LOS ANGELES COUNTY CONGESTION REDUCTION DEMONSTRATION NATIONAL EVALUATION PLAN

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LOS ANGELES COUNTY CONGESTION REDUCTION DEMONSTRATION NATIONAL EVALUATION PLAN

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16. Abstract

This report provides an analytical framework for evaluating the Los Angeles County Congestion Reduction Demonstration (CRD) under the United States Department of Transportation (U.S. DOT) Urban Partnership Agreement (UPA) Program. The Los Angeles CRD projects focus on reducing congestion by employing strategies consisting of combinations of tolling, transit, travel demand management, and technology, also known as the "4Ts". The evaluation of these efforts is being done using the approach set forth in the UPA National Evaluation Framework (NEF) and the Los Angeles County Congestion Reduction Evaluation Strategy. Both of these documents were prepared for U.S. DOT. This Plan and the strategy document that preceded it benefit from substantial input and review by the Los Angeles partner organizations that are implementing the CRD projects. The NEF and this Plan evaluate the efficacy of each of the 4T congestion interventions, and they address the possible collateral impacts of the CRD projects on business, safety, social equity, and the physical environment. The Plan addresses the importance of non-technical success factors such as outreach efforts and media response to the projects in the level of success that they achieve. The planned Los Angeles County CRD evaluation approach concludes with a summary assessment of the projects' net beneficiality using established cost-benefit analysis methods.

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LIST OF ABBREVIATIONS

4Ts	Tolling, Transit, Telecommuting, and Technology
APC	Automatic passenger counter
ATM	Active traffic management
AVL	Automatic vehicle location
AVO	Average Vehicle Occupancy
BRT	Bus rapid transit
Caltrans	California Department of Transportation
CBD	Central Business District
CBA	Cost and benefit analysis
CRD	Congestion Reduction Demonstration
CVO	Commercial vehicle operator
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
HC	Hydrocarbon(s)
HOT	High-occupancy tolling
HOV	High-occupancy vehicle
ITS	Intelligent transportation systems
ITS-OTMC	Intelligent Transportation Systems-Operational Testing to Mitigate Congestion
LADOT	Los Angeles Department of Transportation
LOS	Level of Service
Metro	Los Angeles County Metropolitan Transit Authority
MOE	Measure of effectiveness
MOVES	Motor Vehicle Emissions Simulator
NEF	National Evaluation Framework
NEP	National Evaluation Plan
NEPA	National Environmental Policy Act
NTOC	National Transportation Operations Coalition
O&M	Operation and maintenance
OMB	Office of Management and Budget
OTMC	Operational Testing to Mitigate Congestion
RITA	Research and Innovative Technology Administration
ROG	Reactive organic gas(es)
SCAG	Southern California Association of Governments
SOV	Single-occupant vehicle
TDM	Travel demand management
TMO	Traffic management operations
UPA	Urban Partnership Agreement
U.S. DOT	U.S. Department of Transportation
VII	Vehicle Infrastructure Integration
VMT	Vehicle miles traveled
VOC	Vehicle operating cost or Volatile organic compound
VT	Vehicle trips

EXECUTIVE SUMMARY

This report provides an analytical framework for evaluating the Los Angeles County (LA) Congestion Reduction Demonstration (CRD) effort under the United States Department of Transportation (U.S. DOT) Urban Partnership Program Agreement (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 Los Angeles, 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/Travel Demand Management, which includes additional travel demand management (TDM) strategies, and Technology.

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 Los Angeles County CRD Projects

The Los Angeles County (LA) Congestion Reduction Demonstration effort is led by the Los Angeles County Metropolitan Transportation Authority (Metro). The CRD projects are being implemented with the assistance of a number of supporting agencies especially the California Department of Transportation (Caltrans) and the Los Angeles Department of Transportation (LADOT). The Los Angeles County CRD projects are intended to reduce congestion, promote throughput, and enhance mobility in the I-10 and I-110 corridors, and in downtown Los Angeles. Figure ES-1 shows the location of the L.A. CRD project elements.

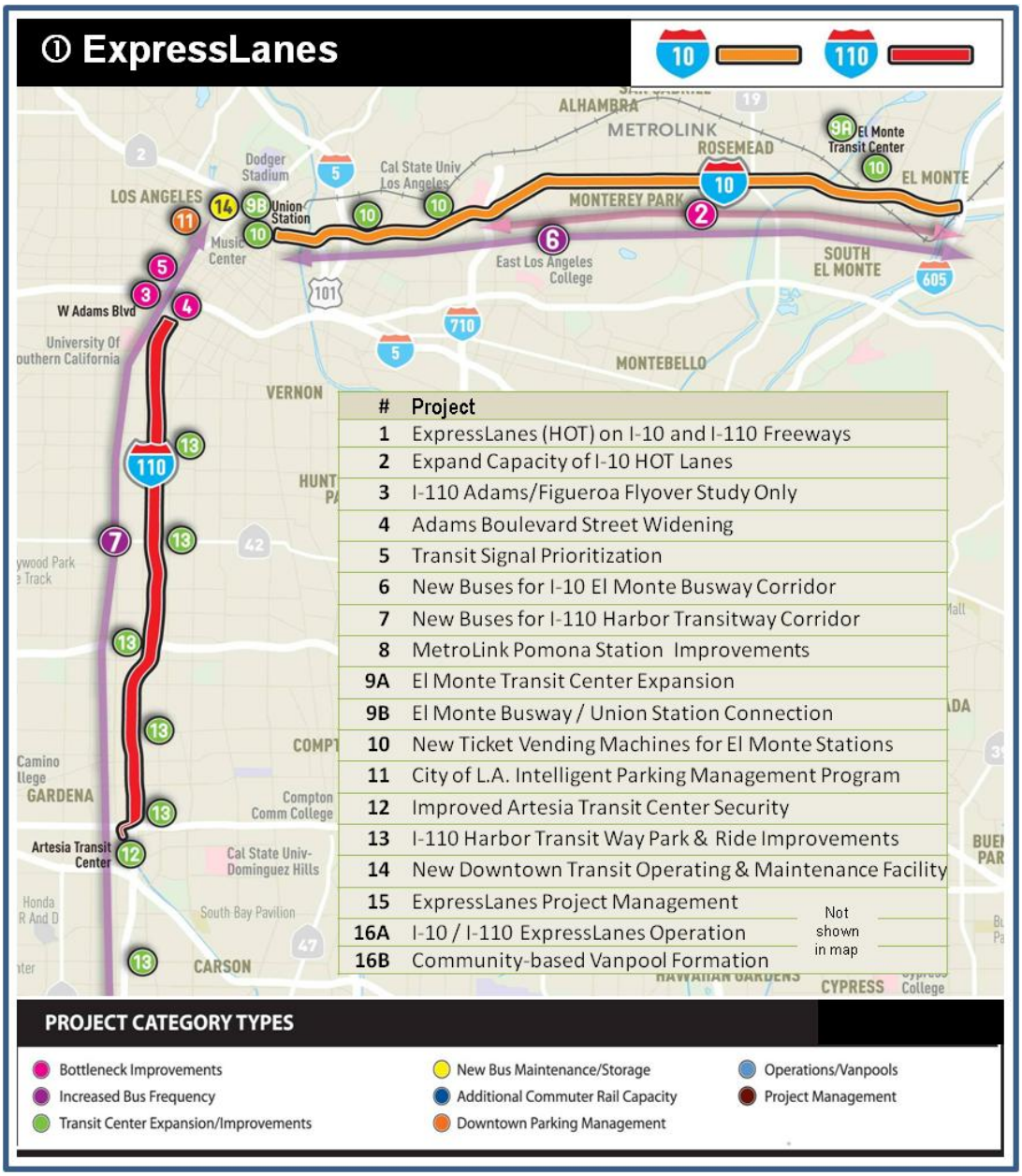


Figure ES-1. Locations of Los Angeles County CRD Projects

The U.S. DOT is allocating $210.6 million in Federal grant funding for the Los Angeles projects. These funds are drawn from the Federal Transit Administration (FTA) 5309 Bus and Bus Facilities Program (the "Bus Program"). The Los Angeles County CRD projects are briefly described as follows.

Transit Improvements. Over half of LA's CRD budget will be devoted to transit improvements. The frequency of Metro Rapid service in the I-10 El-Monte Busway and I-110 Harbor Transitway corridors will be significantly increased through the acquisition of new buses. Other major improvements include a new downtown transit operating and maintenance facility;

improved Artesia Transit Center security; expansion of the El Monte Transit Center; the creation of an El Monte Busway/Union Station connection; expansion of the Pomona Metrolink Station (platforms and parking); and the implementation of additional transit signal prioritization in downtown Los Angeles.

High Occupancy Toll (HOT) Lanes. L.A. will use CRD funds to convert HOV lanes to HOT in the I-10 and I-110 freeways. This will expand freeway capacity by permitting toll-paying, single-occupancy vehicles to use slack, HOT lane capacity. Since the current I-10 HOV lane operates near capacity during peak travel periods, L.A. also plans to add an additional HOT lane to the section of the I-10 bounded by the I-710 and I-605 interchanges.

Intelligent Parking Management (IPM). LADOT will be deploying an IPM (also known as "ExpressPark") in downtown L.A. to alleviate congestion by reducing parking space seek time, an important source of traffic congestion. IPM entails demand-based pricing of city managed parking to promote space turnover and to maintain balance between the parking spaces available and the number of travelers wishing to make use of those spaces. The IPM effort will use advanced technologies to help downtown travelers rapidly locate available parking spaces and to apprise them of current parking prices.

Technology. L.A. will employ advanced technologies in support of both the HOT and IPM efforts. These technologies include algorithms that estimate HOT lane capacity and detect parking spot availability; and advanced, real-time information dissemination technology that will make this information available to travelers through their computers, cell phones, PDAs, and electronic signage.

Ridesharing Promotion (Telecommuting/Travel Demand Management). L.A. will use a variety of promotional methods to increase the number of registered vanpools, and major employer-based ridesharing in general, in the I-10 and I-110 corridors. The methods include subsidies to travelers and vanpool operators and promotional outreach to major employers.

Deployment Schedule

Some transit elements of the Los Angeles County CRD programs are expected to be operational in July, 2010. Most of the remaining projects elements will be deployed by December, 2010. The major exception is a new Metro transit operating and maintenance facility. It is scheduled to be completed in December, 2011.

Evaluation Analyses and Test Plans

The national evaluation of the Los Angeles County CRD projects focuses on the 11 of 12 analysis areas outlined in the NEF. (The goods movement analysis area was not judged to be relevant to the L.A. CRD projects.) Plans for collecting and analyzing the data to support the 11 analyses are described in 11 test plans. Table ES-1 presents the relationship among the analysis areas and the test plans.

Table ES-1. Relationships among Data Test Plans and Evaluation Analyses

Data Test Plans	Evaluation Analyses										
	Tolling	Technology	Transit	Travel Demand Management (TDM)*	Congestion	Safety	Environmental	Equity	Business Impacts	Non-Technical Factors	Cost – Benefit
Traffic	●	●	○		●	●	●	○	○		●
Tolling	●	●			○						●
Transit			●		○	○	○	○			●
Ridesharing				●	○		○	○	○		○
Safety					○	●					●
Transportation Modeling											●
Environmental							●	○			○
Surveys and Interviews	●	●	●	●	○	○	○	●	●	●	
Content										●	
Cost Benefit											●
Exogenous Factors	○	○	○	○	○	○	○	○	○	○	

● Major Input ○ Supporting Input

* = This corresponds to the "Telecommuting/TDM" analysis in the UPA/CRD National Evaluation Framework. The L.A. CRD local partners have requested that the reference to telecommuting be dropped in the L.A. evaluation documents because telecommuting is not included among their strategies.

The transit analysis area is summarized in Table ES-2 to provide a representative example of the hypothesis-driven evaluation approach used in the L.A. CRD National Evaluation Plan. Transit is a key element of the Los Angeles County CRD. The CRD transit projects focus on making riding the bus in the I-10 and I-110 corridors more attractive and convenient by significantly increasing the frequency of bus rapid transit (BRT) service, reducing bus travel times through signal prioritization; mitigating traffic bottlenecks through infrastructure investments; and by reducing travelers potential security concerns at park-and ride-lots and bus stops.

