the San Francisco UPA evaluation plan and preliminary test plans. The report was distributed in late August 2009 and reviewed with U.S. DOT and San Francisco UPA partners during a conference call on October 17, and the final plan is based on all comments and discussions about the evaluation plan. The document will guide the overall conduct of the San Francisco UPA national evaluation.

San Francisco UPA National Evaluation Test Plans. Based on approval from the U.S. DOT, the Battelle San Francisco UPA evaluation team will proceed with developing separate, more detailed test plans for each type of data needed for the evaluation, i.e., traffic, parking, etc. The preliminary test plans contained in the evaluation plan provide the basis for the more fully-developed test plans. Between December 2009 and February 2010 the individual test plans will be developed and reviewed with representatives from the U.S. DOT and local partnership agencies.

Pre-Deployment Data Collection. Based on approval of the San Francisco UPA evaluation individual test plans, data collection activities for the pre-deployment period will be initiated.

The schedule of deployment for SF*park* necessitates an abbreviated pre-deployment data collection period. However, where archived data are available and helpful in establishing long-term trends and in assessing the influence of exogenous factors (such as gas prices), they will be utilized. As discussed in Section 2, the individual projects will come on-line at various points between April and December 2010. Thus, the pre-deployment timeframe will begin in January 2010 and end as early as April and as late as December 2010 depending upon the project.

Post-Deployment Data Collection. Collection of post-deployment data of the San Francisco UPA projects will begin when the SF*park* zones to be evaluated become operational in 2010. As other UPA projects come on-line in 2010, such as dissemination of parking pricing information on 511 phone in April and the 511 website and TransLink® in garages in December, post-deployment data collection for those projects will begin. After the last project is deployed, in December 2010, the final post-deployment data collection will take place. Thus, the post-deployment data collection period stretches from April 2010 through the spring of 2011.

Analysis and Evaluation Reports. Analysis of baseline data will begin once all of the data have been collected in the spring of 2011. Analysis of early (e.g., the first several months of) post-deployment data will begin shortly after the beginning of post-deployment data collection in mid-2010. A technical memorandum on evaluation early results, based on four or five months of post-deployment data, will be completed in the fall of 2010. The final evaluation report will be completed by December 2011.

4.0 SAN FRANCISCO NATIONAL UPA EVALUATION PLAN

This chapter presents the San Francisco UPA Evaluation Plan. This material is presented in major subsections. The first of these sections, 4.1, Evaluation Analyses, discusses the potential benefits, costs, and impacts of the UPA projects; the Evaluation team's planned approach to measuring those effects; the kinds of data needed to perform this work; and the planned analytic approach. The second Section, 4.2, Preliminary Evaluation Test Plans, summarizes in somewhat more detail data sources and analysis methods. Once this evaluation plan has been finalized, the full detail on data collection and analyses will be presented through a set of separate test plan documents.

4.1 Evaluation Analyses

The proposed approach to ten evaluation analyses is presented in this section. For the San Francisco UPA, two of the twelve analyses identified in the NEF—transit and safety—were determined to be unnecessary for the national evaluation. Thus, the ten San Francisco analyses address the following areas:

1. Congestion
2. Pricing
3. Telecommuting/Travel Demand Management (TDM)
4. Technology
5. Equity
6. Environment
7. Goods Movement
8. Business Impacts
9. Non-Technical Success Factors
10. Cost Benefit.

For each of these analyses, key hypotheses and questions to be addressed are presented. The hypotheses describe the results that the UPA projects are expected to produce, including benefits such as throughput improvements, congestion reduction, expanded traveler choices, improved mobility, and related outcomes. In a few cases, unwanted side-effects of the UPA investments are hypothesized. For each hypothesis and question, measures of effectiveness (MOEs) are presented. These are measurable aspects of the San Francisco deployment effects that relate to the evaluation hypotheses and questions.

Each analysis discussion includes a table which summarizes the hypotheses/questions being asked, relevant MOEs, and the data required to compute those MOEs. Accompanying text discusses key aspects of the planned analytic approach and related matters.

4.1.1 Congestion Analysis

The purpose of the congestion analysis is to determine what the combined impact of all the individual UPA projects were on congestion. Specifically, the congestion analysis is designed to answer the following question:

- How much was congestion reduced in the area through the collective deployment of the tolling, transit, technology, and telecommuting strategies?

The Congestion Analysis utilizes the basic principles for monitoring freeway performance discussed in NCHRP's *Guide to Effective Freeway Performance Measures*.[7] Specifically, the Congestion Analysis will attempt to quantify the following as a result of deploying the tolling, technology, transit, and telecommuting strategies in the San Francisco area:

- The amount of reduction in travel time on selected routes in the downtown area,
- The amount of improvement in travel time reliability on selected routes in the downtown area,
- The amount of improvement in vehicle and passenger throughput on selected routes in the downtown area, and
- Changes in travelers' perception of congestion in the downtown area.

Because parking pricing is expected to change every four to six weeks, the performance measures will be computed after each major parking price change in a parking management zone. Performance measures will be computed for each parking management zone and the overall impact will be computed by summing the effects across each parking management zone.

Table 4-1 shows the hypotheses, measures of effectiveness and data that will be used to conduct the congestion analysis. In this case, the data that will be used to conduct analysis will be collected primarily through automated data collection equipment deployed specifically for this project and through use of transit vehicles as surrogates when data for other modes aren't available. These data requirements are discussed more fully in the test plans for traffic system and transit system data in Section 4.2.

[7] Margiotta, Richard A. et al., "Guide to Effective Freeway Performance Measurement: Final Report and Guidebook," NCHRP Project 3-68, August 2006.

Table 4-1. Congestion Analysis Approach

Hypotheses	Measures of Effectiveness	Data
The deployment of SF*park* and the 511 improvements will reduce traffic congestion on selected travel routes in the downtown area	• Change in travel time (transit vehicles) on select routes in the downtown • Change in travel time index • Change in travel time reliability, planning time index, and/or travel time variance on select routes in downtown • Change in vehicle throughput in high demand parking management zones • Change in person throughput in high demand parking management zones • Change in the ratio of average speeds peak to off-peak	• Route travel times • Traffic volumes • Vehicle occupancy
Travelers will perceive that congestion has been reduced	• Percentage of respondents reporting a perceived change in overall congestion in the downtown area • Percentage of respondents citing an improvement in travel time in the downtown area • Percent of respondents citing an improvement in travel time reliability in the downtown area • Percent of respondents citing a reduction in the duration of congestion in the downtown area • Percent of respondents citing a reduction in the extent of congestion in the downtown area	• Traveler survey responses

4.1.2 Pricing Analysis

The pricing analysis focuses on the affect of new parking management approaches and technology to manage San Francisco's parking supply and demand in ways that reduce the number and duration of vehicle trips, congestion, and double parking. There are seven parking pilot areas and three parking control areas as part of the SF*park* project. The pilots include approximately 6,000 on-street metered parking spaces (about 25 percent of the city's total) and 12,250 parking spaces in 15 of 21 SFMTA-managed parking garages, as well as one SFMTA-managed parking lot.

Table 4-2 presents the hypotheses/questions, measures of effectiveness, and data for the pricing analysis. SFMTA's demand-based pricing of parking is expected to result in:

- Increased parking availability due to higher turnover and mode shifts,
- Reduced parking search time and search time variability,
- Reduced frequency and duration of double parking,

- Improvement in reliability and speed of public transit as traffic flow is improved in SF*park* zones, and
- Shifts to other routes, modes, and other parking garages.

Table 4-2. Pricing Analysis Approach

Hypotheses/Questions	Measures of Effectiveness	Data
• Parking pricing will increase parking availability	• Change in the percentage of time that parking availability targets are met • Change in number of vehicles entering/exiting garages and parking on-street by time of day • Change in mode • Change in on- and off-street parking occupancy • Change in parking turnover	• Parking supply/activity data including duration, turnover, price, and tax data for non-SFMTA garages • Observational data from field surveys of parking search time, disabled placard use, double parking, and motorcycle occupancy survey • Reported behavior in visitor/shopper survey
• Parking pricing will lead to reduced search time and variability	• Change in parking search time (by parking management zone) • Change in variability of search time	• Parking search time survey
• Parking pricing will reduce double parking	• Change in double parking • Change in length of stay in commercial loading zones	• Double parking survey • Parking supply/activity data including duration, turnover, and price
• Parking pricing will shorten the duration of the average on-street parking session	• Change in number of parking sessions over X hours • Change in average duration of parking sessions	• Parking supply/activity data including duration, turnover, and price
• Parking pricing will improve reliability and speed of public transit	• Change in average transit running speed • Change in running speed variability • Change in schedule adherence • Change in headway adherence • Change in ridership on pilot area transit routes compared to control routes	• Transit speeds (entire route) accounting for loading and boardings/alightings • Schedule and headway adherence, date, and nature of significant transit service changes • Transit ridership (boardings and alightings)
• Parking pricing will cause a shift to other routes, modes, and other parking garages	• Reported changes in travel behavior attributed to parking pricing, including parking garage/lot, mode, and route use	• Visitor/shopper survey

Measures of effectiveness to test hypotheses will assess changes in parking supply, vehicles entering/exiting garages and parking on-street by time of day, modal split, parking turnover, parking search time, double parking, length of parking session, transit vehicle travel times (including schedule and headway adherence), and reported changes in travel behavior. The data for developing these MOEs will come from a variety of sources. The SF*park* technologies will measure parking duration, turnover, and price. Tax data will be used to assess activity in parking garages. Observational data on search time, disabled placard use,[8] double parking and motorcycle parking will be collected. The reported impact of the UPA strategies on travel behavior will be collected in a survey of visitors and shoppers. Muni bus system data will be used for assessing public transit improvements.

4.1.3 Telecommuting/TDM Analysis

The telecommuting/TDM element of the San Francisco UPA will be of a supportive nature to the primary activities of the UPA, namely the SF*park* and 511 enhancements. The telecommuting/ TDM activities will be conducted by the City of San Francisco DOE under the direction of the SFCTA. Three distinct activities are planned: promotion of SF*park* at DOE outreach events; promotion of 511 enhancements at outreach events; and co-location of a bike-sharing station at an SF*park* facility (e.g., parking structure). The primary objective of these activities is to inform downtown workers about the UPA initiatives and how to get additional information. By so doing, workers, as commuters and downtown travelers, can better use the parking, bike-sharing and information resources available to them. The bike-sharing component is contingent on pending grant activities and the timing of implementation of the city's bike-share system. As shown in Table 4-3, the three hypotheses focus on the impact of these outreach activities on awareness of the UPA activities and their influence on mode shift decisions.

Table 4-3. Telecommuting/TDM Analysis Approach

Hypotheses/Questions	Measures of Effectiveness	Data
• TDM events will increase the demand for information about SF*park* and 511 enhancements	• Total and average number of brochures on SF*park* and 511 distributed at events	• Number of events • Records of brochures distributed
• SF*park* and 511 enhancements will increase effectiveness of TDM program	• Rideshare registration rates	• Rideshare registration statistics
• Distribution of UPA-related information at events will influence parking program awareness and behavior change	• Attribution of SF*park* awareness and behavior change to events	• Survey data from visitor/ shopper survey on where information on SF*park* was obtained

[8] Vehicles displaying a disabled placard are permitted to park without time limits. Counting the number of parked vehicles with placards will be important in analysis of the availability of parking spaces to non-placarded vehicles.

The basic approach to analyzing telecommuting/TDM supportive efforts will be to document increases in the amount and type of information disseminated at DOE outreach events (to include SF*park* and 511 enhancements information) and infer the potential impact of this information on mode shift. Using existing metrics collected by DOE as well as tracking changes in rideshare registration rates, the evaluation can infer the influence of these activities on mode shifts, albeit these shifts cannot be directly measured with available data. In terms of assessing the influence of this outreach on awareness of the SF*park* initiative, additional information will be collected as part of the visitor/shopper survey. This will serve as a means to corroborate the findings from the event as to the proportion of visitors and parkers who heard about SF*park* via the events and who changed their travel behavior as a result.

4.1.4 Technology Analysis

Technologies, including intelligent transportation systems, underlie many of the UPA strategies being deployed in San Francisco. However, the technology analysis is not intended to be an assessment of the performance of the technologies, per se. Rather, the technology analysis is intended to quantify the degree to which those projects identified in the San Francisco UPA as "technology" projects contributed to the overall reduction in congestion and improved transportation system performance. As such, the technology analysis of the San Francisco UPA National Evaluation is structured to answer the following three evaluation questions:

- How did using advanced parking management technologies improve overall agency efficiency and operation to implement new parking pricing changes and manage parking?
- What effect did using advanced information technologies to disseminate information about parking rates and parking availability have on reducing parking search times and influencing travel decision-making?
- How did implementing advanced payment technologies (such as electronic payment cards and advanced parking meters) facilitate the collection of parking fees and influence travelers' mode and route choices in the corridor?

Parking Technology. Table 4-4 summarizes the hypotheses, measures of effectiveness, and data that will be used in the analysis of how deploying advanced parking management technology improves the SFMTA's ability to better manage parking in the target parking management zones. In this portion of the technology analysis, parking usage, enforcement, and technology performance measures will be used to provide a basic understanding of how the technology was used by SFMTA in the SF*park* zones.

Interviews with SFMTA staff will then be conducted to assess if and how agency operations and efficiencies were improved as a result of deploying the parking sensor technology. Usage and performance statistics will be collected monthly for each parking management zone while interviews with the agency personnel will occur toward the end to the evaluation period after agency personnel have accumulated significant experience with the technology.

Table 4-4. Technology Analysis Approach: Parking Sensors

Hypotheses/Questions	Measures of Effectiveness	Data

Implementing advance parking technology will improve agency ability to manage parking	• Number of parking sessions by:
	  o On-street
	  o Surface Lot
	• Number of entry and exits in SFMTA-controlled parking garages
	• Number of parking citations issued
	• Percentage of detectors/meters operational
	• Average (plus max and min) duration sensors are operational
	• Percent error in sensor accuracy (compared to observed – 3 tests)
	  o On-street
	  o Surface lots
		• SF*park* operations logs
		• SF*park* parking enforcement logs
		• Parking sensor logs
		• Parking occupancy survey

	• Changes in agency perceptions related to:
	  o Ability to better manage parking
	  o Ease of making change to parking rate
	  o Effectiveness of technology
	  o Limitations of technology
	  o Ability to target enforcement
	  o Improved cost-effectiveness of parking management operations
		• Interviews responses with SF*park* agency staff

Parking Information Dissemination Technology. A number of information dissemination technologies will be deployed as part of the San Francisco UPA Deployment, including the following:

- The installation of 14 new dynamic messages signs (DMS) by SFMTA[9]
- The implementation of text messaging and a website for parking information by SFMTA
- The inclusion of parking information into the current 511 system by MTC

The purpose of these information dissemination technologies is to provide pricing and availability information related to the on-street and garage parking, and to facilitate way finding to SF*park* parking management zones. The DMSs will also provide traffic information during incident conditions.

The national evaluation will collect performance and usage statistics that will show how travelers used the different information dissemination technologies available to them in the deployment area. Usage statistics will be aggregated for each parking management zone. These performance

[9] The deployment of the DMS has been delayed to December 2011, placing them a year behind the other UPA projects. Rather than delay evaluation of the rest of the projects, the decision was made not to include them in the national evaluation.

measures will be tracked over time and correlated with the current pricing structure to determine how changes in parking pricing impacted travelers' decisions. Travelers surveys will be used to collect information on how travelers used the different information dissemination technologies and how that use impacted their decisions on where and when to park. Table 4-5 shows the hypothesis, measures of effectiveness and data associated with the evaluation of the parking information dissemination technology being deployed as part of the San Francisco UPA Deployment.

Table 4-5. Technology Analysis Approach: Parking Information Dissemination Technologies

Hypotheses/Questions	Measures of Effectiveness	Data
Improving the dissemination of parking information via 511 phone, websites, and text messaging, will reduce parking search times	• Number of page views (per month per PMZ) for both 511.org and SF*park*'s parking websites • Average duration of parking page views session • Number of parking text messages sent (per month per PMZ) • Number of phone requests for Parking Information via 511	• MTC 511 website use logs • SF*park* website use logs • SF*park* operations logs • MTC 511 call logs
	• Change in reported median search time for travelers looking for parking spaces (before/after) • Percentage of respondents aware of each parking information source (511 phone, websites, text messaging) • Percentage of respondents using each parking information source • Percentage of respondents satisfied with information from each source on various attributes (e.g., accuracy, timeliness) • Percentage of respondents using information on parking pricing and availability to make travel decisions (e.g., mode, destination) • Percentage of respondents using parking information who reported reduced parking search time and space availability • Respondents general level of satisfaction with SF*park*	• Traveler survey responses

Electronic Payment Technology. Several electronic payment technologies will be installed as part of the San Francisco UPA deployment. The local partners are implementing a regional electronic payment card (TransLink®) that local travelers can use to pay for transit fares and on a pilot basis to pay for garage parking. In addition, SFMTA's new parking meters will allow travelers to pay their parking fee through an electronic payment system. It is envisioned that this approach will facilitate parking turnover and improve customer satisfaction in these parking management zones. As a result of the San Francisco UPA deployment, travelers in the downtown San Francisco areas can use electronic payment technologies in the following manner:

- The new parking meters will allow travelers to pay either by coin or credit card.
- Travelers who elect to park in selected public garages managed by SFMTA will be able to pay with their TransLink® card.
- Transit users can also use their TransLink® card to pay their fare on certain SFMTA Muni buses.

Performance measures will be monitored throughout the duration of the post-deployment period to examine how the use of these electronic payment systems varied over time. Travelers will also be surveyed during the post-deployment period to examine how having the ability to use these different forms of electronic payment influenced their mode and parking location decisions. Table 4-6 shows the hypotheses, measures of effectiveness and data that will be used in this portion of the Technology Analysis.

Table 4-6. Technology Analysis Approach: Electronic Payment System Technology

Hypotheses/Questions	Measures of Effectiveness	Data

Implementing electronic regional payment system technology (TransLink®) at selected garages will impact travelers' mode, payment type, and parking location decisions.	• Number of accounts with transactions (monthly) that were for:
	  o Transit only
	  o Parking only
	  o Both transit and parking
	• Number of transactions (monthly)
	  o Transit only
	  o Parking only (including monthly parking passes)
	  o Transit and parking within X minutes and on same day (e.g., parker use transit to run errand rather than drive)
	• Percentage of transit trips paid via electronic payment system
	• Percentage of garage entries paid by payment type (cash, credit card, TransLink®)
	• Percentage of on-street/surface lot parking session paid by payment type (cash, credit card, SFMTA pre-paid parking cards)
		• Electronic payment transaction records from MTC
		• Parking payment transaction records from SFMTA
		• Responses to survey of TransLink® card holders and possibly visitor/ shopper survey responses

Travelers will support the implementation of a single method of electronic payment (TransLink®) for both their transit and parking needs.	• Percentage of sampled travelers (transit and parking) indicating positive experience with electronic payment system • Percentage of sampled travelers (transit and parking) indicating negative experience with electronic payment system • Percentage of sampled travelers (transit and parking) indicating desire to expand electronic payment system • Frequency and types of complaints about electronic payment system	• Responses to survey of TransLink® card holders and possibly visitor/shopper survey responses • TransLink® customer service records

4.1.5 Equity Analysis

This analysis will examine potential equity impacts of the SF*park* pricing project. Experience with pricing projects throughout the country indicates that perceptions of fairness, or equity, may be a factor in the acceptance of proposed pricing projects, especially on how pricing impacts are distributed among minorities or lower income populations. Equity may also be a concern in the spatial distribution of services and infrastructure. Equity issues are important to assess because the impacts – both positive and negative – may contribute to public opinion and the potential success or failure of pricing projects.

As presented in Table 4-7, equity will be examined in four ways. First, the direct social effects from the San Francisco UPA projects on various user groups will be examined. These social effects may include parking fees paid, travel-time savings, and adaptation costs. The second hypothesis addresses the spatial distribution of aggregate out-of-pocket and inconvenience costs, and travel time and mobility benefits. Third, possible differential environmental impacts on certain socio-economic groups will be examined. This question addresses possible environmental justice issues. Finally, the reinvestment of revenues from parking pricing and how this reinvestment impacts user groups will be examined.

Data addressing these questions will come from a variety of sources as illustrated in Table 4-7.

Table 4-7. Equity Analysis Approach

Hypotheses/Questions	Measures of Effectiveness	Data
• What are the direct social effects (parking fees, travel times, adaptation costs) for various transportation system user groups? • What is the spatial distribution of aggregate out-of-pocket and inconvenience costs, and travel-time and mobility benefits? • Are there any differential impacts on certain socioeconomic groups?	• Socio-economic and geographic distribution of benefits and impacts o Parking fees and adaptation costs o Changes in travel time & trip distance o Total transportation cost o Environmental impacts (environmental justice) • Public perception of the individualized equity impacts of parking pricing	• Parking account data, if available – home zip code, frequency of use, etc. • Parking revenue • Interviews with agency representatives, policy makers, and other key stakeholders • Survey data on reported travel and parking behavior, transportation costs, perceptions of benefits, etc. • Traffic and transit data • Air quality modeling outputs • Regional socio-economic data
• How does reinvestment of parking pricing revenues impact various transportation system users?	• Spatial and modal distribution of revenue reinvestment	• Parking revenue distribution by area and mode

4.1.6 Environmental Analysis

The environmental analysis will address air quality and energy impacts. The analysis approach outlined in the National Evaluation Framework, which measures changes in traffic volumes in terms of VMT and then applies emission factors for each pollutant, is consistent with the approaches used in other pricing pilot projects, namely those in London and Stockholm and on FHWA Value Pricing pilot projects on I-15 (San Diego), I-394 (Minneapolis) and SR 91 (Orange County, California).

One overall goal of SF*park* is to reduce automobile impedance of transit vehicles, thus increasing transit speeds and travel time reliability. Decreased impedance of transit vehicles could improve overall traffic flow and speeds for all vehicles thereby attracting more non-transit vehicles and increasing non-transit VMT. Thus, one unintended impact of SF*park* could be increased VMT due to induced travel. This will be very difficult to measure, as it would require measurement of net changes in VMT for all of downtown. For this reason, the evaluation will not attempt to measure air quality impacts from potential induced demand.