Table ES-2. Transit Analysis Approach

Hypotheses/Questions	Measures of Effectiveness	Data
CRD projects will enhance transit performance within CRD corridors through reduced travel times, increased service reliability, and increased service capacity	• Reduced end-to-end transit route trip times • Reduced perceived door-to-door passenger trip times • Increased in-transit service speeds • Increased transit reliability (headway variance if freq < 12 mins / schedule adherence if freq > 12 mins) • Increased transit capacity (# seats per hour) • Improved user satisfaction	• Transit travel time data • Transit reliability / schedule adherence data • Transit service characteristics data • Traveler survey data
User perceptions of security at transit stations/park-and-ride lots will be improved by CRD projects	• User perceptions of security at transit stations/park and ride lots	• Traveler survey data
CRD projects will increase ridership and facilitate a mode shift to transit within CRD corridors	• Increased transit ridership • Increased persons per peak revenue hour/period • Reduced cost per passenger mile • Increased park-and-ride lot utilization • Corridor mode split (%)	• Transit ridership data • Traveler survey data • Transit service characteristics data • Park-and-Ride lot utilization data • Traffic volume and vehicle occupancy data
Increased ridership and mode shift to transit will contribute to increased person throughput, congestion mitigation, and transit cost-effectiveness within CRD corridors	• Increase in person throughput attributable to transit • Total change in traffic congestion (as determined in the Congestion Analysis) • Change in transit cost per passenger mile • User perceptions of project impacts	• Transit ridership data • Traveler survey data • Transit service characteristics data • Park-and-Ride lot utilization data • Traffic congestion data (from Congestion Analysis) • Traffic volume and vehicle occupancy data • Transit cost data
What was the relative contribution of each CRD project element to increased ridership/ transit mode share/ person throughput?	• All of the above measures, supplemented by those obtained from other aspects of the evaluation	• All of the above data sources

The first hypothesis shown in Table ES-2 relates to the use of CRD funds to attain reduced transit travel times and improved service reliability by buses in the I-10 and I-110 corridors. Six measures of effectiveness (reduced end-to-end transit route trip times, reduced perceived door-to-door passenger trip times, etc.) are presented in the adjacent column. They enumerate the measures that the evaluation will use to assess the correctness of the hypothesis. The third column lists the key data elements that will be needed to compute the measures of effectiveness. In the case of the first hypothesis, these data elements include numeric transit travel time and reliability data, which will provide objective measures of service improvements. Required data also includes survey data that will help the evaluation determine whether transit users perceive these service improvements.

This transit analysis example typifies the multi-layered approach that will be used in many of the CRD evaluation analyses. In such a multi-layered approach, the later hypotheses focus on the intended "bottom line" results, which for the CRD is primarily to reduce congestion. The earlier hypotheses focus on the series of causes and effects that are intended to yield those bottom line results. In this case those earlier causes and effects consist of improving transit performance in order to increase ridership and transit mode share. Testing hypotheses at each of these layers helps explain how and why the intended congestion reduction results were realized or not realized.

Plans for collecting and analyzing data pertaining to the transit hypotheses and all other evaluation hypotheses are detailed in a series of data test plan documents. Preliminary versions of these data test plan documents are included within the body of this evaluation plan. Full, finalized versions of the data test plans will be generated in coming months.

Responsibility for collecting the data required by the evaluation resides with the Los Angeles County CRD partners. The Battelle evaluation team will provide guidance to the partners on data collection. The evaluation team is also responsible for analyzing the data and reporting results.

Next Steps

The next steps in the Los Angeles County CRD 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 Los Angeles County CRD National Evaluation Plan. It is anticipated that the draft test plans will be developed by January 2010. The results of the Los Angeles County CRD national evaluation are expected in late-2012.

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 Los Angeles County CRD, focusing on the I-10 and I-110 corridors, was one of the selected sites. Based on a competitive procurement process, the U.S. DOT selected the Battelle team to conduct the national evaluations of the UPA/CRD projects.

This document presents the Los Angeles County CRD National Evaluation Plan which has been developed by the Battelle team, in cooperation with the Los Angeles County CRD 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.

1.1 U.S. DOT Program to Reduce Congestion

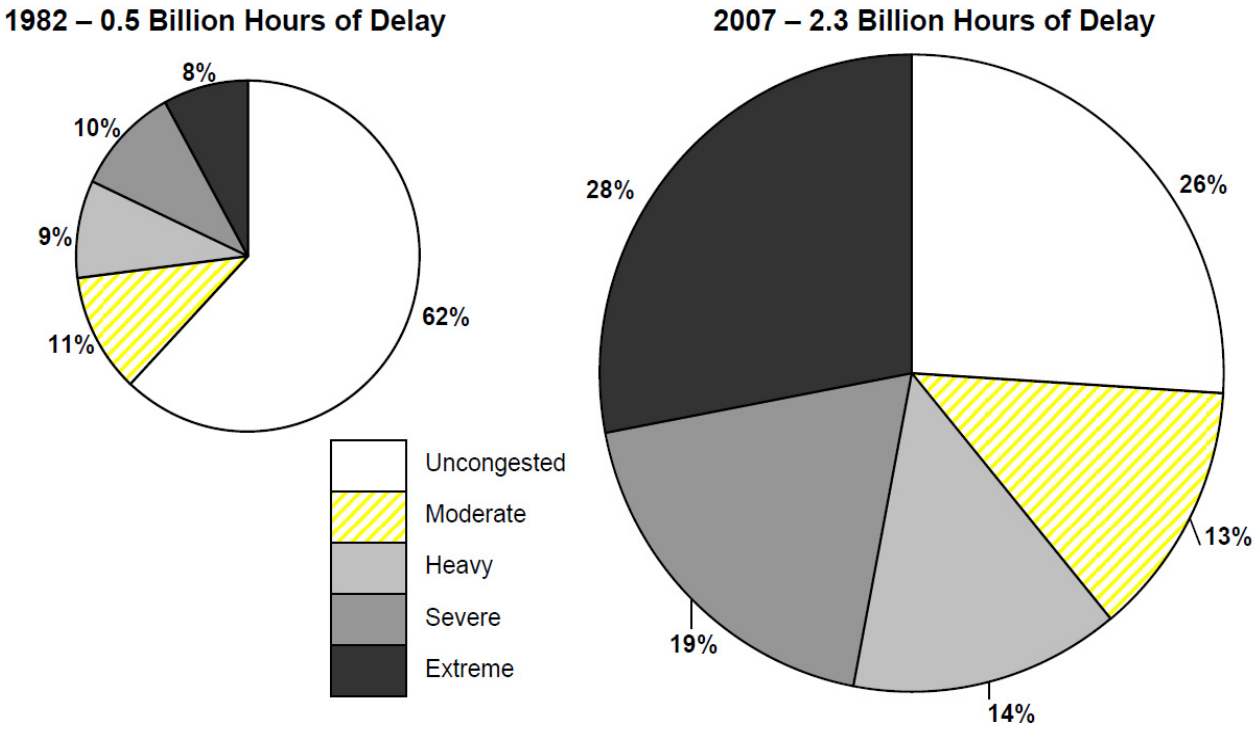
Transportation system congestion is a significant threat to the economic prosperity and way of life in the U.S. Whether it takes the form of trucks stalled in traffic, cargo stuck at overwhelmed seaports, or airplanes stuck on the tarmac, congestion costs the nation an estimated $200 billion a year. 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 over the previous decade. Congestion affects the quality of life in America by robbing time that could be spent with families and friends, in participation in civic life, and in 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.

In 2006, the U.S. DOT initiated a program to explore reducing congestion in partnership with metropolitan areas through the implementation of pricing activities combined with necessary supporting elements. This program was instituted through the Urban Partnership Agreements (UPAs) and the Congestion Reduction Demonstrations (CRDs). Within each program, multiple sites around the U.S. have been awarded funding for implementation of congestion reduction strategies. Background information on the UPA and CRD programs is presented below, followed by a summary of strategies being deployed at each of the UPA and CRD sites. More information on the two programs is available at http://www.upa.dot.gov/ and http://www.crd.dot.gov.

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 amounting to 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.



Source: *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 (CRD) 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 CRD grants in November 2009 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. The Los Angeles County CRD projects include congestion pricing in the form of HOT lanes on the I-10 and I-110 freeways; intelligent parking management (IPM) in downtown LA; enhanced bus rapid transit (BRT) service; enhanced park-and-ride security; and significantly expanded ridesharing in the treatment corridors.

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 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
Implement new, 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

The U.S. DOT selected a national evaluation contractor through a competitive procurement process to assess the effectiveness of the various UPA/CRD strategies. The Battelle team was selected to conduct the national evaluation. The team has been working with representatives from the U.S. DOT and the UPA/CRD sites to develop and conduct the evaluation process. This report was prepared by members of the Battelle team working in cooperation with the Los Angeles County CRD partners and representatives from the U.S. DOT.

1.2 Organization of this Report

The remainder of this report is divided into four sections. Chapter 2.0 discusses the Los Angeles County CRD. An overview of the transportation system in the Los Angeles metropolitan area is presented first, followed by a description of the Los Angeles County CRD partners and the CRD 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 Los Angeles County CRD evaluation process. Chapter 4.0 presents the Los Angeles County CRD evaluation plan. The chapter discusses the 12 evaluation analyses and describes the preliminary evaluation test plans. The report concludes with a discussion of the next steps in the Los Angeles County CRD national evaluation process.

2.0 LOS ANGELES COUNTY CONGESTION REDUCTION DEMONSTRATION AGREEMENT

This chapter describes the Congestion Reduction Agreement between USDOT and the Los Angeles County local partners. It provides an overview of the transportation system in the Los Angeles County CRD treatment corridors and describes the congestion challenges faced there. It also describes the Los Angeles County CRD partners and their organizational relationships. This chapter closes with a summary characterization of the L.A. CRD projects and their deployment schedules.

2.1 The Transportation System and Congestion in Los Angeles County

The Los Angeles-Long Beach-Santa Ana urban area has more than 10 million residents. Despite its reputation for urban sprawl, it has the second highest population density in the country, second only to the New York-New Jersey metroplex. Roughly 85 percent of the urbanized area falls within L.A. County, which covers more than 4,000 square miles and includes 88 cities plus several unincorporated areas.

The Los Angeles Region is the home of major transportation facilities that are of regional and national significance including the Port of Los Angeles, the Port of Long Beach, and the Los Angeles International Airport (LAX). Los Angeles County's economy is ranked 16th worldwide. Its two ports combined rank fifth worldwide in the volume of cargo that they handle.

The region has a complex transportation network of freeways and arterial roads; heavy and light rail; commuter rail; and bus service including bus rapid transit (BRT). L.A.'s freeway system, including its network of HOV lanes, is the most extensive in the country. Public transportation is available throughout the region, with Metro being the largest transit provider. Metro buses serve an area of 1,433 square miles. Sixteen other municipal transit operators provide additional bus service in Los Angeles County.

The L.A. CRD projects relate to the I-10 and I-110 transportation corridors which move traffic to and from downtown Los Angeles, and also to downtown Los Angeles parking facilities. Table 2-1 describes key transportation facilities in these CRD project treatment areas. It should be noted that neither the I-10 nor I-110 corridors have light rail service. However, the Blue Line runs parallel to the I-110 at certain locations. Similarly, the Metrolink San Bernardino Line commuter rail service parallels the I-10 at certain locations along its route.

Congestion. The Los Angeles region has consistently been ranked as the most congested urbanized area in the country by the Texas Transportation Institute (TTI). Peak-period traffic and major congestion on the roadway system extends from 6 to 10 a.m. in the morning and from 3 to 7 p.m. in the evening. Roughly 86 percent of peak-period vehicle miles occur in congested conditions.

Table 2-1. I-10 and I-110 Corridor Characteristics

Statistic	I-10	I-110
Freeway Infrastructure (in each direction)		
Mixed Flow Lanes (MFL)	4	4
High Occupancy Vehicle (HOV) Lanes	1	2
Freeway Usage during Morning Rush		
MFL, Vehicles per Hour	5,775	5,770
HOV, Vehicles per Hour	1,515	3,175
MFL, Persons per Hour	6,285	6,115
HOV, Persons per Hour	6,884	7,546
MFL, Average Vehicle Occupancy	1.09	1.06
HOV, Average Vehicle Occupancy	4.54	2.38
HOV, Traveler Time Savings[1]	46%	53%
Transit Service and Park & Ride		
Number of Park & Ride Spaces/Sites	2089 spaces at 5 sites	1693 spaces at 8 sites
Metro Bus Route Miles within Treatment Corridors[2]	84.6	190.6
Metro Bus Ridership within Treatment Corridors[3]	9,082	5,693
Vanpool Service		
Number of Vanpools[4]	49	74
Downtown Parking (included in the CRD Intelligent Parking Mgt. Project)		
Off-Street Publicly Owned Parking Spaces	7,500	
On-Street Parking Spaces	Approximately 5,500	

Sources

- Freeway usage data: California State DOT District 7, 2007 HOV Annual Report, July 2007
- Bus data: Metro Service Planning & Development Department, June 2009.
- Vanpool data: Metro Research and Development Department, April 2008.
- Parking data: LADOT, November 2009.

Notes

1. HOV lane time savings measured for westbound a.m. travel.
2. Round-trip bus route miles by Metro Rapid and local buses within the treatment corridors.
3. Weekday boardings that include Metro Rapid and local buses at busway stations and stops in downtown Los Angeles only.
4. Vanpool numbers are from Metro's April 2008 Vanpool Survey.

The following factors contribute to Los Angeles traffic congestion:

- A large and growing population and employment base
- Increasing trend toward urban sprawl development in the outer areas of the county; this limits the effectiveness of transit strategies while creating demand for additional roads and highly subsidized transit services
- The polycentric structure of the Los Angeles urban area that promotes travel in many different directions and impedes the provision of economical mass transit
- Rapid growth of freight movement traffic for all modes, particularly trucks transporting containers
- Disproportionate increase in the demand for travel relative to the growth in road capacity (i.e., vehicle miles of travel compared to road lane-miles)
- Increasing numbers of traffic incidents especially along major freight corridors
- Historically low gasoline prices
- Insufficient funding resources to implement needed transportation investments in a timely manner
- The abundance of free or relatively inexpensive parking
- Competing transportation investment priorities, especially the need to reduce air pollution from transportation sources.

Despite enormous transportation investments, it is widely accepted that major elements of L.A.'s transportation network are operating at or near capacity. The CRD projects are important to L.A. because they will add peak hour transportation capacity in treatment corridors while providing transit and ridesharing alternatives to vehicle travel. As these projects become reality, they will also test the public's willingness to accept pricing as a way of moderating congestion and improving transportation facility utilization in the Los Angeles region.

2.2 The Los Angeles County CRD Partners

A number of state, regional, and local agencies are collaborating on the Los Angeles County CRD projects. As Figure 2-1 indicates, Metro has taken the lead with active engagement by Caltrans; the City and County of Los Angeles; the Southern California Association of Governments (SCAG); and a number of other supporting agencies. The following paragraphs briefly describe each of the partner organizations and their role in the L.A. CRD effort.

The Los Angeles County Metropolitan Transportation Authority (Metro). Metro serves as transportation planner, coordinator, designer, builder; and transit operator for Los Angeles County's 88 cities. It is responsible for preparing the Long-Range Transportation Plan for Los Angeles County. The 2000+ buses and rail lines operated by Metro-- which include an extensive BRT network and 73.1 miles of passenger rail lines--average 1.54 million boardings each weekday. Metro also partially funds 16 municipal bus operators and Metrolink. As noted earlier, Metro is coordinating the overall L.A. CRD effort, and is managing its transit and ridesharing project elements.

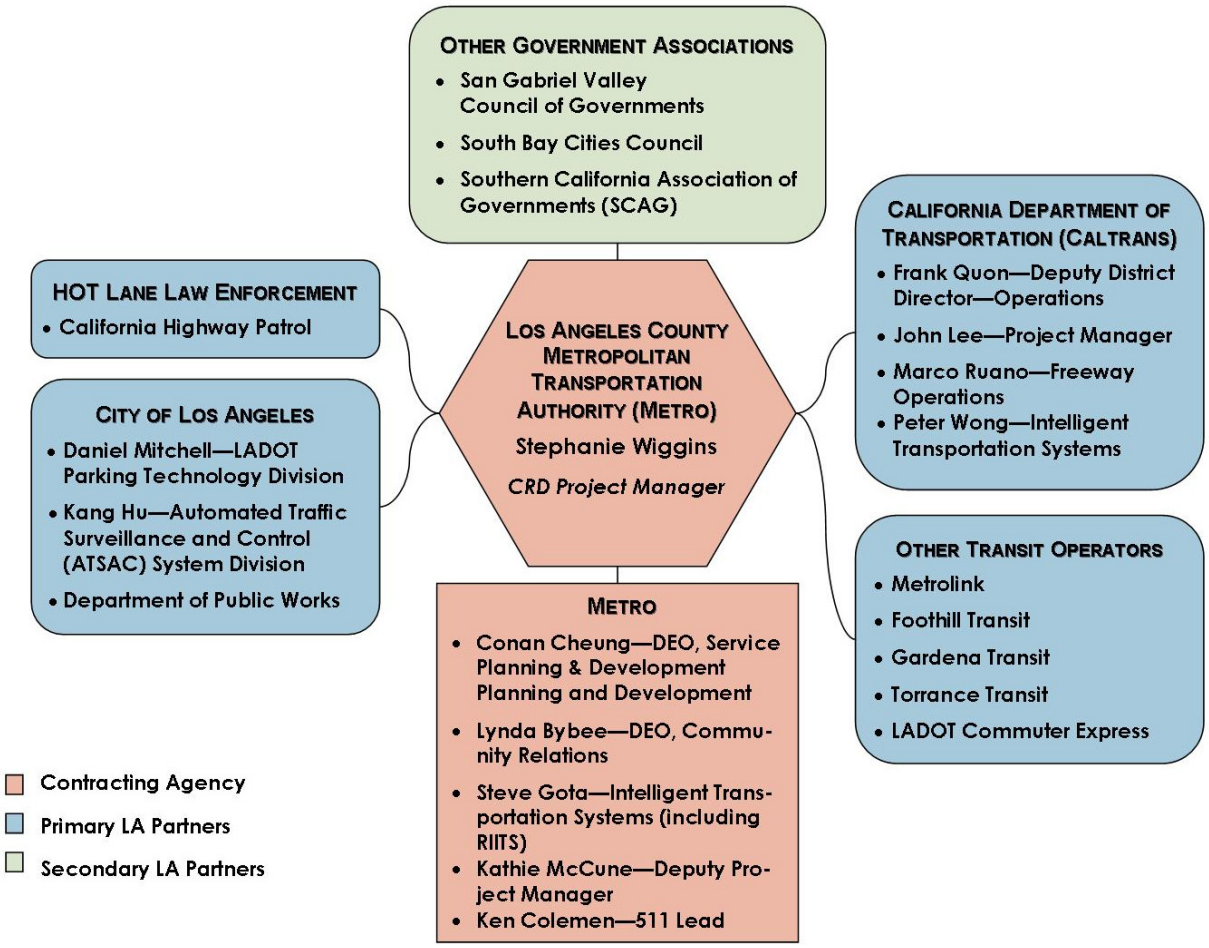


Figure 2-1. Organization of Los Angeles County CRD Project Stakeholders

The California Department of Transportation (Caltrans). Caltrans District 7 includes Los Angeles and Ventura Counties. District 7 is responsible for the operation and maintenance of the largest urban freeway system in the country. It built and manages 468 HOV lane-miles in Los Angeles County and has implemented an advanced Transportation Management Center (TMC) for monitoring and managing L.A. and Ventura County freeway systems. Caltrans is leading the CRD HOT projects on the I-10 and I-110 freeways.

The Los Angeles Department of Transportation (LADOT). LADOT provides the transportation infrastructure and services on L.A.'s arterials and feeder streets. It operates the Adaptive Traffic Control System (ATCS), a computer-based real-time traffic signal monitoring and control system for L.A. arterials. LADOT is leading the CRD Intelligent Parking Management (IPM) project which will use advanced sensing and communication technologies, including a Parking Guidance System, as well as pricing strategies, to achieve fuller utilization of downtown L.A. parking capacity and to make it easier for travelers to find available parking spaces.

Southern California Association of Governments (SCAG). SCAG is the designated Metropolitan Planning Organization (MPO) for six counties in Southern California: Los Angeles, Orange, San Bernardino, Riverside, Ventura and Imperial. The region encompasses a population exceeding 18 million residents in an area of more than 38,000 square miles. SCAG is mandated by the federal government to do region-wide research and planning for transportation, growth management, hazardous waste management, and air quality. SCAG is playing a supporting role in the L.A. CRD effort. Its principal contributions involve survey data collection and transportation modeling.

San Gabriel Valley Council of Governments (SGVCOG). SGVCOG represents more than two million residents and 31 incorporated cities and unincorporated communities in the San Gabriel Valley. SGVCOG formed the Pasadena Gold Line Construction Authority to build the Metro's 13.6-mile Gold Line light rail from downtown Los Angeles to Pasadena. SGVCOG is an important stakeholder in the success of the CRD project and has a special interest in the social equity impacts of the projects.

South Bay Cities Council of Governments (SBCCOG). SBCCOG serves 15 cities and unincorporated areas in the southeastern corner of L.A. County. The SBCCOG area has 1.4 million residents. The SBCCOG helps its member cities to obtain transportation funding from local, state, and regional sources. It maintains a continuously updated assessment of the area's transportation needs. It also funds studies to analyze congested corridors and ways of mitigating that congestion. Like SGVCOG, SBCCOG has a special interest in the social equity impacts of the CRD projects.

Southern California Regional Rail Authority (Metrolink). Metrolink is a regional rail transit system formed by five county transportation agencies: Metro, the Orange County Transportation Authority (OCTA), the Riverside County Transportation Commission (RCTC), San Bernardino Associated Governments (SANBAG), and the Ventura County Transportation Commission (VCTC). Metrolink has seven rail lines, two of which (the San Bernardino Line and the Riverside Line) travel through the San Gabriel Valley in the vicinity of the I-10 corridor and connect to Union Station in downtown Los Angeles. The Pomona Metrolink station will benefit from several CRD-funded improvements including the addition of 100 new parking spaces and the expansion of platforms to accommodate longer eight-car trains.

Other L.A. CRD Partners. Other regional partners for the Los Angeles County CRD effort include: Foothill Transit which serves the I-10 corridor and Gardena Transit and Torrance Transit, both of which serve the I-10 corridor; the California Highway Patrol (CHP) which will provide safety data related to the HOT implementation, and the Los Angeles County Sheriff's Department which has a Metro Division that is expected to be a source of security incident data for the Metro park-and-ride lots and transit stations.

2.3 L.A. CRD Projects and Deployment Schedules

In Los Angeles the CRD projects are collectively known as the "ExpressLanes". The projects are briefly summarized in the following paragraphs.

Transit Improvements. Over half of LA's CRD budget will be devoted to transit improvements. Metro bus rapid transit service in the I-10 El-Monte Busway and I-110 Harbor Transitway corridors will be greatly increased with headways as close as three minutes during peak periods. Other major improvements include a new downtown transit operating and maintenance facility; improved Artesia Transit Center security; expansion of the El Monte Transit Center; the creation of an El Monte Busway/Union Center connection; and the implementation of additional transit signal prioritization in downtown Los Angeles.