Table 4-8 summarizes the environmental analysis approach. The first air quality hypothesis focuses on observed or estimated reductions in vehicle miles of travel (VMT) resulting from three possible outcomes of SF*park*: 1) mode shift to transit, 2) reduced VMT from less search for parking, and 3) reduced idling from fewer cars double or illegally parked. The second hypothesis focuses on perceptions of the public and stakeholders as to the overall environmental impacts of the projects. The third hypothesis involves the potential for energy saving as estimated using VMT reductions.

Table 4-8. Environmental Analysis Approach

Hypotheses/Questions	Measures of Effectiveness	Data
• SF*park* will improve air quality by reducing parking search times and shifting trips from car to transit	• Mode shift to transit • Reductions in idling • Reductions in VMT • Reductions in ozone precursors, NO_x, PM, and CO_2	• Travelers' reported mode shift • Changes in transit ridership • Measured reductions in parking search time converted to VMT reduction • Incidence of idling while double-parked • Emission factors for each pollutant
• The public will perceive an improvement in air quality resulting from SF*park*	• Perceived changes in air quality	• Surveyed visitors/shoppers' perceptions of air quality • Stakeholders' perceptions of air quality
• SF*park* will reduce fuel consumption by reducing parking search times and shifting trips from car to transit	• Mode shift to transit • Reductions in idling • Reductions in VMT • Reduction in fuel consumption	• Visitor/shopper reported mode shift • Changes in transit ridership • Measured reductions in parking search time converted to VMT reduction • Changes in the incidence of idling while double parked • Fuel consumption factors

The air quality impacts will be analyzed using two primary sources of "observed" data: parking search time data (from search time surveys) and transit ridership data (from transit operators) used to estimate VMT changes. Changes in the amount of idling due to double parking will be documented, but will not be sufficient for emissions analysis. Emission factors for the San Francisco region, provided by the California Air Resources Board and approved by MTC, will be utilized to estimate the emission reductions associated with reduced miles of travel attributable to SF*park*. The Air Resources Board will use the EMFAC 2007 model for the San Francisco region to derive the emission factors (emissions reduced per mile). (FHWA has recommended that another alternative be considered for San Francisco and other UPA/CRD sites, and that is the use of EPA's new MOVES [Motor Vehicle Emissions Simulator] model. Use of MOVES would require additional data collection, including driving cycle data. The evaluation team will explore this alternative with FHWA and include the final approach in the detailed test plans.) VMT reductions from mode shift may use different emission factors than reductions from less cruising for parking, given the difference in average speeds for each kind of travel. Average fuel consumption per mile for the San Francisco Bay Area will be used to estimate energy savings.

4.1.7 Goods Movement Analysis

Commercial vehicle operators (CVOs), making deliveries to and parking in SF*park* zones, are expected to experience benefits related to improved travel and parking conditions. Frequently there are no available parking spaces for CVOs and often loading and freight zones are occupied, and as a result CVOs double park, which can reduce street capacity by as much as 40 percent and contribute significantly to congestion.

Table 4-9 presents the goods movement analysis approach for the San Francisco UPA. CVO travel and parking conditions are expected to improve based on four hypothesized effects of the SF*park* program: 1) CVO double parking is expected to decrease; 2) CVO fines are also expected to decrease; 3) parking availability in response to pricing, including loading and freight zones, will increase in the SF*park* areas; and 4) travel times will decrease in the SF*park* areas for CVOs and other vehicles. These hypotheses will be tested by measuring changes in double parking, double parking fines, parking availability, and travel times before and after the implementation of the program in the SF*park* areas relative to control areas. The data to test these measures will be obtained from double parking surveys, records of double parking violation, as well as parking supply and traffic data from sensors.

Table 4-9. Goods Movement Analysis Approach

Hypotheses/Questions	Measures of Effectiveness	Data
• CVO double parking will decrease in the SF*park* areas.	• Change in CVO double parking frequency before and after SF*park* areas compared to the control areas.	• Double parking surveys
• CVO double parking fines will decrease in the SF*park* areas.	• Change in CVO double parking fine frequency before and after SF*park* areas compared to the control areas.	• Records of CVO double parking violations.
• Parking availability, including loading and freight zones, will increase in the SF*park* areas.	• Change in parking availability before and after SF*park* areas compared to control areas.	• Parking supply and activity from sensors by zone including parking duration and turnover.
• Travel times will decrease in the SF*park* areas for CVOs and other vehicles.	• Change in vehicle travel times before and after SF*park* areas compared to control areas.	• Traffic data including volumes, densities, and speeds by time of day, location, and lane.

4.1.8 Business Impacts Analysis

This element will examine the impact of the San Francisco UPA SF*park* project on retail and similar businesses. The SF*park* project is expected to improve parking availability and travel time for customers accessing businesses in the SF*park* areas. However, it is also possible that the added parking costs of the program may discourage some customers from frequenting SF*park* businesses.

Table 4-10 highlights the approach for analyzing the impacts of the SF*park* project on retail and similar businesses that rely on customers accessing their location. The first hypothesis is that sales will increase in the SF*park* areas. Sales tax receipts are available in San Francisco at a geographic scale that is fine enough to assess the impact of SF*park* compared to control areas.

The second hypothesis is that overall travel to access retail and similar businesses will increase in the SF*park* areas. Parking supply and activity data from sensors will be used to test for significant changes in the number of parking events before and after the implementation of the SF*park* program in the treatment and control areas. In addition, data from a survey of visitors and shoppers will be examined for changes in the number, destination, mode choice, and reasons for change in travel to the SF*park* areas relative to the control areas.

Table 4-10. Business Impacts Analysis Approach

Hypotheses/Questions	Measures of Effectiveness	Data
• Sales will increase in the SF*park* areas.	• Change in sales tax receipts before and after SF*park* areas compared to the control areas.	• Sales tax receipts.
• Overall travel to access retail and similar businesses will increase in the SF*park* areas.	• Change in parking and travel (i.e., number of trips by destination by mode) before and after SF*park* areas compared to the control areas. • Travelers' reported reasons for change in travel to SF*park* areas.	• Parking supply and activity from sensors by zones including parking duration and turnover. • Visitor/shopper survey data.

4.1.9 Non-Technical Success Factors Analysis

This analysis will collect lessons learned about non-technical success factors from the San Francisco UPA. These non-technical success factors include outreach, political and community support, and the institutional arrangements used to manage and guide implementation of the San Francisco UPA projects. Information on the non-technical success factors is of benefit to the U.S. DOT, state departments of transportation, MPOs, and local communities interested in planning and deploying similar projects.

Table 4-11 presents the questions, measures of effectiveness and data sources associated with the analysis of the non-technical success factors. The first hypothesis/question focuses on understanding how a wide range of variables influence the success of the San Francisco UPA project deployments. The variables have been grouped into five major categories: (1) people, (2) process, (3) structures, (4) media, and (5) competencies. The categorization scheme emerged from the Hubert H. Humphrey Institute of Public Affairs' recent study of the Minnesota UPA process leading up to that site's UPA award by U.S. DOT.[10]

As indicated in Table 4-11 this analysis relies heavily on information provided by the San Francisco UPA partners. Input from the San Francisco UPA partners will be collected using the formal mechanisms shown in Table 4-11, which includes rounds of interviews followed by a group workshop addressing the non-technical success factors. Additionally, information will be gleaned informally through observation and interaction with the San Francisco UPA partners over the course of the demonstration, as well as an examination of formal partnership documents, outreach material, and media coverage. The second question guiding this analysis focuses on public opinion regarding the San Francisco UPA project. Does the public view the UPA projects

[10] John M. Bryson, Barbara C. Crosby, Melissa M. Stone, J Clare Mortensen (2008). "Collaboration in Fighting Traffic Congestion: A Study of Minnesota's Urban Partnership Agreement." Report no. CTS 08-25, University of Minnesota ITS Institute. December.
http://www.its.umn.edu/Publications/ResearchReports/reportdetail.html?id=1714

as effective and appropriate ways to reduce congestion? Public opinion data, if available, and information from the stakeholder interviews will be used.

Table 4-11. Non-Technical Success Factors Analysis Approach

Hypotheses/Questions	Measures of Effectiveness	Data
• What role did factors related to these five areas play in the success of the deployment? 1. People (sponsors, champions, policy entrepreneurs, neutral conveners) 2. Process (forums [including stakeholder outreach], meetings, alignment of policy ideas with favorable politics and agreement on nature of the problem) 3. Structures (networks, connections and partnerships, concentration of power and decision-making authority, conflict-management mechanisms, communications strategies, supportive rules and procedures) 4. Media (media coverage, public education) 5. Competencies (cutting across the preceding areas: persuasion, getting grants, conducting research, technical/technological competencies; ability to be policy entrepreneurs; knowing how to use markets)	• Observations from UPA participants	• One-on-one interviews followed by group workshops: – End of planning and implementation phase – End of UPA one-year operational evaluation period
	• Partnership documents (e.g., Memoranda of Understanding)	• UPA partners' documents
	• Outreach materials (press releases, brochures, websites, etc.)	• UPA partners' outreach materials
	• Radio, TV and newspaper coverage	• Internet-based tracking of media coverage • UPA partners' files
• Does the public support the UPA strategies as effective and appropriate ways to reduce congestion?	• Public opinion	• Survey of general public about the UPA project • Comments at public forums

4.1.10 Cost Benefit Analysis

The purpose of the cost benefit analysis (CBA) is to quantify and monetize the potential costs and benefits that may be incurred from implementing the San Francisco UPA projects. The net benefit from the UPA projects, which is the difference between the total benefits and the total costs, will indicate the potential returns from the public investment. The cost benefit analysis plays an important role in determining the feasibility of transportation projects because the results from the analysis are easily understood and acknowledged.

The cost benefit analysis will be performed using a 10-year time frame (the 10 years following implementation of the San Francisco UPA projects). Within this evaluation time frame, the cost benefit analysis will estimate and compare annual benefits and costs between two scenarios—before and after implementation of the San Francisco UPA projects.

Since the UPA projects focus on reducing congestion in the San Francisco downtown area, the expected benefits include travel-time savings, vehicle operating cost savings, increases in travel time reliability, and increase in business activities. On the cost side, the capital costs of the UPA projects will be included, as will operating and maintenance costs, and replacement and reinvestment costs for technology components, such as new facilities for charging parking prices. For communities, the potential benefits include reduction in emissions.

The cost benefit analysis for the San Francisco UPA projects depends on several types of data. These data sources include the future traffic forecasts from the regional travel demand model, the data collected from surveys, and the project investment or the expenditures of the local government agencies.

To examine the impacts of certain parameters on the net benefits calculated in the cost benefits analysis, a sensitivity analysis will be conducted. Vehicle operating cost savings, for instance, are one of the major benefits that will be experienced by drivers and freight transportation. The calculation of the vehicle operating cost savings depends on fuel price, which has been volatile in recent years. Because forecasting the future movement of fuel price is beyond the scope of the San Francisco UPA evaluation, a sensitivity analysis will be utilized to examine the impacts of fuel price on vehicle operating cost savings and the net benefit generated from the cost benefits analysis.

Table 4-12 summarizes the key hypothesis/question that will be addressed by the cost benefit analysis and the main data components that will be calculated in the analysis.