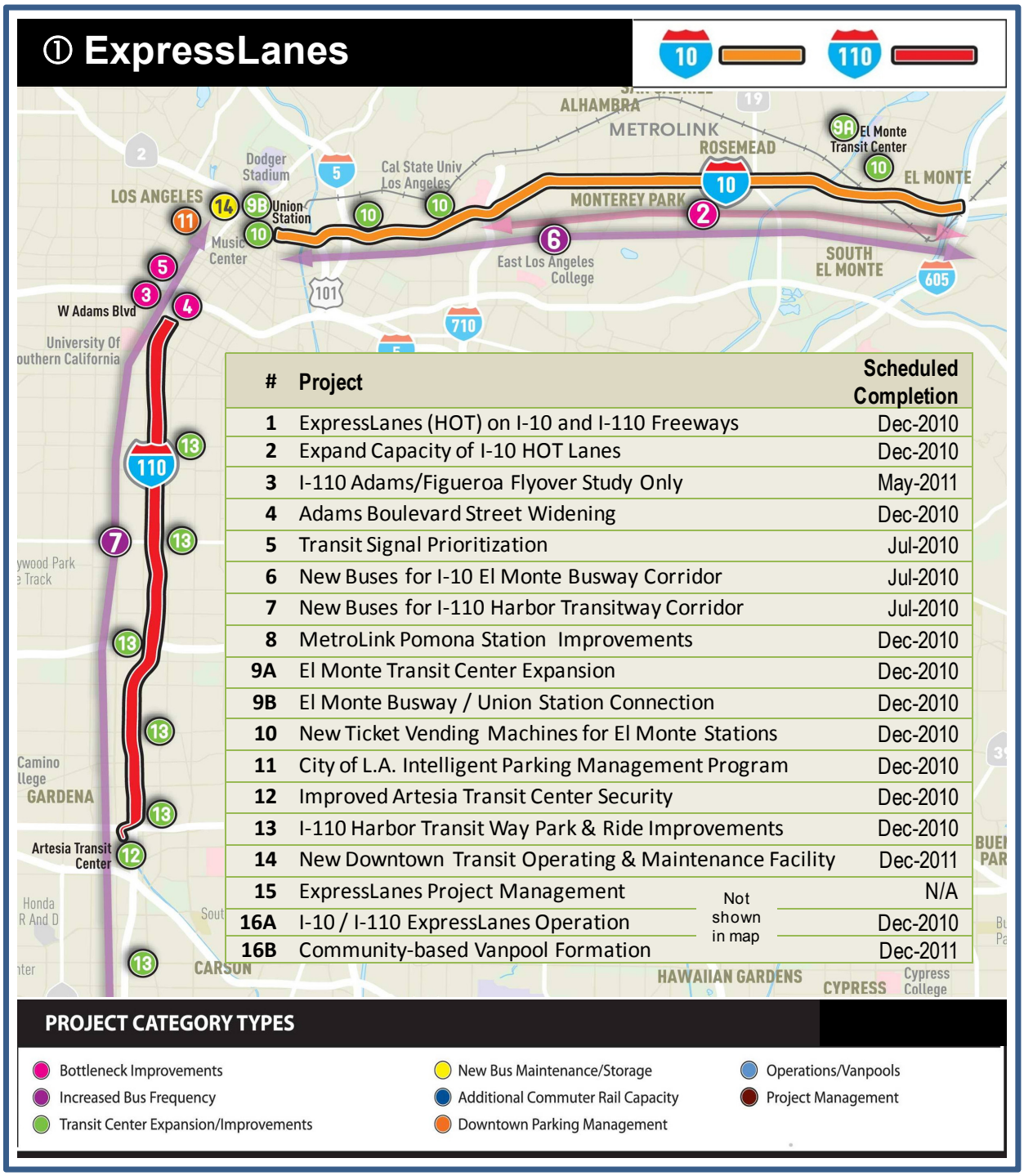
High Occupancy Toll (HOT) Lanes. L.A. will use CRD funds to convert HOV lanes to HOT in the I-10 and I-110 freeways. This will expand freeway capacity by permitting toll-paying, single-occupancy vehicles to use slack, HOT lane capacity. L.A. is committed to maintaining a minimum speed of 45 MPH at all times in the HOT lanes through dynamic pricing. Since the current I-10 HOV lane operates at capacity during peak travel periods, L.A. also plans to add an additional HOT lane to the section of the I-10 bounded by the I-710 and I-605 interchanges. It will do this through restriping and buffer changes pending FHWA approval of these modifications.

Intelligent Parking Management (IPM). L.A. will be deploying an IPM system in downtown L.A. The purpose of the system is to alleviate congestion by pricing parking so as to encourage use of alternate modes such as transit and by reducing parking space seek time, an important source of traffic congestion, by providing travelers information through a parking guidance system. IPM entails demand-based pricing of city managed parking to promote space turnover and to maintain balance between the parking spaces available and the number of travelers wishing to make use of those spaces. The IPM effort will use the advanced technologies described in the following paragraph to help downtown travelers rapidly locate available parking and to apprise them of current parking prices. The IPM will be deployed on approximately 7,500 city-owned off-street parking spaces and approximately 5,500 on-street spaces.

Technology. L.A. will be employing advanced technologies in support of both the HOT and IPM efforts. These technologies include algorithms that detect HOT lane capacity and parking spot availability; and advanced, real-time information dissemination technology that will make this information available to travelers through their computers, cell phones, PDAs, and electronic signage.

Ridesharing Expansion (Travel Demand Management). L.A. will use a variety of promotional methods to promote ridesharing, with a particular focus on Metro subsidized vanpools. Strategies include subsidies to travelers and vanpool operators and promotional outreach to major employers. This strategy falls within the Telecommuting/Travel Demand Management "T" of the U.S. DOT "4 T" strategies for the UPA/CRD sites. The L.A. CRD local partners have requested that the reference to telecommuting be dropped in the L.A. evaluation documents because telecommuting is not included among their strategies.

Figure 2-2 provides additional details about the projects, shows their locations in the Los Angeles region, and lists the scheduled deployment dates of project elements.



#	Project	Scheduled Completion
1	ExpressLanes (HOT) on I-10 and I-110 Freeways	Dec-2010
2	Expand Capacity of I-10 HOT Lanes	Dec-2010
3	I-110 Adams/Figueroa Flyover Study Only	May-2011
4	Adams Boulevard Street Widening	Dec-2010
5	Transit Signal Prioritization	Jul-2010
6	New Buses for I-10 El Monte Busway Corridor	Jul-2010
7	New Buses for I-110 Harbor Transitway Corridor	Jul-2010
8	MetroLink Pomona Station Improvements	Dec-2010
9A	El Monte Transit Center Expansion	Dec-2010
9B	El Monte Busway / Union Station Connection	Dec-2010
10	New Ticket Vending Machines for El Monte Stations	Dec-2010
11	City of L.A. Intelligent Parking Management Program	Dec-2010
12	Improved Artesia Transit Center Security	Dec-2010
13	I-110 Harbor Transit Way Park & Ride Improvements	Dec-2010
14	New Downtown Transit Operating & Maintenance Facility	Dec-2011
15	ExpressLanes Project Management	N/A
16A	I-10 / I-110 ExpressLanes Operation	Dec-2010
16B	Community-based Vanpool Formation	Dec-2011

Not shown in map

Source: Derived from Metro FastLanes project map with updates from ExpressLanes "Project Status Report May-June 2009 (draft final")

Figure 2-2. Map Depicting Los Angeles County CRD County Project Corridors, Project Elements, and Scheduled Completion Dates

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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 Los Angeles County CRD evaluation process.

3.1 National Evaluation Organizational Structure

The evaluation of the UPA/CRD national evaluation is sponsored by the U.S. DOT. The 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.

The Battelle team was selected by the U.S. DOT to conduct the national evaluation through a competitive procurement process. Members of the Battelle 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
- Wilber Smith Associates
- Eric Schreffler, ESTC
- 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.

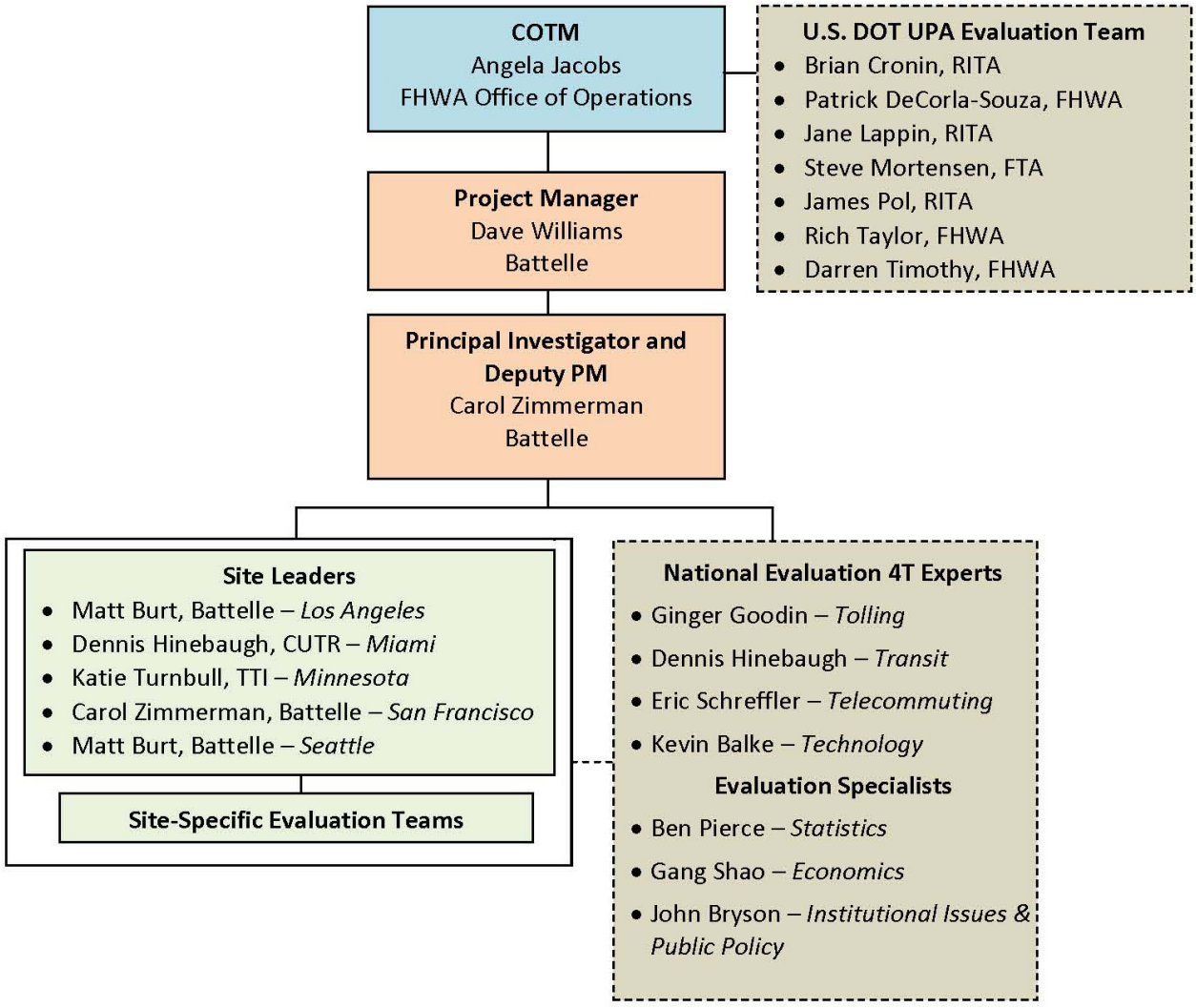

Figure 3-1. Battelle Team Organizational Structure

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.

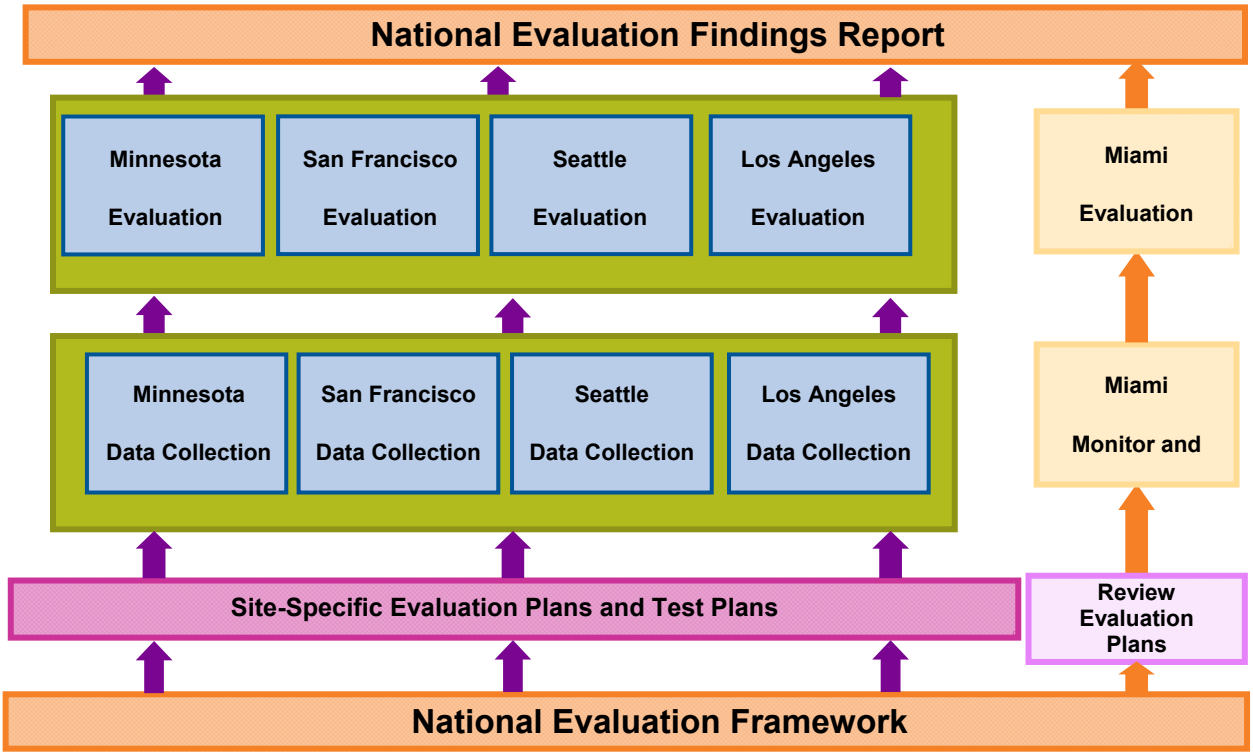

Figure 3-2. The National Evaluation Framework in Relation to Other Evaluation Activities

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
- Analysis of the collected data
- 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, measures of effectiveness will be collected before the deployments become operational. For the "after" or post-deployment period, the same measures 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.[1] 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 related to the four objective questions. These 12 analyses form the basis of the evaluation plans at the UPA/CRD sites, including Los Angeles.

[1] "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.
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.
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?
4	What are the overall costs and benefits of the deployed set of strategies?

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."

Table 3-2. U.S. DOT Objective Questions vs. NEF 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: Travel Demand Management* #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

* This analysis is referred to as the "Telecommuting/Travel Demand Management" analysis in the NEF. The L.A. CRD local partners have requested that the reference to telecommuting be dropped in the L.A. evaluation documents because telecommuting is not included among their strategies.

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.

The non-technical success factors referenced in Table 3-2 include L.A. partner outreach activities; political and community support; and institutional arrangements. The cost benefit analysis of the deployed projects will provide a summary measure of the UPA/CRD projects net value to the extent that such value can be measured using financial criteria.

3.4 Los Angeles County CRD Evaluation Process

Figure 3-3 presents the Los Angeles County CRD national evaluation team. The team includes U.S. DOT National Evaluation leader, the COTM, the U.S. DOT evaluation team, the FHWA point of contact, and the Battelle team. Representatives from the partnership agencies are involved in development of the CRD national evaluation.

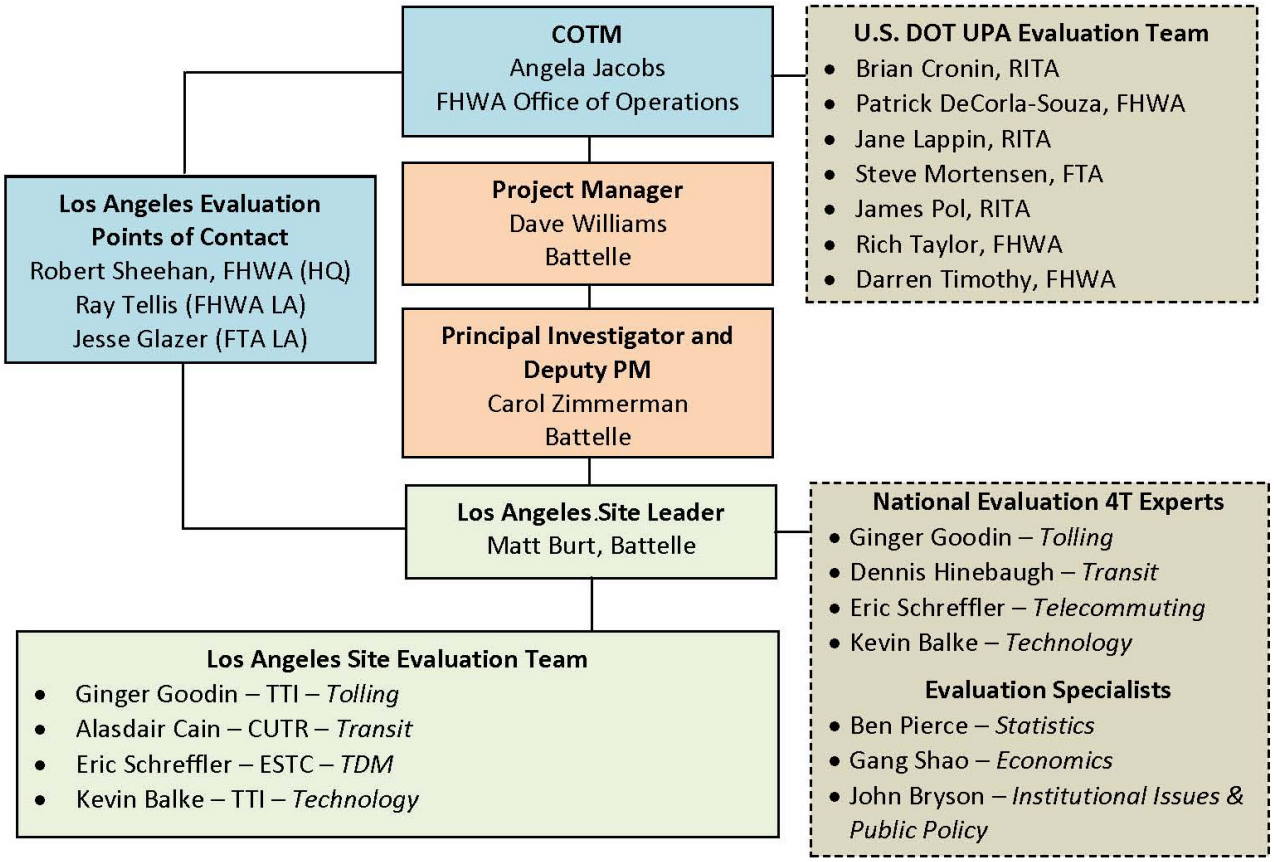

Figure 3-3. Los Angeles County CRD National Evaluation Team

Figure 3-4 lists actual and planned milestones for the L.A. CRD evaluation effort. These milestones dates are substantially determined by L.A.'s scheduled deployments of the CRD projects. LA's CRD application was approved in final form on July 24, 2008. The L.A. CRD Evaluation commenced shortly thereafter in September 2008. All of the L.A. CRD projects that will be examined by this evaluation are expected to be fully deployed by December, 2010. The Evaluation plans to publish its findings by December 2012, two years later. The following paragraphs provide some additional details on the Evaluation process. The first phase of development activity is the creation of an evaluation framework specific to the L.A. site.

Kick-Off Conference Call. The kick-off conference telephone call, held on November 4, 2008, introduced the Los Angeles partners, the U.S. DOT representatives, and the Battelle team members. The Los Angeles County CRD projects and deployment schedule were discussed, and the national evaluation approach and activities were presented. A series of handouts were distributed prior to the conference call and a summary was prepared and distributed to participants after the call.

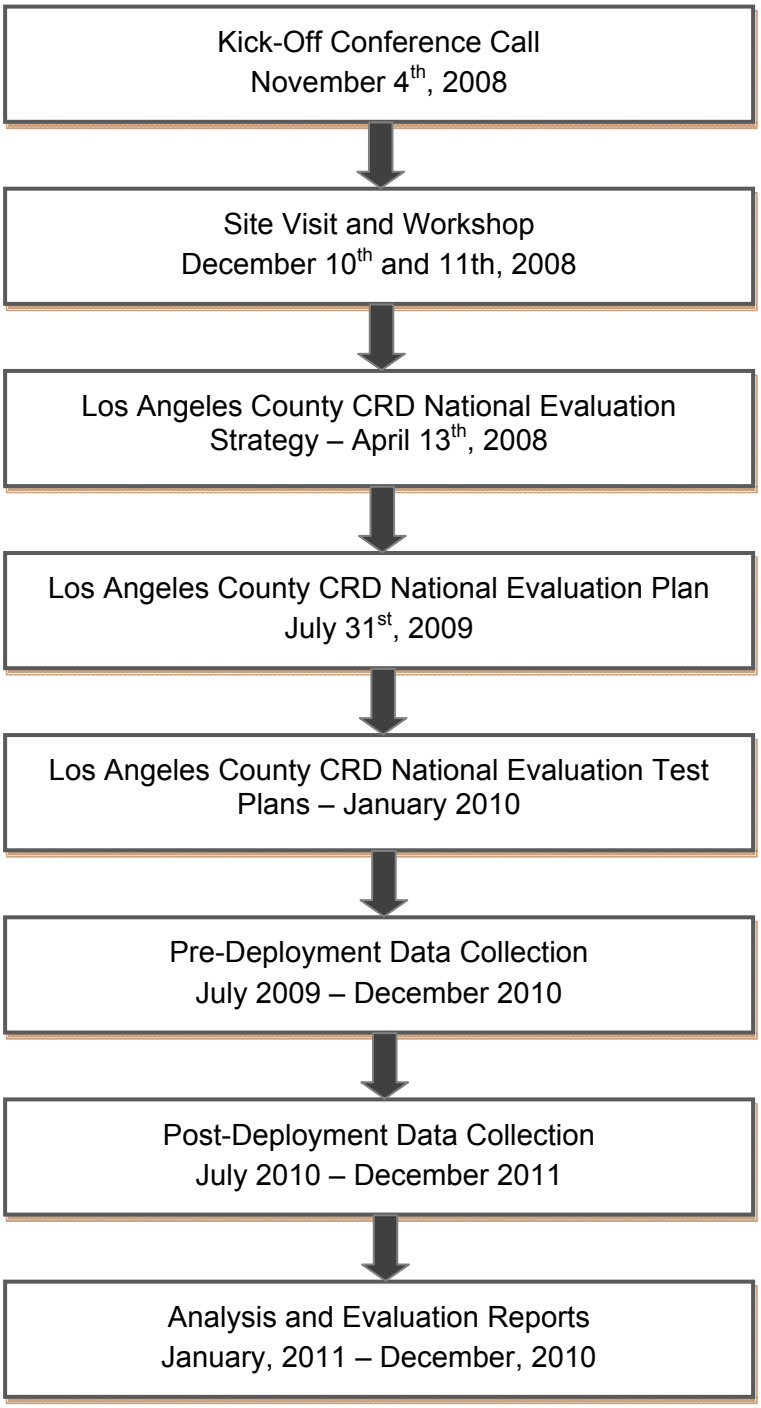

Figure 3-4. Los Angeles County CRD National Evaluation Process

Site Visit and Workshop. Members of the U.S. DOT evaluation team and the Battelle team traveled to Los Angeles on December 10th and 11th, 2008. On the morning of 10-Dec, L.A. stakeholder organizations including Metro, Caltrans, and LADOT briefed the evaluation team on L.A.'s CRD projects. During the afternoon, the FHWA led a tour of CRD project locations in the I-10 and I-110 treatment corridors, and the downtown. On the second day of the visit, the Evaluation team presented the preliminary draft of the evaluation strategy. The L.A.

stakeholders provided extensive and valuable feedback on the evaluation approach outlined by the Battelle team.

Finalization of the L.A. CRD Evaluation Strategy. The preliminary evaluation strategy presented in December 2008 was refined over the balance of the month of December and the month of January, 2009 in light of inputs from L.A. stakeholders and the evaluation teams own research efforts. The draft final Evaluation Strategy was briefed to U.S. DOT and the L.A. partners on 4-March-2009. The briefing, which also identified key data acquisition challenges faced by the evaluation, elicited a great deal of additional input from the L.A. partners and U.S. DOT. As a consequence, only half of the briefing was covered in the available two-hour time slot. The second half of the briefing was presented on 13-April and the L.A. CRD Evaluation Strategy document was finalized soon thereafter.

L.A. CRD Evaluation Plan. The L.A. CRD Evaluation Strategy consists of an extensive series of tables and supporting PowerPoint slides. However, it is not a formal, publishable report. The Evaluation Plan (this document) expands on the strategy document, puts it in a publishable form, and also presents the preliminary data test plans (Section 4.2). The L.A. Evaluation Strategy was developed in late spring and summer, 2009.

LA CRD Evaluation Data Test Plans. The final step in the development of the Evaluation Framework is the creation of Data Test Plans for each major data source available to the Evaluation. These test plans describe the data that are required; identify the sources from which the data will be obtained; describe any issues surrounding the data's availability to the Evaluation; and speak to the ways that the data will be used by the various Evaluation analyses. The evaluation team expects the L.A. data test plans to be complete in January or February 2010.

Pre-Deployment Data Collection. Ideally, the Evaluation would have at least one-year of pre-deployment data to use as a baseline against which post-project deployment data can be interpreted. L.A.'s CRD projects are expected to deploy over the June-2010 through Dec-2010 time frame. As a consequence, baseline data collection began in June 2009. This is possible because much of the required data are system generated (e.g., L.A. freeway traffic data, acquired through an extensive network of vehicle detection stations, are available from Caltrans archives as far back as 2000). Surveys conducted during the pre-deployment period will also provide crucial data to the evaluation.

Post-Deployment Data Collection. The pre- and post-data collection efforts overlap because the deployment dates for L.A. CRD projects are spread over an eighteen month period. The post-deployment data efforts will be somewhat more extensive than the pre-deployment baselining efforts. Additional post-deployment data collection activities will include surveys of corridor travelers to gauge their response to the CRD projects (e.g., the introduction of HOT lanes, significantly expanded transit service, the introduction of IPM to the downtown), especially the ways that the projects influenced travelers mode choices.