Table 4-12. Cost Benefit Analysis Approach

Hypotheses/ Questions	Data
• What is the net benefit (benefits minus costs) of the San Francisco UPA projects?	• Much data will come from other analyses and test plans (traffic, safety, etc.) • Cost data include: – Capital costs – Operation and maintenance costs – Replacement and re-investment costs • Benefits data include: – Travel time savings – Vehicle operating cost savings – Improvement in travel time reliability – Increase in business activities – Reduction in emissions

4.2 Preliminary Evaluation Test Plans

Individual test plans will be developed and conducted to collect and analyze the data needed to assess the hypothesis in the 10 evaluation analyses presented in Section 4.1. The 10 test plans for the San Francisco UPA are:

- Traffic System Data Test Plan
- Parking Data Test Plan
- Transit System Data Test Plan
- Telecommuting/TDM Data Test Plan
- Traveler Information System Data Test Plan
- Surveys and Interviews Test Plan
- Environmental Data Test Plan
- Content Analysis Test Plan
- Cost Benefit Analysis Test Plan
- Exogenous Factors Test Plan.

Table 4-13 illustrates the relationship among the 10 test plans and the 10 evaluation analyses. The use of data from the various test plans in assessing the evaluation analyses – both as major input and as supporting input – is highlighted. Table 4-14 presents the more specific data needed for each of the 10 evaluation analyses that will be included in the test plans. Figure 4-1 summarizes the schedule for data collection.

The remainder of this section summarizes the key elements of each of the 10 test plans. Preliminary information on the data sources, data availability, data analysis, and the data collection schedule and responsibilities is presented. The more detailed test plans will be developed as the next step in the evaluation process.

Table 4-13. Relationships Among Test Plans and Evaluation Analyses

San Francisco UPA Test Plans	Congestion Analysis	Pricing Analysis	Telecommuting/ TDM Analysis	Technology Analysis	Equity Analysis	Environmental Analysis	Goods Movement Analysis	Business Impact Analysis	Non-Technical Success Factors Analysis	Cost Benefit Analysis
Traffic System Data Test Plan	●				○		●			
Parking Data Test Plan		●		○	○	○	●	○		
Transit System Data Test Plan	○	●			○	○				
Telecommuting/TDM Data Test Plan			●							
Traveler Information Data Test Plan				●						
Surveys and Interviews Test Plan	●	●	●	●	●	○		○	●	○
Environmental Data Test Plan					○	●				
Content Analysis Test Plan									●	
Cost Benefit Analysis Test Plan								●		●
Exogenous Factors Test Plan	○	○		○						

● — Major Input ○ — Supporting Input

Table 4-14. Data for the Evaluation Analyses

Evaluation Data	Congestion	Pricing	Telecommuting/ TDM	Technology	Equity	Environmental	Goods Movement	Business Impacts	Non-Technical Success Factors	Cost Benefit
Traffic Data										
Travel times	X				X		X			
Travel speeds	X				X		X			
Traffic volumes	X						X			
Vehicle occupancy	X									
Parking Data										
Search time		X				X				
Duration		X					X	X		
Turnover		X		X			X	X		
Price		X								
Garage parking tax		X								
Disabled placard use		X								
Double parking and idling		X				X	X			
Motorcycle parking		X								
Transit Data										
Travel times		X			X					
Schedule adherence		X			X					
Headway adherence		X			X					
Transit service changes		X								
Ridership	X	X				X				
Traveler Information Data										
Website usage logs				X						
511 phone usage logs				X						
Text messaging usage logs				X						
Parking Payment Data										
TransLink® data				X	X					
SF*park* payment data				X	X					

Table 4-14. Data for the Evaluation Analyses (Continued)

Evaluation Data	Congestion	Pricing	Telecommuting/ TDM	Technology	Equity	Environmental	Goods Movement	Business Impacts	Non-Technical Success Factors	Cost Benefit
Surveys/Interviews: Transportation Experience and Opinion Data										
Traveler behavior	X	X	X	X	X	X		X		X
Traveler costs					X					X
Public/travelers' perceptions	X			X	X	X		X	X	
SF*park* operations staff				X						
Stakeholders experience and opinions					X	X			X	
Agency Data										
TDM event data			X							
Agency cost data										X
Parking revenue					X					
Transportation model outputs										X
SF*park* operations logs				X						
SF*park* enforcement logs				X			X			
Retail sales tax data								X		X
Regional socio-economic data					X					
Air quality emissions factors					X	X				
Vehicle fuel use factors						X				
Stakeholder documents									X	
Stakeholder outreach materials			X						X	
TransLink® Customer Service logs										
Media Coverage/Public and Political Outreach Information									X	

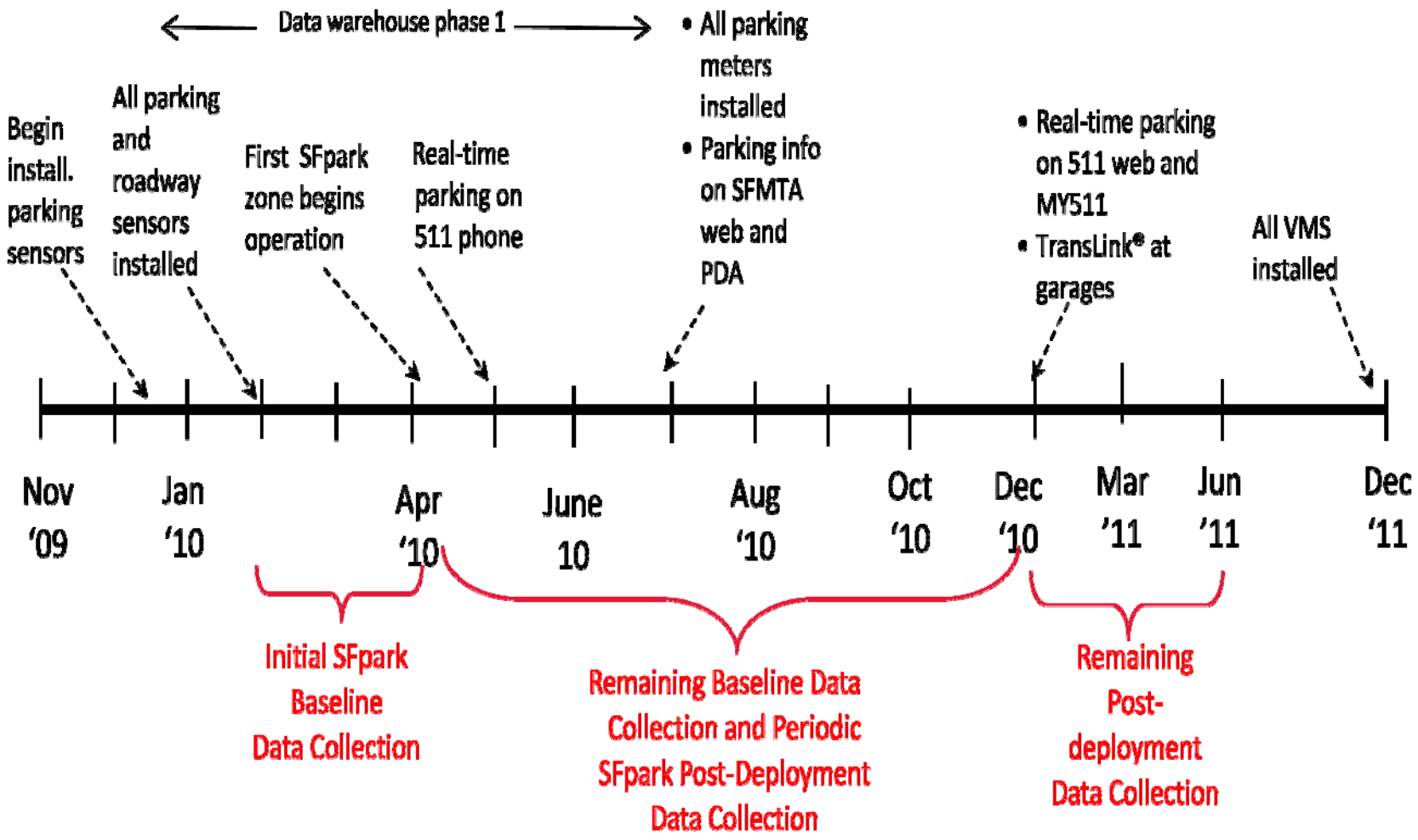

Figure 4-1. San Francisco UPA Projects Deployment and Evaluation Data Collection Schedule

4.2.1 Traffic System Data Test Plan

Data Sources

The following sources of traffic system data are recommended for use in the national evaluation. At the time of this writing, the national evaluation team and the local partners were investigating potential methods for collecting the recommended data. The specific methods will determine which of the recommended data sources end up being available, and these will be defined in the detailed test plan at a later date.

Vehicle Travel Time Data. SFMTA is investigating use of parking sensors installed as a network of traffic sensors. These sensors would be deployed to provide a saturation of volume counts and potentially speed measurements throughout the different parking management zones. While these sensors are not likely to provide direct measurements of travel times, the national evaluation team is working with SFMTA to determine other potential surrogate measures for travel time, which can be used to assess congestion reduction impacts. The parking sensor vendor has tested the sensor for a variety of non-parking data collection applications, which need to be investigated further for use in the national evaluation.

Transit Probe Travel Time Studies. Muni AVL-equipped buses (described in Section 4.2.3) are one potential source of travel time data in the study area. Probe travel time studies will need to be performed in the pre- and post-deployment conditions and potentially after significant pricing changes in each parking management zone.

Traffic Volume Counts. As mentioned previously, SFMTA is considering deploying a network of sensors that will allow traffic volume information to be obtained from the network. These sensors are expected to be the same type of sensors used to determine vehicle occupancy in parking spaces. Information from this sensor network can be used to compute changes in vehicle throughput in the corridor. Traffic counts should be performed pre-and post-deployment, and after each significant rate change in each parking management zone.

Vehicle Occupancy Counts. Data on the average number of occupants per vehicle class are needed for the congestion analysis. The anticipated types of vehicle classes from which these data are needed include passenger vehicles, HOV vehicles (carpools and vanpools) and transit. One of the stated objectives of SF*park* is to promote mode shift (especially to transit), and, therefore, it will be particularly important to gather information on vehicle occupancy rates to determine if UPA improvements achieved this objective. Vehicle occupancy levels are critical in computing passenger throughput at both the facility and corridor levels. It is highly recommended that pre- and post-deployment sampling of vehicle occupancy rates be conducted as part of the evaluation. The approach would be to collect occupancy rates on selected routes. For transit occupancy the automatic passenger counter data can be sampled to calculate average transit occupancy for those routes. For other types of vehicles a protocol for field observation should be developed to count the number of occupants in each vehicle.

Data Availability

Much of the traffic system data is envisioned to be included in SFMTA's data warehouse, which is being constructed as part of the UPA deployment. While the bulk of the data that will be included in the data warehouse is parking sensor data, the warehouse is envisioned also to retain in-road sensor data and manually collected data.[11] Data from the special studies recommended for the national evaluation could also be housed in the data warehouse, including the vehicle occupancy counts, traffic volume counts, and probe vehicle studies. SFMTA currently envisions that data will be added to the data warehouse on either a real-time basis or through nightly batch processes. SFMTA plans on granting the national evaluation team access to the data warehouse. It is anticipated that the evaluation team will access the data warehouse and extract the pertinent traffic system data on a monthly basis.