Analysis and Evaluation Reports. Analysis of the pre- and post-deployment data will be initiated in January 2011. A preliminary evaluation of L.A. CRD project effects is expected early in calendar 2012. The evaluation team expects to finalize the evaluation report late in 2012.

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4.0 LOS ANGELES COUNTY CRD NATIONAL EVALUATION PLAN

This chapter presents the Los Angeles County CRD Evaluation Plan. This material is presented in two major subsections. The first of these sections, 4.1, Evaluation Analyses, discusses the potential benefits, costs, and impacts of the CRD projects; the Evaluation team's planned approach to measuring those effects; the kinds of data it will need to perform this work; and its planned analytic approach. The second section, 4.2, Preliminary Data Test Plans, addresses data requirements in further detail, speaking to the potential sources of those data and their expected information content.

4.1 Evaluation Analyses

The intended approach to the eleven evaluation analyses is presented in this section. These analyses address:

1. Tolling
2. Technology
3. Transit
4. Travel Demand Management (TDM)[2]
5. Congestion
6. Safety
7. Equity
8. Environment
9. Business Impacts
10. Non-Technical Success Factors
11. Cost-Benefit.

For each of these analyses, the key hypotheses and questions to be addressed are presented. The hypotheses describe the results that the CRD projects are expected to produce. These include anticipated project benefits such as throughput improvements, congestion reduction, expanded traveler choices, improved mobility, and related outcomes. In a few cases, possible unwanted side-effects of the CRD improvements may also be hypothesized.

For each hypothesis and question, *measures of effectiveness* (MOEs) are presented. These are measurable aspects of the L.A. treatment corridors that relate to 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.

[2] This analysis is referred to as the "Telecommuting/Travel Demand Management" analysis in the NEF. The L.A. CRD local partners have requested that the reference to telecommuting be dropped in the L.A. evaluation documents because telecommuting is not included among their strategies.

Throughout this document, the terms "corridor traffic" or "treatment corridor traffic" should always be taken as a reference to all traffic in the corridor whether it is moving on freeways, parallel arterial roadways, or rail. If the concern is narrower (e.g., just traffic on parallel arterials), it will be specifically called out.

4.1.1 Tolling Analysis

Table 4-1 presents the hypotheses and questions that the evaluation team will address in the tolling analysis. The tolling analysis focuses on the two pricing components of the Los Angeles County CRD: HOT lanes on I-10 and I-110 and the downtown IPM (ExpressPark) system. The evaluation will examine the affect of tolling on travel behavior; I-10 and I-110 operations; and parking availability and revenues in downtown L.A. It will estimate demand elasticities for the HOT lanes and downtown parking.

The first three hypotheses in Table 4-1 relate to HOT lanes and the remaining two hypotheses pertain to the downtown IPM project. Given the IPM project's emphasis on improved traveler information (guidance to available parking) and intention to shift trips from driving to transit via parking pricing, it would be desirable to investigate, through a survey, downtown travelers' stated behavioral reactions and perceptions. However, hypotheses in those areas are not included in the evaluation because local partner evaluation resources are not available to support such surveys.

The data needed to assess the measures of effectiveness for these hypotheses include toll, freeway traffic, and parking system data. For example, data on the HOT toll transactions and toll rates, which will range from $0.25 to $1.40 a mile, will be obtained and analyzed. Surveys of I-10 and I-110 travelers will also be required (those surveys are discussed in the preliminary Surveys and Interviews Data Test Plan in Section 4.2.6).

It is envisioned that the parking space occupancy data will be collected using the ExpressPark parking space sensors. The evaluation also assumes that the parking space sensors will be operational for a sufficient period of time prior to the implementation of any new pricing strategy so that baseline parking behavior can be measured. Post-deployment, ExpressPark sensor log data will be collected after each parking pricing change.

Table 4-1. Tolling Analysis Approach

Hypotheses/Questions	Measures of Effectiveness	Data
• The HOT lanes will regulate vehicular access to the I-10 and I-110 and improve their operation.	• Increase in vehicle throughput (number of vehicles) on I-10 and I-110 • Increase in person throughput (vehicle occupants) on I-10 and I-110 • Improved level-of-service on I-10 and I-110 • Improved travel-time reliability in I-10 and I-110 HOT lanes • Increase average vehicle occupancy in HOT lanes vs. general-purpose lanes • Traffic density on I-10 and I-110	• Toll transactions by time-of-day • Traffic volumes by time-of-day, location/segment, and lane types • Number of vehicle occupants
• Some general-purpose lane travelers will shift to the HOT lanes, while HOV lane travelers will continue to use them after they are converted to HOT.	• Previous HOV travelers elect to use HOT lanes • Some general purpose lane travelers will shift to HOT lanes	• Traveler's behavior reported in surveys
• After ramp-up, the HOT lanes on I-10 and I-110 pricing maintains operating improvements on I-10 and I-110	• Travel time reliability in the HOT lanes, normalized over time • Days exceeding reliability targets and performance thresholds	• Time-series comparison of traffic volumes by time-of-day, location/segment, and lane type
• The downtown IPM project will result in 70-90% of the parking spaces on each block occupied throughout the day	• Change in on- and off-street parking occupancy by time-of-day and zone	• Parking sensor logs (showing occupancy, turnover, length of stay) • (to aid in interpretation) Parking rate data • (to aid in interpretation) Parking citation (violation) data
• The downtown IPM project may increase parking revenues that can be used to fund system expansion in other high-demand areas	• Change in parking rates in the targeted zones • Change in parking revenues generated in the targeted zones	• Parking rates and revenues by zone and time of day • Use of revenues to fund system expansion • (to aid in interpretation) Parking payment methods by time of day for each zone

4.1.2 Technology Analysis

While every project being implemented in the L.A. CRD project has a technology component, this analysis is concerned with those projects that are heavily reliant on technology to effect improvements in the treatment areas. The Intelligent Parking Management System (called *Express*Park) meets this criterion. The stated goals of *Express*Park are as follows:

- Increase the availability of on-street parking to ensure a 10 to 30 percent availability in spaces on each block
- Reduce traffic congestion and pollution by reducing "cruising" for parking
- Help travelers quickly locate the best available on- and off-street parking through implementation of a parking guidance system
- Encourage a shift in travel choices from those driving alone to more efficient options, such as carpooling, transit, etc.

The technology components that will be installed as part of this deployment include the following:

- New parking meter technology that permits travelers to use multiple payment options (coins, credit card and cell phone) and that allow travelers to be charged demand-based parking rates
- Vehicle sensors that permit the real-time measurement of parking spaces
- A central management system that can be used to optimize rates, time limits, and hours of operations
- A real-time parking guidance system including on-street dynamic message signs, voice recognition telephone system, and web-enabled mobile devices (iPhone, Blackberry, etc.).

Table 4-2 shows the hypothesis, measures of effectiveness, and data sources that will be used to assess the effects of the the technology associated with ExpressPark improvements not covered elsewhere, including payment technology and parking information.

Table 4-2. Technology Analysis Approach

Hypotheses/Questions	Measures of Effectiveness	Data
Travelers will access the IPM website and telephone information system	• Number of page views of parking websites • Number of telephone requests for parking information	• Traveler information system logs (website and phone; showing phone calls and website user sessions)
IPM will improve L.A.DOT's ability to reconfigure parking restrictions and rates	Perceptions of L.A.DOT managers that IPM improved agency's ability to reconfigure parking restrictions and rates	Agency interviews
IPM will improve L.A.DOT's ability to enforce parking regulations	Perceptions of L.A.DOT managers that IPM technology has enhanced its ability to enforce parking regulations	Agency interviews

4.1.3 Transit Analysis

Table 4-3 presents the core evaluation hypotheses, measures of effectiveness (MOE), and data needs for the Transit Analysis.

The first hypothesis relates to measuring any changes in transit service performance as a result of the CRD project, which includes transit specific improvements, plus other CRD project elements that could impact transit services such as HOV/HOT conversions that could improve transit service speeds and reliability. Defined performance measures include travel speeds, travel times, reliability (schedule adherence/on-time performance), as well as changes to service capacity. User perceptions of service performance improvements will also be assessed here through on-board surveys.

The second hypothesis focuses on traveler perceptions of security at CRD corridor transit stations and park-and-ride lots. The local partners think that such security perceptions are a significant factor in some travelers' mode choice decisions. Traveler surveys (discussed in the Surveys and Interviews Data Test Plan) will be used to collect the perception data, including transit on-board surveys focusing on riders' impressions of the CRD transit security improvements as well as the general public survey which will investigate travelers' concerns about transit security in general, the impact of those concerns on their mode choice decisions, and how they view transit security enhancements of the sort included in the CRD project.

Table 4-3. Transit Analysis Approach

Hypotheses/Questions	Measures of Effectiveness	Data
CRD projects will enhance transit performance within CRD corridors through reduced travel times, increased service reliability, and increased service capacity	• Reduced end-to-end transit route trip times • Reduced perceived door-to-door passenger trip times • Increased in-transit service speeds • Increased transit reliability (headway variance if freq < 12 mins / schedule adherence if freq > 12 mins) • Increased transit capacity (# seats per hour) • Improved user satisfaction	• Transit travel time data • Transit reliability / schedule adherence data • Transit service characteristics data • Traveler survey data
User perceptions of security at transit stations/park-and-ride lots will be improved by CRD projects	• User perceptions of security at transit stations/park and ride lots	• Traveler survey data
CRD projects will increase ridership and facilitate a mode shift to transit within CRD corridors	• Increased transit ridership • Increased persons per peak revenue hour/period • Reduced cost per passenger mile • Increased park-and-ride lot utilization • Corridor mode split (%)	• Transit ridership data • Traveler survey data • Transit service characteristics data • Park-and-Ride lot utilization data • Traffic volume and vehicle occupancy data
Increased ridership and mode shift to transit will contribute to increased person throughput, congestion mitigation, and transit cost-effectiveness within CRD corridors	• Increase in person throughput attributable to transit • Total change in traffic congestion (as determined in the Congestion Analysis) • Change in transit cost per passenger mile • User perceptions of project impacts	• Transit ridership data • Traveler survey data • Transit service characteristics data • Park-and-Ride lot utilization data • Traffic congestion data (from Congestion Analysis) • Traffic volume and vehicle occupancy data • Transit cost data
What was the relative contribution of each CRD project element to increased ridership/ transit mode share/ person throughput?	• All of the above measures, supplemented by those obtained from other aspects of the evaluation	• All of the above data sources

The third hypothesis investigates the impact of the CRD projects on transit ridership and mode share, which are expected to increase due to the improved transit performance and enhanced perceived security. Note that the calculation of mode share requires data for each mode (single occupant vehicle, carpool/vanpool, transit). The non-transit vehicle traffic volumes and vehicle occupancy data needed to calculate corridor mode split percentages will be available through the Congestion Analysis. Park-and-ride utilization data and traveler survey data will be used to further understand any observed changes in transit mode share. Note that the Transit Analysis is the place in the CRD evaluation where before and after corridor mode share changes are calculated, drawing upon both transit data as well as non-transit traffic volume and vehicle occupancy data from the Congestion Analysis.

The fourth hypothesis relates to the identification and measurement of three impacts resulting from increased transit ridership/increased transit mode share: 1) Increased total corridor person throughput, 2) Reduced traffic congestion, and 3) Increased transit cost effectiveness (i.e., with increased ridership the average cost per transit passenger mile is hypothesized to decrease). Assessment of contributions to traffic congestion reduction will require data describing the transit impacts (e.g., ridership increases attributable to the CRD) as well as data from the Congestion Analysis showing the total estimated CRD-related change in congestion. The issue of public perceptions is also considered here. Do people notice the improvement in transit service performance? Do they perceive it as an improvement? Has it influenced their travel behavior in any way? These questions will be addressed primarily through on-board surveys of transit riders.

The fifth hypothesis relates to the interpretation and understanding of any net mode shift to transit that may be identified. If this does occur, it is important to be able to understand why, and to relate the resultant mode shift to specific project elements. While the preceding hypotheses focus on documenting how transit services within the CRD corridors have changed, and what the impacts of these changes have been, the last hypothesis seeks to answer the question of why these changes have occurred. Answering this question will require an understanding of how each of the CRD project elements contributed to transit mode shift and subsequent impacts. Potential contributory factors include increased vehicle travel cost, decreased transit travel time, increased transit reliability, improved perceptions of security, and increased service quantity, in addition to exogenous factors such as gasoline prices and the state of the local economy. This will require consideration of transit data sources including park and ride lot utilization and traveler survey data, supplemented by information from other aspects of the evaluation.