Data Analysis

Traffic system data will be used in a number of analyses including the congestion analysis, the technology analysis, the pricing analysis, and others. These data will be used to conduct before-and-after analyses to gauge the extent to which system performance was enhanced as a result of the UPA deployments. Examples of the measures that use traffic system data include the following:

- Change in transit travel time on select routes
- Change in transit travel time reliability and variance
- Change in vehicle and passenger throughput
- Change in peak-to-off-peak average travel speed

Data Collection Schedule and Responsibility

SFMTA will be responsible for securing the traffic system data and making it available to the Battelle team. Traffic sensor data should be archived on a continuous basis and incorporated into the SFMTA data warehouse system on a regular basis. SFMTA will be responsible for any special traffic data collection, which need to be collected on a routine basis – at least every quarter and/or after major parking price changes. However, what specific data and how SFMTA will collect the data will be specified in the detailed test plan.

The Battelle team will be responsible for the analysis of the traffic data. Prior to using any of the traffic system data in the analysis, the Battelle team, with the assistance of SFMTA, will inspect the data so as not to include any suspect or obviously invalid data which could bias the results of the analyses. Pre- and post-deployment data from control sites will be compared to data from deployment sites to ensure data trends are similar.

Table 4-15 shows the schedule for baseline and post-deployment data collection of the traffic system data.

[11] SF*park* Data Warehousing Plan. SFMTA. January 6, 2009.

Table 4-15. Traffic System Data Collection Schedule

Project Element	Baseline Data	Post-Deployment Data
Vehicle Travel Time Data	Winter 2010	April 2010 through Spring 2011
Transit Probe Travel Time Studies	Winter 2010	April 2010 through Spring 2011
Traffic Volume Counts	Winter 2010	April 2010 through Spring 2011
Vehicle Occupancy Counts	Winter 2010	April 2010 through Spring 2011 – periodic sampling (recommend quarterly)

4.2.2 Parking Data Test Plan

Data Sources

The parking data test plan supports six evaluation analysis areas: pricing, goods movement, technology, environmental, equity, and business impacts. The data will come from four primary sources, including field observational survey data, data generated by parking system technology, parking operations and enforcement data, and tax data for garages. SFMTA's data warehouse will be the repository for the data for this test plan.

Field Observational Survey Data. Field observation will be used to collect the types of data related to parking patterns in SF*park* and control zones that are not available from the installed parking technology. The surveys will be collected by personnel stationed in the field and collecting the data using preset protocols to ensure data reliability. Pre-deployment and post-deployment surveys will be conducted to collect the following data:

- Parking search time. Surveyors will record the time it takes to find the first available parking space and its location using preset routes.
- Disabled placard use. The disabled placard survey will document how many spaces are occupied by vehicles with a disabled placard and the turnover rates for them. This is an area of interest for the city as there is a policy in San Francisco that allows vehicles with a disabled placard to park for free and unlimited times in metered spaces.
- Double parking. Surveyors will identify instances of double parking. They will also record the incidence of idling vehicles as part of this survey for use in the environmental analysis. A double parking survey will help clarify the impact of SF*park* on double parking due to increased availability (e.g., length of stay in commercial loading zones).
- Motorcycle occupancy. Surveyors will identify the number and location of parking spaces occupied by motorcycles. These data will be used to assess increases in motorcycle parking availability due to pricing.

Parking Technology Data. Technology installed as part of the SF*park* program will provide automated data on usage and pricing. Parking sensors installed in spaces on-street and at one SFMTA parking lot will detect the presence of a parked vehicle, which will be used to measure parking availability and session durations. Parking payment data will come from parking meters

for on-street and parking lot payment and from garage payment systems. The parking payment and transaction data include the following:

- The number of parking meter sessions paid for by coin/cash, credit card, and/or smart card;
- The number of parking garage entries paid for by coins/cash, credit card, and/or electronic payment card (including TransLink®); and
- The amount of revenue collected by the parking management system through each of the payment methods.

Parking Operations and Enforcement Data. The national evaluation team will also review any logs maintained by parking operations and enforcement personnel that can be used to quantify how agency operational procedures change as a direct result of implementing new parking pricing strategies. Examples of the types of data expected to be obtained through these logs include the following:

- The number and frequency of parking rate changes;
- The number, type, and frequency of enforcement activities performed;
- The number of parking citations issued in each parking management zone; and
- The number of requests for special parking enforcement activities in each parking management zone.

Parking Tax Data for Garages. Since privately run garages are also part of the parking supply, parking tax data are an available data source for monitoring usage at those locations. A 25 percent tax is assessed (with approximately a three to six month delay in tax data availability) for both SFMTA and non-SFMTA facilities. The locations of non-SFMTA garages (off-street) will be identified in a manual census of garages available to the public conducted by SFMTA. Parking tax data for those locations should result in useful tax data for non-SFMTA facilities. These tax data will be used to approximate changes in supply, activity, and price during the pilot. Such data for non-SFMTA garages will likely be aggregated for small geographic areas.

Data Availability

The data identified in this test plan are part of SFMTA's planned data collection process. The data will be available to the national evaluation team either from the SF*park* data warehouse or other means.

Data Analysis

The data will be used to develop measures of effectiveness for several analyses. Examples of measures of effectiveness to be derived using data collected through this Parking Data Test Plan include:

- Change in parking availability targets, vehicles by time of day, mode, on- and off-street parking occupancy, and parking turnover;
- Change in parking search time;
- Change in variability of search time;

- Change in double parking and length of stay in commercial loading zones; and
- Change in average length of parking sessions;
- Parking revenues: and
- Air quality impacts of idling vehicles.

Data Collection Schedule and Responsibilities

Table 4-16 highlights the proposed data collection schedule for the parking data test plan. Baseline collection for the parking technology data should begin as soon as the sensors are installed in the winter of 2010. All other baseline data collection should be conducted prior to the start of variable pricing, which is now scheduled for April 2010 in the initial SF*park* zones. Data collection would continue through the spring of 2011 to provide at least one full year of post-deployment data for the last SF*park* zone to go operational.

Table 4-16. Parking Data Collection Schedule

Data	Baseline Data Collection	Post-Deployment Data Collection
Parking Technology	Winter 2010	April 2010 – Spring 2011
Field Observational Survey Data	Winter 2010	April 2010 – Spring 2011
Parking Operations and Enforcement Data	Winter 2010	April 2010 – Spring 2011
Garage Tax Data	Winter 2010	April 2010 – Spring 2011

Battelle team members will work with SFMTA and DOT personnel to establish the data collection and analysis protocol. SFMTA will be responsible for all data collection, with the exception of MTC providing TransLink® data. The Battelle team will analyze the data and report the findings.

4.2.3 Transit System Data Test Plan

Data Sources

Muni APC System Logs. As part of their Transit Effectiveness Project (TEP), SFMTA installed automatic passenger counter (APC) devices on approximately 25 percent of their bus transit fleet. This system uses infrared sensor technologies to measure passenger boarding and alighting activity at each transit stop and to generate passenger loading information. Passenger loading and boarding information will be used by the national evaluation team to determine if changes in parking pricing caused a shift in travel demand to transit. Data by route, bus stop and time of day and week are needed.

Muni AVL System Logs. Each APC-equipped bus also contains global positioning system (GPS) technologies as part of the automatic vehicle location (AVL) system. The GPS technologies can potentially be used to derive transit running times on corridors where the intelligent parking system has been deployed. GPS technology records the position of the transit vehicle when the doors are opened and closed for passenger boarding. Using this information,

the evaluation team will compute the average running time between bus stops and the average corridor running time (the actual travel time minus the transit dwell time) as a surrogate for vehicle travel time. Unfortunately, the Muni AVL transit logs may not shed light on the source of delays between transit stops (i.e., whether transit delays were caused by parking maneuvers or signalized intersections, etc.).

NextBus (or NextMuni) System Logs. Another potential source of transit travel time information is the NextBus system installed on SFMTA Muni transit vehicles, known as NextMuni. NextBus technology uses GPS positioning, coupled with computer modeling, to track transit vehicles on their route. The software uses the actual position of the vehicle, their intended stops, and typical traffic patterns to estimate (within a minute) the expected arrival time of buses at each stop. Anticipated bus arrival times at each stop location are then made available to transit riders via the NextBus website, electronic signs located at stops, and through mobile communication devices.

It is unclear at this time whether or not this is a viable source of transit travel time information. To be a viable source of transit information, the evaluation team would need access to position information collected by vehicles as they traversed through the study corridors. It is unclear at this time what (if any) vehicle position information is retained and by whom.

San Francisco Bay Area Rapid Transit (BART) Ridership Data. The BART system automatically collects boardings and alightings of passengers using BART at the turnstiles in each station. Data for BART's stations in San Francisco will be collected by SFMTA and included in the data warehouse.

Data Availability

Pre-deployment and post-deployment transit data from Muni APCs and BART boardings/ alightings at San Francisco stations will be used in the analysis. Currently, approximately 25 percent of Muni buses are equipped with APCs. To facilitate comparisons, the evaluation team will focus on strategic roadways that include major transit lines that travel through the SF*park* zones. Thus, transit data will be collected from strategic roadways within the deployment zones, such as Fillmore, Mission, Chestnut, Union, Market, Van Ness, and North Point. There is a possibility that the APC coverage on the routes of interest to the national evaluation will not be adequate, in which case the NextBus data may be a viable alternative in some cases.

Data Analysis

Transit travel times and passenger loading information from transit routes that travel through the SF*park* pilot area will be used to assess the impacts of parking pricing on both mode shift and transit service. Standard statistical procedures will be used to compare changes in transit ridership and transit running times in the strategic corridors after each parking price change. SFMTA expects that parking rates are likely to change every four to eight weeks throughout the "after" period in each of the parking management zones. This pricing change will need to be correlated with transit vehicle performance to gauge the impacts of parking pricing strategies.

Data Collection Schedule and Responsibilities

SFMTA will be responsible for making the transit data available to the evaluation team; they will be available through the data warehouse. The Battelle team is responsible for analyzing the data and reporting the findings. Table 4-17 presents the transit system data collection schedule.

Table 4-17. Transit System Data Collection Schedule

Project Element	Baseline Data	Post-Deployment Data
Muni APC System Logs	April 2009 – March 2010	April 2010 – Spring 2011
Muni AVL System Logs	April 2009 – March 2010	April 2010 – Spring 2011
NextBus (or Next-Muni) Logs	April 2009 – March 2010	April 2010 – Spring 2011
BART Boardings/Alightings (San Francisco Stations) Logs	April 2009 – March 2010	April 2010 – Spring 2011

4.2.4 Telecommuting/TDM Data Test Plan

The telecommuting/TDM data test plan will be used primarily for the telecommuting/TDM analysis. It also supports the congestion, environmental, equity, business impacts, and cost benefit analyses. SFCTA and the DOE are still working out the final plans for including SF*park* and 511 enhancements in their outreach events. As a result, the final telecommuting/TDM test plan will be developed in cooperation with SFCTA and DOE, based on the final outreach plan. Activities related to bike-sharing will be added if this element is added to the telecommuting/TDM element of the UPA. (This activity is pending separate funding approval and discussion between MTA and SFCTA.) Therefore the test plan description provided here focuses on evaluating the outreach element of the telecommuting/TDM activities of the UPA for San Francisco.

Data Sources

The primary source of data for the telecommuting/TDM analysis will be records of outreach events held by the DOE and surveys of travelers. The evaluation will also track trends in ridesharing registration statistics to infer whether the additional information provided at outreach events has an impact on rideshare registration levels. Finally, questions in the visitor/shopper survey can document the recall of outreach events as a source of information on SF*park.*

Records of Outreach Events. DOE plans to conduct outreach events in downtown San Francisco for commuters in order to provide information on alternatives to driving alone to work. These events are held in public places with significant foot traffic, at employment sites, or in conjunction with other events (e.g., Earth Day, Carfree Day). These events are planned on a 3-month rolling basis, and DOE or SFCTA will provide to the national evaluation team a listing of planned events over the course of the evaluation period. The events will provide a venue for distribution of information on SF*park* and 511, and DOE will track the number of brochures distributed.

Rideshare Registration Data. Ridesharing registration trends, as maintained by MTC as part of regional ridematching activities, will be tracked to assess potential changes in registration levels that might be influenced by the additional information provided at outreach events.

Surveys of Travelers. The visitor/shopper survey (described in Section 4.2.6) that SFMTA will conduct will be used as a corroborative source of data. The visitor/shopper survey should collect information about respondents' awareness of the parking changes and the source of this information prior to their visit. One category for this source of information should be a DOE/employer outreach event.

Data Availability

It is anticipated that the data needed to assess the impacts of the telecommuting/TDM outreach information about UPA activities will come from data collection activities already planned by SFMTA and from regular tracking data available from DOE and/or SFCTA. DOE would also need to begin recording the number of SF*park* and 511 brochures distributed at each event. Rideshare registration trend data will be available from MTC and is also a regular reporting activity that DOE tracks as part of their standard set of metrics of their outreach activities. The visitor/shopper survey will be undertaken by SFMTA. To support the telecommuting/TDM analysis, the survey should include a question about how the respondent learned of the variable parking prices, with one of the response categories being the DOE outreach events.

Data Analysis

The Battelle team will perform the analysis of telecommuting/TDM outreach effectiveness in informing commuters about parking changes and parking information. Data provided by DOE outreach events and survey data from SFMTA will be the basis of the analysis.

The analysis will be largely qualitative or descriptive in terms of the amount of information distributed and role of outreach in providing information to commuters on UPA activities. To the extent possible, the analysis will attempt to infer the influence of this information on parking or mode behavior, based on rideshare registration data and SFMTA surveys.

Data Collection Schedule and Responsibilities

The DOE will be responsible for providing records of the events they conduct and the metrics they track including rideshare registration statistics. SFMTA will provide the visitor/shopper survey data. All the data collection will be post-deployment following the start of operation of SF*park* pricing in April 2010 through the spring of 2011.

The Battelle team is responsible for coordinating with SFMTA, DOE, and SFCTA, providing technical assistance to local partners to incorporate UPA-specific survey questions as appropriate, analyzing the data, and reporting the findings.

4.2.5 Traveler Information System Data Test Plan

Data Sources

SF*park* Website Use and Operations Logs. As part of the SF*park* deployment, the SFMTA is planning on implementing a self-maintained website that provides up-to-the-minute parking

availability and pricing information from all the different parking management zones. Travelers can access the website and/receive text messages about parking availability from their mobile devices. The national evaluation team anticipates that logs will be generated that can be used to monitor the number and duration of requests for parking information from SFMTA's website and from their text messaging system.

511 Logs and Usage Reports. SFMTA will feed real-time parking availability and pricing information to the Bay Area 511 system operated by the MTC. The national evaluation team will use operator logs and usage reports produced by MTC to monitor changes in parking availability and pricing information and usage of that information by travelers.

Data Availability

The SF*park* data warehouse is expected to house data on SF*park* website usage and operations logs which the national evaluation team would access on a monthly basis. Other data, such as the 511.org website and 511 phone service and operations logs, are expected to be provided to the evaluation team at the end of each month.

Data Analysis

The traveler information system data will be used in the technology analysis to track post-deployment patterns of operations of the systems by the SFMTA and MTC and the access to the parking information by travelers. Examples of the measures that use the traveler information system data include the following:

- Number of page views for parking information per month for both 511.org and SF*park* websites
- Average duration of parking page views per session
- Number of parking text messages sent (per month) from SFMTA and, if available, from MTC.

Schedule and Responsibility

The data that will be used in this test plan will come from manual or automated logs of the different systems (i.e., the website usage logs, operator logs, etc.) as well as SFMTA's data warehouse. SFMTA plans to include in the data warehouse information about requests for parking information. MTC will be responsible for providing information related to requests for parking information associated with SF*park*. It is expected that the national evaluation team would collect information from these agencies monthly. Table 4-18 presents the data collection schedule.

Table 4-18. Traveler Information System Data Collection Schedule

Project Element	Baseline Data	Post-Deployment Data
SF*park* Website Use and Operations Logs	none	April 2010 through Spring 2011
511 Logs and Usage Reports	2009 and 2010 up to deployment date of enhancements	April 2010 through Spring 2011

4.2.6 Surveys and Interviews Test Plan

Data Sources and Availability

Surveys, interviews and workshops are critical for obtaining information needed to assess the influence of the San Francisco UPA projects on changes in travel behavior and perceptions. Possible behavior changes include shifting travel modes, frequency of trips and parking in San Francisco, and changing time-of-travel. While traffic counts and bus ridership data are important, the only way to ascertain if people have changed their travel mode or made other changes as a result of the UPA projects (as opposed to other factors) is to ask them. Surveys, interviews and workshops also provide information about individuals' perceptions of different strategies and projects, the ease or difficulty of using technologies and services, and concerns about equity.

This test plan outlines the survey, interview and workshop-related UPA evaluation data needs. Planning and conducting special surveys can be costly and so the national evaluation team has, aided by the San Francisco partners, inventoried existing data sets and planned surveys for possible use in the UPA evaluation. The recommended approach includes identification of existing and planned local partner data and data collection that may be used in the UPA evaluation. It also identifies the additional UPA-specific surveys, interviews and workshops needed to fully evaluate the San Francisco UPA deployment.

Table 4-19 presents the information needed from various populations and summarizes the recommended approach. A total of 5 population groups and the associated information needed for the evaluation are identified.

Table 4-19. Recommended Survey and Interviews

Population Group/ Information Needed	Recommended Approach	
	Baseline	**Post-Deployment**
General Public. General public's expectations and reaction to the San Francisco parking-related UPA projects with respect to reducing congestion, equity of pricing, and environmental quality.	• 2007 Mobility, Access and Pricing Study (MAPS) Public Opinion Poll provides some information about attitudes on congestion pricing that may be useful • Doyle Drive Tolling Survey of 2008 provides some opinion data about pricing as a transportation management tool. • No UPA-specific survey recommended other than incorporation of opinion questions in visitor/shopper survey	• No UPA-specific survey recommended other than incorporation of opinion questions in visitor/shopper survey
Visitor/Shoppers in San Francisco. Reported impact of parking pricing on travel to SF in terms of frequency, mode, origin-destination, etc. Use of traveler information systems as source of information on parking pricing and availability. Perception of the impact of the San Francisco UPA strategies on reducing congestion and perception of equity of pricing.	• UPA-specific survey needed • 2007 MAPS Retail Survey provides some relevant pre-deployment data • The 2009 version of the 511 satisfaction survey of phone and website users may include a question on parking that could provide some useful data	• UPA-specific survey needed
TransLink® Cardholders Survey. Reported awareness of and usage of the card for parking in the SFMTA garages and perceived benefits of the parking payment feature.	• No baseline data needed	• UPA-specific survey needed
Interviews with SF*park* Operations Staff. Perception of impact of SF*park* technology and variable pricing on agency operations and efficiency	• No baseline data needed (analysis is post-deployment only)	• UPA interviews needed
Partnership Agency Representatives and Other Key Stakeholders. Information on perception of factors influencing the success of the San Francisco UPA partnership, project benefits, and lessons learned.	• UPA interviews and workshops needed	• UPA interviews and workshops needed

The sections that follow briefly discuss each survey, interview, or workshop to be used, first presenting the existing or planned local partner data to be utilized and then identifying the UPA-specific method that is recommended. Details on questions and survey protocols (recruitment, sampling method, etc.) will be presented in the full test plan documents and will include consultation with the local partners.

Use of San Francisco Partners' Relevant Existing and Planned Surveys

Mobility, Access and Pricing Study (MAPS) Retail Survey. As part of its assessment of pricing to manage congestion, SFCTA was aware of potential concern among the business community that pricing may negatively impact downtown merchants. To collect data on existing travel and spending patterns, SFCTA conducted a random physical intercept study in the winter of 2007 and spring of 2008 with 1,390 visitors to shopping areas. The objective was to understand the behavior of patrons to two shopping areas in San Francisco and two areas outside the city. The survey averaged three minutes and asked shoppers about trip purpose, frequency and mode of travel to the shopping area, what is liked most and least about the area, spending levels at the area, and socio-economic data. This survey may provide some useful comparative data for the baseline analysis to the extent the surveyed areas overlap SF*park* zones and control zones.

Mobility, Access and Pricing Study (MAPS) Public Opinion Survey. Also part of the assessment of congestion pricing in San Francisco, this survey collected information on commute habits, parking fees and subsidies, and opinions on congestion. A random telephone survey of 600 households in six Bay Area counties was conducted in the fall of 2007. This survey may provide useful baseline data on public opinion about congestion pricing.

Doyle Drive Tolling Survey. This survey was conducted in 2008 by SFCTA in conjunction with plans for tolling Doyle Drive that were part of the original UPA proposal. Some of the opinion questions may be useful as baseline data for opinions about pricing as a travel demand management tool.

511 Transit 2009 Focus Groups. MTC conducted four focus groups in July 2009 to gather post-launch feedback from users of the 511 Transit website. The main purpose was to gather feedback about the website's specific features, but the focus groups afforded an opportunity to gain some initial feedback on MTC's concept for a multimodal trip planner. Parking information and cost of parking were some of the most frequently requested types of information by focus group participants.

511 Annual Phone and Website Satisfaction Studies. MTC has conducted annual 511 user satisfaction surveys on both their phone system and website since 2004. Both the phone and website samples are self-selecting based on a phone prompt or banner ad soliciting survey participation. The surveys in 2008 yielded 1,000 website users and 1,500 callers. In the past surveys no questions about parking were asked and a search of comments from the web survey respondents did not reveal any mention of parking. However, MTC is considering addition of a question related to parking in the 2009 survey now being planned. If so, the findings may provide useful comparative data.

Needed Surveys and Interviews

Visitor/Shopper Survey (Baseline & Post Deployment). These surveys will provide details on travel and parking behavior in response to parking pricing and other travel options, the awareness and use of real-time parking information disseminated through various means, the use of TransLink® integrated payment system, as well as perception of the impact and value of the UPA project for addressing congestion issues. Surveys will reveal the perceived personal advantages and disadvantages of the UPA strategies to the traveler, such as improved parking availability, travel time reliability, and the perceptions of the broader societal implications (e.g., equity, safety, and environment). Collecting information on travel behavior, including changes in travel patterns (e.g., frequency of travel to San Francisco or mode) and the reason for the changes is essential for differentiating the impact of the UPA from the influence of various exogenous factors and understanding traveler responses to specific UPA strategies.