4.1.4 Travel Demand Management (TDM) Analysis Approach

The TDM element of the Los Angeles County CRD is intended to increase ridesharing (carpooling and vanpooling). Since all vehicles with at least three occupants will be able to use the HOT lanes free of charge, creation of the HOT lanes themselves are expected to be one impetus ridesharing increases. In addition, the local partners will carry out a variety of specific promotional activities to encourage ridesharing, including subsidies to travelers and vanpool operators and promotional outreach to major employers. Potential sources of ridesharing increases include expansion of Metro's subsidized vanpool program, expansion of other employer-based ridersharing programs, and increases in casual (non-Metro subsidized and non-employer-based) ridehsharing.

The local partners have set a goal of a total of 100 new Metro vanpools. No specific goals have been set for other carpool/vanpool increases. The goal was set for Metro-subsidized vanpools because the local partners feel that they have the most accurate data for that program and are, therefore, most confident in setting a goal and gauging success in achieving it.

The evaluation hypotheses, measures of effectiveness and data associated with the L.A. CRD TDM analysis are summarized in Table 4-4. The hypotheses/questions focus on quantifying the change in ridesharing attributable to the CRD and understanding the factors that influenced those changes. Data required to test these hypotheses include Metro vanpool program registration data, Metro data on other major employer ridesharing programs, I-10 and I-110 corridor traffic volume and average vehicle occupancy data (which will show changes in the number of high-occupancy vehicles), surveys of major employers that support ridesharing programs, and surveys of the participants in major employer-based ridesharing programs.

Table 4-4. TDM Analysis Approach

Hypotheses/Questions	Measures of Effectiveness	Data
The CRD projects will increase ridesharing.	Change in number of vanpools in the treatment corridors.	• Metro subsidized vanpool registration data • Metro data on other major employer vanpool registrations • Survey data (major employers and the ridesharing program participants)
	Change in the number of individual ridesharers in the treatment corridors.	• Metro subsidized vanpool registration data • Metro data on other major employer vanpool registrations • Survey data (major employers and the ridesharing program participants) • Traffic volume and vehicle occupancy data (from the Congestion Analysis)
	Change in ridesharing vehicle miles traveled in the treatment corridors	• Surveys of new vanpool riders • Surveys of ex-vanpool riders
Will CRD HOT and transit improvements lead to unintended breakups of current carpools/vanpools?	Number of carpool/vanpool breakups attributed to CRD HOT or transit improvements.	• Surveys of major employers • Traffic volume and vehicle occupancy data (from the Congestion Analysis) • Surveys of ex-vanpool riders • Surveys of transit riders
Which factors were most effective in promoting ridesharing?	Employer and ridesharing participants' perspectives on the relative influence of various factors on their shift to ridesharing	• Surveys of new carpool and vanpool program participants at major employers • Surveys of major employers

4.1.5 Congestion Analysis

One of FHWA's main objectives in conducting an evaluation of the Los Angeles UPA/CRD deployment is to determine the extent to which all the improvements, when taken collectively, reduced congestion in the I-10 and I-110 corridors. The purpose of the congestion analysis is to answer this main evaluation question. Following the evaluation principles outlined in NCHRP *Guide to Effective Freeway Performance Management Management*[3], the evaluation approach will assess the degree to which the improvements implemented in the two corridors impacted the following:

- Travel time and trip time reliability in both the HOV/HOT and general purpose lanes of I-10 and I-110 as well as adjacent roadways paralleling these facilities
- The vehicle and passenger throughput of both the HOV/HOT and general purpose lanes of I-10 and I-110 and major roadways paralleling these facilities
- User perceptions and customer satisfaction levels have changed as a result of implementing the improvements in both the I-10 and I-110 corridors
- The spatial and temporal extent of congestion in both the HOV/HOT and general purpose lanes of I-10 and I-110 as well as adjacent roadways paralleling these facilities.

L.A. will use UPA/CRD funds to deploy an intelligent parking management system (IPM) throughout the downtown area. IPM is expected to reduce parking search time and overall congestion in the downtown area by creating parking turnover. The evaluation team will evaluate IPM's effectiveness in alleviating downtown congestion under this analysis.

Travel Time and Trip-Time Reliability

According to NCHRP *Guide to Effective Freeway Performance Measurement,* travel time and travel time reliability are the primary measures of mobility for freeways. Accordingly, these will be the primary measures the evaluation team will use in the congestion evaluation as indicated by Table 4-5.

The congestion analysis will compare travel times in the general purpose lanes and the HOV/HOT lanes before and after the lanes' conversion to HOT. The evaluation will also examine changes in travel times on the arterial streets paralleling the I-10 and I-110 freeways to determine if traffic shifted to or from the arterials in response to CRD improvements.

Travel time variability can be caused by not only normal day-to-day fluctuation in demand, but also events such as traffic incidents, work zones, weather, special events, etc. Within the limits of available data, the evaluation will examine the effects of the CRD projects on travel time variability. This will entail separate analysis of traffic data in "normal" conditions from that which is impacted by traffic incidents, inclement weather, and construction/maintenance and other special conditions.

[3] R. Margiotta, T. Lomax, M. Hallenbeck, S. Turner, A Skabardonis, C. Ferrell, and B. Eisele. *Guide to Effective Freeway Performance Measures: Final Report and Guidebook*. NCRHP Web-Only Document 97. National Research Council, Transportation Research Board. August 2006. Available at http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_w97.pdf. Accessed June 15th, 2009.

Table 4-5. Hypotheses Related to Travel Time and Trip-Time Reliability

Hypotheses/Questions	Measures of Effectiveness	Data
Deployment of the CRD improvements will reduce the travel time of users in the I-10 and I-110 corridors.	• Percent change in trip travel time in general-purpose lanes on I-10 and I-110 • Percent change in trip travel times in HOV/HOT travel lanes on I-10 and I-110 • Percent change in trip travel times on arterials paralleling I-10 and I-110. • Percent change in person travel time in the CRD deployment corridors • Percent change in the travel-time index of travelers in the CRD deployment corridors	• Segment travel time by facility • Cumulative person travel time in corridor
Deployment of the CRD improvements will improve the reliability of user trips in the I-10 and I-110 corridors.	• Percent change in the variability[4] of trip travel time in the general-purpose lanes on I-10 and I-110 • Percent change in the variability of trip travel times in the HOV/HOT lanes on I-10 and I-110 • Percent change in the variability of trip travel times on arterials paralleling I-10 and I-110. • Percent change and change in variability in the buffer index of travelers in the CRD deployment corridors • Percent change and change in variability in the planning index of travelers in the CRD deployment corridors	• Segment travel time and end-to-end (or trip) travel time by facility • Cumulative person travel time in corridor • 95th percentile travel time
Deployment of the Downtown L.A. Intelligent Parking Management Project will reduce congestion in the downtown.	• Change in travel times for transit in the downtown area	• Transit AVL Data

[4] Of particular interest is variability due to traffic incidents, adverse weather, or other special events.

Changes in travel time reliability can be quantified using two primary measures: the Buffer Index and the Planning Time Index. Both the Buffer Index and the Planning Time Index are common measures used to evaluate freeway performance and have been used in the Urban Mobility Study and other academic and government research to express travel scheduling/budgeting. The Buffer Index (BI) is the amount of extra time that travelers in the corridor need to incorporate into their travel schedule to ensure that they arrive at their destination on time. The buffer index is computed as the difference between the 95th percentile travel time and the average travel time, normalized by the average travel time, and then expressed as a percentage. A buffer index of 40% means that a traveler needs to allow 1.4 times as much time during congested periods to ensure that he or she reaches their destination on time with 95 percent certainty. Planning Time Index (PTI) is a related measure that the *total* travel time that is necessary to achieve reliable on-time arrival whereas the buffer index computes the *additional* time that travelers must add to their schedules to be confident of on-time arrival.

Throughput

The congestion analysis will estimate the increased peak period throughput in the treatment corridor that can be reasonably attributed to the CRD projects. Throughput is a measure of the number of users "served" by the transportation system. The reasons for assessing the impacts of the improvements on throughput in addition to travel time and travel time reliability is because of latent demand that potentially exists in the treatment corridors. This latent demand may make it difficult to discern significant improvements in travel time or travel time reliability from the CRD improvements. However, it can be demonstrated that these improvements allowed more vehicles and persons to use the corridor during peak periods that can be viewed as an important step towards congestion reduction.

Table 4-6 lists the hypotheses, measures of effectiveness, and data requirements that will be used to assess the effects of CRD improvements on treatment corridor throughput in terms of both vehicles and persons.

Table 4-6. Hypothesis Related to Improvements in Corridor Throughput

Hypotheses/Questions	Measures of Effectiveness	Data
Deploying the CRD improvements will result in more vehicles and persons served in the I-10 and I-110 corridors during peak periods.	Percent change in the number of vehicles served by the facilities impacted by the CRD deployments	• Vehicle counts in corridor • Vehicle miles of travel (VMT)
	Percent change in the total number of people serviced by the facilities impacted by the CRD deployments	• Vehicle counts in corridor by facility type (GP, HOT/HOV, Transit, Arterials) • Average number of vehicle occupants by facility type • People miles of travel (PMT)

Customer Satisfaction

A survey of corridor travelers will determine whether they perceived congestion reduction in the treatment corridors that they ascribed to the CRD projects. Table 4-7 lists the evaluation questions, measures of effectiveness, and sources of data that will be used to measure user perceptions and customer satisfaction in the corridor.

Spatial and Temporal Extent of Congestion

Congestion has a spatial and temporal aspect; therefore, the congestion analysis will estimate the extent to which the CRD improvements redistributed congestion along spatial and temporal dimensions in the treatment corridors. For example, did HOT prices at the "peak of the peak" cause some traffic to shift to from this very high travel demand period to earlier or later travel times when HOT lanes were accessible to SOVs or priced lower.

It is L.A. partners' intent that the HOV/HOT conversions not negatively impact the current HOV traffic in the corridor. Specifically, the introduction of SOV traffic into the HOT lanes will not cause the travel times of the historical HOV traffic to change. The congestion analysis will examine the degree to which the L.A. partners have met this objective.

Table 4-7. Questions Related to Post-Deployment Customer Satisfaction

Hypotheses/Questions	Measures of Effectiveness	Data
Will surveyed travelers perceive a noticeable reduction in travel times in the treatment corridors?	Percentage of respondents reporting a reduction in average travel time	• Corridor traveler survey responses • Corridor traveler interview responses
Will surveyed travelers perceive a noticeable improvement in trip-time reliability in the treatment corridors?	Percentage of respondents reporting an improvement in travel time reliability	
Will surveyed travelers perceive a noticeable reduction in the duration of congested periods in the treatment corridors?	Percentage of respondents reporting an average reduction in the duration of the congestion episodes they experience	
Will surveyed travelers perceive a noticeable reduction in the length of peak congestion periods in the treatment corridors?	Percentage of respondents who perceive a reduction in the average length of peak congestion periods	

Table 4-8 lists the extensive set of hypotheses and performance measures that will be used to assess the effects of the CRD improvements on the spatial and temporal extent and distribution of congestion in the I-10 and I-110 treatment corridors.