The surveys will focus on persons in the parking management and control zones of the SF*park* pilot areas. Several options for conducting a survey of visitors and shoppers were considered by the national evaluation team and SFMTA, including cross-sectional and panel studies. Other methodological options pertain to the method of recruiting participants (e.g., on-street intercept and telephone sampling) and conducting the survey (e.g., in-person interview, telephone interview, and on-line). For cost-considerations, the recommended approach is a cross-sectional on street intercept survey and follow-up telephone survey conducted before and after the variable pricing is implemented in selected SF*park* zones. A brief 3-minute on-street intercept can be used to solicit respondents and collect contact information for the more in-depth telephone interview of approximately 15 minutes.

TransLink® Cardholders Survey (Post-Deployment). This survey would use e-mail addresses in MTC's database of TransLink® cardholders to solicit them to participate in an on-line survey. MTC has previously had success in conducting surveys of cardholders about topics related to TransLink® and have used commercially available on-line survey tools such as SurveyMonkey.com. Questions would ask about the cardholder's awareness of and usage of the card for parking in the SFMTA garages and their perception of the benefits of the parking payment feature. Directly surveying cardholders would result in a higher likelihood of reaching people who have used the card for parking than would a survey aimed at a general cross-section such as the visitor/shopper survey.

Interviews with SF*park* Operators (Post-Deployment). These interviews will collect information from staff of SFMTA who is responsible for parking operations and management of the SF*park* system. The interviews will gather information about experience in using the technology associated with SF*park* in terms of ease of using the system and advantages relative to the previously used technology. The interviews will also focus on the impact of SF*park* on efficiency of operations of the on-street and off-street parking such as revenue collection, enforcement, and other types of improvements.

Partnership Agency Representatives and Other Key Stakeholders (Baseline & Post-Deployment). Members of the national evaluation team will conduct one-on-one interviews with representatives of organizations that play an important role in planning, deploying and/or operating the UPA projects. This will include those organizations instrumental in the institutional, technical or public outreach aspects of the UPA projects. As the full test plan is

developed the national evaluation team will work with the local partners to further specify interviewees. Two rounds of interviews will be conducted, one each near the end of the baseline and post-deployment periods. Each round of interviews will include a group workshop to discuss lessons learned.

Data Analysis

A variety of data analysis techniques will be used to analyze the wide range of survey and interview data, with techniques varying according to the type of data and the intended use of the resulting measures of effectiveness in the various evaluation analyses. In the case of interviews, key points from each interview will be compiled, summarized and discussed, and areas of agreement, disagreement and recurring themes cutting across multiple interviews will also be identified.

Survey analysis will begin with checking the data for anomalies, outliers, or other data peculiarities and to prepare the data, including applying any necessary weighting to adjust for selection bias, unequal response rates in various strata, etc. Descriptive statistics will be prepared to characterize outcomes of interest such as the percentage of respondents reporting that they experienced less parking search time or found parking information on 511 useful in making travel decisions, as well as potential predictor variables such as trip purpose.

Data Collection Schedule and Responsibilities

The San Francisco local partners will be responsible for collecting the data in this test plan with the exception of interviews with the partnership agencies and other key stakeholders, which will be conducted by the national evaluation team. SFMTA will procure survey contractor services for the visitor/shopper survey. The national evaluation team will, through the full Surveys and Interviews Test Plan document to be developed, provide the local partners specific guidance and recommendations on the key aspects of the survey methodology, including specific information to be collected.

Baseline surveys should be conducted shortly before the SF*park* pilot areas go into operation in April 2010. Since the SF*park* zones will be phased in over several weeks or months, it will be advantageous to focus the visitor/shopper survey on parking zones that go into operation later to maximize the time available for survey design and pretesting by SFMTA's survey consultant.

Post-deployment surveying should occur after all the parking-related UPA projects are operational. The TransLink® integrated payment system is expected to be operational in December 2010 and the initial SF*park* zones will have been in operation for one year in March 2011. Thus, the post-deployment visitor/shopper survey and the TransLink® cardholder survey should occur in the spring of 2011. Other post-deployment interviews will also occur during this period.

4.2.7 Environmental Data Test Plan

Data Sources

The environmental data test plan will be used primarily in the environmental analysis, but it will also support the equity and cost benefit analyses. The environmental analysis for the national

UPA evaluation will be based on assessing the impacts of the various projects on VMT rather than direct monitoring of air pollutants. Data will come from other test plans (including the traffic, parking, transit, telecommuting/TDM, and survey and interview data test plans), and include the following data:

- vehicle classification, including alternative fuel vehicles;
- changes in parking search time;
- incidence of double-parked idling vehicles;
- VMT estimates;
- traffic speeds;
- vehicle-occupancy levels; and
- mode shift data.

Parking search time data collection is described in Section 4.2.2 the Parking Data Test Plan. This will involve a before and after survey in the pilot and control zones. Changes in idling will be derived from the disabled placard/double parking survey and will describe the incidence of idling, but not the duration, due to limitations with the data to be collected. SFMTA will be responsible for this data collection activity and providing VMT reduction estimates. VMT reduction from mode shift to transit will come from both the transit data described in the transit data test plan (to get changes in ridership) and from the visitor/shopper surveys to assess prior mode (hence mode shift). These surveys will be implemented toward the end of the deployment period or during post-deployment.

The approach will be to apply the appropriate emission rates to VMT estimates for each pilot area based on observed changes in search time and idling. Emission factors will be obtained from the California Air Resources Board (ARB) and/or the MTC, who regularly generate these factors for other analyses, including conformity. Additionally, emission factors and fuel efficiency factors will be used to estimate air quality and energy impacts from VMT reductions.

Data Availability

The data for the air quality analysis will be obtained from the parking, transit, and survey test plans. The key data from the parking test plan will be changes in parking search time, vehicle speeds and incidence of vehicles idling. Changes in search time will be converted to miles of travel reduced. No additional data collection is anticipated for the environmental analysis. Emission factors will be obtained from ARB and/or MTC.

Data Analysis

The air quality analysis will assess emission impacts based on before and after estimates of VMT changes due to changes in parking search behavior. Reduction in specific pollutants will be estimated, including volatile organic compounds (VOC), nitrogen oxide (NOx), particulate matter (PM) and carbon dioxide (CO_2). Additionally, mode shift data will also be assessed in order to estimate concomitant VMT reduction, which will be converted to emission reduction using emission factors. Fuel consumption factors applied to VMT will be used to assess energy impacts.

The three basic sources of potential air quality impacts are:

1. Reduced VMT from reduced searching for parking
2. Reduced emissions from reduced idling from reduced double parking
3. Reduced VMT from a mode shift to transit as induced by parking pricing and improved transit travel time reliability

Emission reductions from reduced search time will be possible using data from parking search time surveys. Emission analysis tied to idling and transit ridership increases require data that may not be available in a form convertible to VMT. If this is the case, the potential contribution of reduced idling and increased transit use will be discussed, but not necessarily converted to emissions reductions. Options for energy modeling will be examined in the development of the detailed test plan, but at a minimum will involve the application of average fuel consumption factors to VMT reductions.

Data Collection Schedule and Responsibilities

SFMTA is responsible for collecting the data identified in this test plan. SFMTA will begin collecting baseline data in the winter of 2010, with post-deployment data collection beginning in the spring of 2010 and running through winter of 2011The Battelle team will be responsible for analyzing the data to produce aggregated VMT reduction estimates to assess the air quality impacts by applying the appropriate emission factors.

4.2.8 Content Analysis Test Plan

Data Sources

The content analysis test plan focuses on collecting and analyzing information on San Francisco UPA outreach activities, media coverage, and reactions from the public, policy makers, and other groups. The information collected and analyzed in the content analysis test plan will be used primarily in the non-technical success factors analysis.

Two primary data sources will be used in this test plan. The first data source is on-line search engines Google Alerts and Vocus. Information from the San Francisco UPA agency partners represents the second data source.

Google Alerts and Vocus. Google Alerts is a free on-line search engine that tracks news articles, web-based information, blogs, video, and other media information based on search terms. Members of the Battelle team have signed up with Google Alerts and have entered key terms based on each of the UPA sites. Examples of key terms for the San Francisco UPA projects include SF*park*, parking pricing, and San Francisco UPA. Vocus is a private company providing a subscription service that monitors media coverage based on key search words. Through team member TTI's subscription to Vocus, the Battelle team will collect information about media coverage of the SF UPA projects.

San Francisco UPA Partnership Agency Information. Press releases and outreach, public education, and marketing materials issued by the San Francisco UPA agencies represent the second source of information for the content analysis test plan. Staff from the San Francisco partnering agencies will include Battelle team members on the distribution list for these efforts.

Members of the Battelle team will monitor these activities and will document press releases and other outreach activities. To the extent the information is available, members of the Battelle team will also obtain information from the agencies on letters, e-mails, and telephone calls received about the UPA projects.

Data Availability

The availability of most agency data is assumed to be good in that the local partners will be maintaining archives of media coverage. It is anticipated that post-deployment information will be available, with the possible exception of extensive tracking of letters, e-mails, and telephone calls received by the partnership agencies. Google Alert data are already being collected by the Battelle team and Vocus data will be available soon. Both on-line sources are assumed to be available over the course of the evaluation.

Data Analysis

The information obtained in this test plan will be used in the lessons learned analysis and will support other analyses. The following questions provide examples of how the qualitative information obtained in the test plan will be applied in the evaluation.

- What types of outreach materials and activities were used by the San Francisco UPA partners?
- What was the extent and nature of media coverage of the UPA projects?
- What was the reaction of travelers in the areas affected by San Francisco UPA projects as reported in the media and in communications to the agencies?

Members of the Battelle team will document the results of the Google Alerts and Vocus on-line search tools and information obtained from the partnership agencies. Table 4-20 illustrates how the information will be tracked, categorized, and analyzed.

Table 4-20. Content Analysis Tracking Log

Date of Item	Source	Audience (if available)	UPA Projects Referenced	Nature of Comments/Coverage	Evaluation Team Discussion
				Examples might include: • Was coverage neutral, positive, negative, • Type of information (status, use guidelines, technical, policy-oriented, etc.)	

Data Collection and Responsibilities

The San Francisco partners are responsible for providing their data for the content analysis to the Battelle team. Members of the Battelle team have already begun data collection activities related to this test plan. Battelle team researchers have registered with Google Alert and Vocus. Members of the Battelle team will continue to monitor these on-line resources over the course of the pre- and post-deployment periods. The Battelle team will be responsible for analyzing the content analysis data and reporting the findings.

As Table 4-21 highlights, partial pre-deployment information is available from the two sources used in this test plan.

Table 4-21. Schedule for Content Analysis Data Collection

Data Source	Pre-Deployment	Post-Deployment
Google Alert and Vocus	Yes	Yes
Partnership Agency Data	Yes	Yes

4.2.9 Cost Benefit Analysis Test Plan

Data Sources

The cost benefit analysis test plan will be used in the cost benefit analysis. The cost benefit analysis test plan will use several sources of data. One source is the detailed costs associated with the UPA projects to be provided by the partner agencies. A second source of data is forecasts of travel from the region's transportation model. A third source is tax data for businesses in San Francisco. The fourth data source is data collected through other test plans.

Cost Data from Participating Agencies. Cost data will be obtained from SFMTA, MTC, and SFCTA related to their UPA projects. Data include the capital costs associated with various projects, the operating and maintenance costs, and the replacement and re-investment costs. The following examples are some but not all of the cost categories needed for this test plan.

- Capital investment costs
  - Equipment and installation of parking sensors and meters
  - 511 enhancement costs
- Operating and maintenance costs
  - Operating and maintaining parking facilities and electronic payment systems
  - Operating and maintaining TransLink® payment system at garages
- Replacement and re-investment costs.
  - Replacing components of parking facilities
  - Replacing and/or updating computer hardware and software for parking payment systems
  - Replacing and/or updating communication equipment for parking.

Travel Demand Forecasting Model Data. The SFCTA's travel demand forecasting model (SF-CHAMP) will be used to generate 10-year forecasts of travel patterns in San Francisco resulting from the UPA strategies. The model is equipped to handle parking pricing changes by trip purpose, but at the present time, its ability to handle variable parking pricing (for example, by time of day or by parking duration) at the level needed to represent SF*park* is limited. Depending on availability of data, the San Francisco Model may be improved to capture this capability by the time the data are needed for post deployment evaluation.

The San Francisco model was developed in 2002 using an activity-based framework to improve the simulation of travelers' responses to transportation policies relative to the traditional four-step approach.[12] In an activity-based framework, individuals' activities drive their travel. Travel is modeled as a tour, which is a closed chain of trips that begins and ends at one location (e.g., home or work). The model includes six types of tours: Work Tours, Grade School Tours, High School Tours, College Tours, Other Tours, and Work-based Tours. There were several surveys used for model development, including the 1990 and 2000 Bay Area Travel Survey, census data, and other sources. A local stated preference survey was used to develop the model's pricing sensitivity. Microsimulation is used to forecast the travel of each person in the population. The synthetic population was generated from the U.S. Census Public Use Microdata Sample, San Francisco County population and employment data, and other demographic data developed by the Metropolitan Transportation Commission. The current population is about 800,000.

The model includes 2,475 travel analysis zones (TAZs), 981 of which are in San Francisco and which are essentially blocks that conform well to the SF*park* zones. The network used in the model is highly detailed: it includes every street, road, transit line, and transit stop. Currently, the supply and availability of parking is represented in the vehicle availability model through a parking availability index and in the mode choice models through an average parking cost for work trips (eight hours) and average parking cost for other trips (one hour). The model is currently being used to forecast up to 2035. The model can generate VMT by facility type and speed by neighborhood for emissions analysis. Commercial vehicle travel is represented very crudely in the model.

The structure of the San Francisco model facilitates its representation of pricing policies because it can be adjusted to track daily payments and wide variations in individual response to pricing. In 2008, several enhancements were made to the model to further improve its representation of cordon and congestion pricing: 1) model expansion to nine Bay Area counties; 2) representation of toll payment in sub-models; 3) use of continuous value-of-time distributions using the results of a new stated preference survey; and 4) other structural improvements to better represent travel time and cost in the model and traveler response to change.

The San Francisco model does have a parking cost sub-model, but its representation of parking supply and cost is too general to precisely replicate the UPA parking pricing scenarios at the present time. For example, the model uses average parking costs and a generalized measure of parking availability, and it does not differentiate on-street parking from off-street parking.

[12] SFCTA. San Francisco Travel Demand Forecasting Model Development, Executive Summary. October 1, 2002; and Freedman, Joel and Charlton, Billy. Activity-Based Travel Models for Road Pricing. April 14, 2008.

SFCTA would like to update the model's parking supply data with the data that SFMTA is collecting for SF*park*. In sum, although the model is very advanced relative to the state-of-the-practice in the U.S., its ability to precisely represent the UPA parking pricing policy is limited. SFCTA plans to make further improvements to the model's capabilities for handling variable parking pricing, which may be available in time for the post-deployment analysis of SF*park*.

Sales Tax Receipts. Quarterly sales tax revenue data will be provided by the Controller's Office for the City and County of San Francisco. This data is available by economic category, economic segments, and business code for the SF*park* areas and the control areas. This data will also be accessible from the data warehouse. Table 4-22 lists the economic categories and segments available.

Table 4-22. Economic Category and Segment for Sales Tax Revenue

Economic Category	Economic Segment
General Retail	Apparel stores Department stores Furniture stores Drug stores Recreational products Florist/nursery Miscellaneous retail
Food Products	Restaurants Food markets Liquor Stores Food processing equipment
Transportation	Auto parts /repair Auto sales-new Auto sales-used Service stations Miscellaneous vehicle sales
Construction	Building materials – wholesale Building materials – retail
Business to Business	Office equipment Electronic equipment Business services Energy sales Chemical products Heavy industrial Light industrial Leasing
Miscellaneous	Health and government Miscellaneous other Closed account-adjustment

Other San Francisco UPA Test Plans. Another important source of data for the cost benefit analysis is other test plans. The data from each test plan will be used to compare the scenarios before and after the UPA projects are implemented. The following are examples of the data from other test plans that will be used in the cost benefit analysis:

- Reduction in travel time from the traffic system data test plan;
- Reduction in parking search time from the parking data test plan;
- Reduction in transit travel time from the transit system data test plan;
- Transit fares paid by the people who switch from driving to riding the bus from the visitor/shopper survey in the survey test plan; and
- Improvement in air quality and fuel usage from the environmental data test plan.

Data Availability

It is anticipated that agency cost data will be available from SFMTA, MTC, and SFCTA records. SFCTA has agreed to run the SF-CHAMP model to produce forecasts for the national evaluation, but the planned improvements to the parking pricing submodel will need to occur to produce the quality of the forecasts needed for the evaluation. Sales tax data are available as public records summarized by geographic areas of the city from Comptroller's Office. Other needed data for the cost benefit analysis will be obtained from other test plans.

Data Analysis

As noted previously, SFCTA's regional travel forecast model will be used to estimate the benefits related to congestion reduction resulting from the UPA projects. The cost benefit analysis will be performed using a 10-year time frame. This time frame includes the first year after implementation of the San Francisco UPA projects and again nine years into the future, for a total 10-year period after implementation of the projects. Within this evaluation time frame, the cost benefit analysis will estimate and compare annual benefits and costs between two scenarios—before implementation of the San Francisco UPA projects and after implementation of the San Francisco UPA projects.

Data Collection Schedule and Responsibilities

The cost benefit analysis will be initiated prior to deployment of the San Francisco UPA projects. The analysis will be completed after all the UPA projects are in operation. The local partners will be responsible for providing the cost information relevant to the UPA projects that each agency is deploying. SFCTA will run the regional travel model to provide forecasts based on collaboration with the Battelle team about the inputs and the outputs needed. Members of the Battelle team will perform the cost benefit analysis based on data from the various sources.

It is anticipated that the Battelle team will work with the SFCTA staff running the regional travel model to perform test runs during the post-deployment operation phase of SF*park* and the other UPA projects. Test runs will help identify any modeling issues that need to be resolved before the final modeling is performed. Once the modeling data and all the other data from this test plan are available following the post-deployment data collection, the cost benefit analysis will be performed.

4.2.10 Exogenous Factors Test Plan

Data Sources

The exogenous factors test plan will be used to monitor elements unrelated to the SF*park* UPA project that may influence travel in San Francisco and changes in travel modes, routes, and parking location. The data obtained in the exogenous factors test plan supports the SF*park* project primarily. As outlined in this section, elements included in the test plan are changes in fuel prices; employment factors (e.g., unemployment rates); transit strike tracking (Bay Area Rapid Transit (BART) District); construction; and changes in overall parking supply, availability, and pricing.

Energy Information Administration Gasoline Prices. The Energy Information Administration of the U.S. DOE monitors gasoline prices by the nation, selected states, and regions, including San Francisco. Historical data on weekly retail gasoline prices for various grades have been available on-line since 2000. Data will be monitored over the course of the San Francisco UPA evaluation at http://tonto.eia.doe.gov/dnav/pet/pet_pri_gnd_dcus_nus_w.htm and tracked in the SFMTA data warehouse.

Employment Factors. Unemployment rates in the San Francisco Bay Area will be tracked, along with possible furlough activity in SF*park* pilot and control areas and maintained in the SFMTA data warehouse.

General System Impacts. General system impacts will be monitored throughout the pilot project, such as strikes or changes to the BART District and other transit providers and major incidents that significantly disrupt traffic. Such activity will be tracked throughout the pilot to assess any impacts on travel behavior that could result from a transit strike(s) or other system changes. These data will be recorded in the SFMTA data warehouse.

Large-Scale Construction Events. In downtown areas, traffic patterns can be significantly impacted by both on-roadway and off-roadway construction activities. Off-roadway construction sites frequently remove on-street parking to accommodate construction equipment and/or pedestrian movements. Construction activities can sometimes infringe and impede traffic flow in travel lanes. For evaluation purposes, it will be important for the national evaluation team to know when and where major construction is occurring in the various parking management zones so that unusual or atypical changes in traffic patterns can be observed. SFMTA will track large-scale construction events for control and pilot areas. These events will be noted by duration and types and be available through the SFMTA data warehouse.

Changes in Parking Supply. Changes in parking supply will be derived from a manual census of publically available garage data and parking tax data for those locations. A 25 percent tax is assessed (with approximately a three to six month delay in reporting) for both SFMTA and non-SFMTA facilities. It is hoped that the manual census, currently being conducted by SFMTA, will result in better parking tax data for non-SFMTA facilities. These parking tax data will be used to approximate changes in supply/activity and price during the pilot. Such data for non-SFMTA garages will likely be aggregated for smaller geographic areas. These data will be available through the SFMTA data warehouse.

Control Areas. There are three SF*park* control areas that will be used to compare changes due to parking pricing in the seven pilot areas. The three control areas are Inner Richmond, West Portal, and Union Street.

Data Availability

As noted previously, historical, pre-deployment, and post-deployment data are available for gasoline prices and unemployment rates. Historical and pre-deployment data on other exogenous factors are limited, but post-deployment data will be available on all of the elements in the test plan. The SF*park* data warehouse will serve as a repository for the data elements in this test plan.

Data Analysis

The exogenous factors included in this test plan will be used as comparison checks in the analysis of SF*park* primarily. Information on the exogenous factors will assist in identifying elements that may influence and explain changes in parking availability, travel patterns, traffic conditions, and modal changes that are not due to the UPA strategies by themselves.

Data Collection Schedule and Responsibilities

Table 4-23 presents the anticipated data collection schedule for the exogenous factors test plan. As noted, historical data and pre-deployment data are available for some factors, while post-deployment data are available for all factors. The responsibility for collecting data will reside with the local partners.

Table 4-23. Exogenous Factors Data Collection Schedule

Data Source	Historical Data	Pre-Deployment Data	Post-Deployment Data
Unemployment Rates	✔	✔	✔
Gasoline Prices	✔	✔	✔
General System Impacts	Not Needed	✔	✔
Construction Events (large-scale events only)	Not Needed	✔	✔
Changes in Parking Supply	Not Needed	✔	✔
Control Area	Not Needed	✔	✔

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5.0 NEXT STEPS

The next steps in the San Francisco UPA national evaluation are highlighted below.

- Detailed test plans will be developed based on this final San Francisco UPA National Evaluation Plan. It is anticipated that the test plans will be completed by February 2010.
- Baseline data collection will be initiated along with the development of the test plans.
- Members of the Battelle team will continue to monitor the deployment status of the San Francisco UPA projects and will provide assistance with elements of the evaluation as requested.
- Members of the Battelle team will continue to coordinate with other UPA/CRD sites and share experiences and "lessons learned."

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