Table 4-8. Hypotheses Related to the Spatial and Temporal Extents of Congestion

Hypotheses/Questions	Measures of Effectiveness	Data
Relative travel times for HOV/HOT lanes vs. general purpose lanes will either remain the same or (more likely) improve for HOV/HOT travelers as a result of the CRD deployments.	• Travel time savings on the HOV/HOT lane compared to the general purpose lanes. • Difference in planning index for trips in the HOV/HOT Lanes compared to the general purpose lanes.	• Link or section travel time • Average vehicular speed
The introduction of tolled SOV traffic into the HOT lanes in the deployment corridors will not negatively impact HOV or transit traffic in terms of average travel times or travel reliability.	• Median travel time of traffic traveling in the HOV/HOT lane after deployment of the CRD improvements compared to before. • Variability of travel time of traffic traveling in the HOV/HOT lane after deployment of the CRD improvements compared to before. • Planning index of traffic traveling in the HOV/HOT lanes after deployment of the CRD improvements compared to before.	• Link or section travel time • Average vehicular speed
The CRD deployment will not cause traffic congestion to increase in the HOV/HOT lanes.	• % Change in number of lane miles per analysis period that the HOV/HOT lanes are operating in congested conditions • % Change in number the minutes per analysis period that the HOV/HOT lanes are operating in a congested condition	• Average speed per freeway detector station – HOV/HOT lane (5-minute intervals by time of day) • Average segment travel time – HOV/HOT lane
Because of latent demand in the deployment corridors, the CRD deployments are not likely to impact in traffic congestion on the general purpose lanes.	• % Change in number of lane miles per analysis period that the general purpose lanes of I-10 and I-110 are operating in congested conditions • % Change in number the minutes per analysis period that the general purpose lanes of I-10 and I-110 are operating in a congested condition	• Average speed per freeway detector station – general purpose lanes (5-minute intervals) • Average segment travel time – general purpose lanes
Because of the CRD deployments, congestion on the arterials streets paralleling the corridors will be reduced.	• % Change in number of lane miles per analysis period that the arterials paralleling I-10 and I-110 are operating at LOS E or F • % Change in number the minutes per analysis period that the arterials paralleling I-10 and I-110 are operating at LOS E or F	• Average arterial street travel times

For Freeway links, the methodology described in NCHRP *Guide to Effective Freeway Performance* Measurement, which uses speed to define whether a freeway link is congestion, will be used for determining the spatial and temporal extent of congestion. For the arterial streets, a similar methodology will be used except that the criteria used to define whether or not a segment is congested will be based on level of service (LOS). Chapter 15 of the 2000 *Highway Capacity Manual* provides a framework for evaluating urban arterial streets. The technique uses travel times to determine the street's level of service. As shown in Table 4-9, the thresholds for defining LOS are based on travel speed and the speed thresholds vary by class of arterial. The analysis process accounts for midblock impedances that affect travel time and the process also reflects delay experienced at signalized intersections. For the purposes of the national evaluation, an arterial segment will be classified as congested if the level of service is determined to be LOS E or F.

Arterial street speeds will be derived from BRT travel times (from the BRT AVL system), the best source of data available to the local partners and to the evaluation. BRT vehicles make fewer stops than regular buses and LADOT has previously found BRT AVL-derived travel time an effective measure of general traffic travel times.

Table 4-9. Urban Street LOS by Class

Urban Street Class	I	II	III	IV
Range of free-flow speeds (FFS)	55 to 45 mi/h	45 to 35 mi/h	35 to30 mi/h	35 to 25 mi/h
Typical FFS	50 mi/h	40 mi/h	35 mi/h	30 mi/h
LOS	Average Travel Speed (mi/h)			
A	> 42	> 35	> 30	> 25
B	> 34 – 42	> 28 – 35	> 24 – 30	> 19 – 25
C	> 27 – 34	> 22 – 28	> 18 – 24	> 13 – 19
D	> 21 – 27	> 17 – 22	> 14 – 18	> 9 – 13
E	> 16 – 21	> 13 – 17	> 10 – 14	> 7 – 9
F	≤ 16	≤ 13	≤ 10	≤ 7

Source: 2000 *Highway Capacity Manual*

4.1.6 Safety Analysis

Table 4-10 summarizes our planned approach to evaluating CRD project safety impacts in L.A. Safety considerations associated with the L.A. CRD efforts mainly relate to HOT lanes. It is possible that drivers may be confused by new lane markings and signage at the entrances to the HOT lanes. The transition zones from general purpose lanes to HOT lanes, new to L.A. drivers, could be an accident factor. Finally, some drivers may illegally engage in "boundary jumping" to avoid paying HOT tolls which could lead to accidents. The second hypothesis on transition zones is provisional. The final decision on whether this hypothesis is included in the evaluation will depend on the local partners' final design. If the design is very similar to ones that have been used in the region previously, this hypothesis will be eliminated.

Table 4-10. Safety Analysis Approach

Hypotheses / Questions	Measures of Effectiveness	Data
The collective impacts of CRD improvements[5] will be safety neutral or safety positive	Change in incidents per VMT in treatment corridors is comparable to that occurring in control corridors	Frequency, type[6], and severity[7] of safety incidents on treatment corridor freeways and arteries per VMT
The addition of transition zones will not increase incidents	• Few if any safety events involving HOT transitions • Few if any citations for transition zone violations • Corridor operating personnel do not perceive a significant number of incidents attributable to transition zones	• Frequency of safety incidents near transition zones • Frequency of citations for transition zone violations • Interviews with CHP and FSP personnel; bus drivers; van pool drivers; and related persons
Will boundary jumping cause incidents?	• Few if any safety incidents attributable to boundary jumping • Few if any citations for boundary jumping • Corridor operating personnel do not perceive a significant number of incidents attributable to boundary jumping	• Frequency of safety incidents involving boundary jumping • Frequency of citations for boundary jumping • Interviews with CHP and FSP personnel; bus drivers; van pool drivers; and related persons
Will HOT infrastructure changes affect the time needed to respond to or clear accidents?	• Change in average accident response time in treatment corridors is comparable to that occurring in control corridors • Change in accident clearance times in treatment corridors is comparable to that occurring in control corridors	• CHP accident logs
Will adjusted enforcement procedures affect the number of incidents?	Corridor operating personnel do not perceive a significant number of incidents attributable to changed enforcement procedures	• Interviews with CHP personnel

While the preceding safety impacts are not expected to be large, they still merit careful examination. Three kinds of data will be required to do this. These include VMT data for affected freeways and arteries since VMT is a primary measure of risk exposure; incident data (frequency, type, and severity) that can be used to quantity the numbers of accidents occurring before and after HOT deployment; and the subjective observations of the law enforcement

[5] Relevant UPA changes include narrower lanes on portions of the I-10 freeway, new signage, new HOT procedures, new enforcement procedures, and reduced congestion (i.e., faster flowing traffic).

[6] Types of accidents include transition zone events, boundary jumping events, and events occurring during mergers to and from HOT lanes.

[7] Severity will be coarsely estimated with the primary distinction made between events that resulted in bodily harm versus those that caused property damage only.

personnel, service personnel, and professional drivers who serve and travel in the treatment corridors.

4.1.7 Equity Analysis

Experience with pricing projects throughout the country indicates that perceptions of fairness, or equity, may be a key factor in the acceptance of transportation projects especially those involving the introduction of pricing. Equity is assessed in terms of the socio-economic and spatial distribution of the benefits and costs of transportation improvements.

As Table 4-11 indicates, the evaluation will assess the equity effects of the L.A. CRD projects in three ways. First, the evaluation will estimate the direct social effects of the projects on the persons who live in the treatment corridors and downtown L.A. and those who travel through these areas. These social effects may include travel-time savings; tolls and parking fees paid; adaptation costs; and inconvenience costs. Second, the evaluation team will estimate the ways that the CRD projects' environmental benefits and disbenefits impact various socio-economic groups. Finally, the evaluation will examine the planned reinvestment strategy of the revenues produced by the CRD HOT and IPM programs with emphasis on the ways that they affect different resident and user groups.

Table 4-11. Equity Analysis Approach

Hypotheses/Questions	Measures of Effectiveness	Data
What is the socio-economic and spatial distribution of the direct social effects of the CRD projects?	• Socio-economic and spatial distribution of tolls, parking fees, and adaptation costs • Socio-economic and spatial distribution of changes in travel time and trip distance • Socio-economic and spatial distribution of changes in total transportation costs • Public perception of the individualized equity impacts of the HOT lanes and the downtown IPM project	• Parking and HOT account data (amount, frequency of use, etc.) by zip code if available • Interviews with agency representatives, policy makers, and other key stakeholders • Traffic and transit data • Regional and socio-economic data
Are there any differential environmental impacts on certain socio-economic groups?	Socio-economic and spatial distribution of environmental impacts (environmental justice)	• Air quality modeling outputs
Will the potential HOT and IPM net revenues be reinvested in an equitable manner?	Spatial and modal distribution of revenue reinvestments	• Agency records on HOT and downtown IPM program revenues and reinvestment • Expectations of agency officials

4.1.8 Environmental Analysis

The evaluation will estimate the impacts of the CRD projects on the environment. It will assess the collective environmental effects of mode shift, increased speeds, reductions in idling, increases in transit ridership, and increased ridesharing. The environmental analysis will address air emissions, fuel use, and, if feasible, noise.

Table 4-12 lists the hypotheses and questions that are currently expected to be addressed by the environmental analysis, along with the expected measures of effectiveness and data. The details of the environmental analysis, primarily focusing on the air quality elements, are still being developed. At a high level, the approach will be to calculate emissions before and after the CRD deployment by multiplying observed, roadway link VMT (at specific speeds for specific times of the day) by appropriate emission rates. The VMT change estimates will be adjusted for externalities using national or local adjustment factors that account for changes in regional economic conditions, fuel pricing and other externalities that might be included in such an adjustment process. U.S. DOT has requested that the evaluation utilize the EPA MOVES (Motor Vehicle Emission Simulator) model, which is capable of both producing emission factors and, when supplied with observed VMT, speed and other data, calculating emissions. The details of the air quality analysis approach will be worked out in partnership between U.S. DOT, the local partners, and the national evaluation team as the Environmental Test Plan is developed over the next few months.

Table 4-12. Environmental Analysis Approach

Hypotheses / Questions	Measures of Effectiveness	Data
Average vehicle-related air emissions will decrease in the treatment corridors	Decreased VMT-based estimates of air emissions in treatment corridors	• Before and after VMT and vehicle speed distribution data for freeways and arterials • LA-specific air pollution emission factors (VOC, NO_x, $PM_{2.5}$, and CO_2)
Average vehicle fuel economy will improve in the treatment corridors	Decreased VMT-based estimates of fuel consumption in treatment corridors	• Before and after VMT and vehicle speed distribution data for freeways and arterials • LA-specific fuel consumption factors
Average vehicle-related noise will decrease in the treatment corridors	Decreased VMT-based estimates of noise emissions in treatment corridors	• VMT and vehicle speed distribution data for freeways and arterials • FHWA noise model VMT factors

Currently, it is anticipated that the LA CRD emissions analysis will consider the following pollutants:

- Volatile Organic Compounds (VOC)
- Nitrogen oxides (NO_x)
- Particulate matter ($PM_{2.5}$)
- Carbon dioxide (CO_2).

Impacts on energy consumption (fuel use) will be estimating using the same adjusted before and after VMT estimates and applying average fuel consumption factors derived from accepted sources, such as the Auto Club of Southern California and/or U.S. DOE. Likewise, noise impacts can be estimated using VMT and speed impacts as calculated using the FHWA Traffic Noise Model.

4.1.9 Business Impact Analysis

This analysis will examine the effects of the I-10 and I-110 HOT lanes; the transit and ridesharing improvements; and the downtown IPM program on employers and businesses. The CRD projects are expected to have mainly positive impacts on employers and businesses. As shown in Table 4-13, this analysis will investigate a single hypothesis related to the impact of the downtown IPM project on the sales at businesses within the IPM zone that rely on customers accessing their store, such as a retail establishments. Sales tax receipts will be collected from businesses within the IPM zone and, in order to control for non-IPM related fluctuations in sales tax receipts, compared to comparable data from outside the IPM zone.

Table 4-13. Business Impacts Analysis Approach

Hypotheses/Questions	Measures of Effectiveness	Data
How will the downtown IPM project affect retailers and similar businesses that rely on customers' ability to access their stores?	• Change in store sales within the downtown IPM project zones	• Sales tax receipts from the downtown IPM project zones and, for comparison, from comparable non-IPM zones elsewhere in the region/state

4.1.10 Non-Technical Success Factors Analysis

This analysis will collect lessons about the ways that non-technical success factors influenced the success of the Los Angeles County CRD projects. These non-technical success factors include outreach, political and community support, and the institutional arrangements used to manage and guide implementation of the Los Angeles County CRD 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 4-14 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 Los Angeles County CRD project deployments. The variables have been grouped into five major categories: (1) people, (2) process, (3) structures, (4) media, and (5) competencies.

Table 4-14. 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, legislators 2. Process Forums (including stakeholder outreach), meetings, alignment of policy ideas with favorable politics and agreement on nature of the problem), legislative and Congressional engagements 3. Structures Networks, connections and partnerships, concentration of power & decision making authority, conflict mgt. mechanisms, communications strategies, supportive rules and procedures 4. Media Media coverage, public education 5. Competencies Cutting across the preceding areas: persuasion, getting grants, doing research, technical/technological competencies; ability to be policy entrepreneurs; knowing how to use markets	Observations by L.A. partners	• One-on-one interviews followed by group workshops: end of planning and implementation phase • One-on-one interviews followed by group workshops: end of CRD one-year operational evaluation period
	Partnership documents (e.g., Memoranda of Understanding)	L.A. partners' documents
	Outreach materials (press releases, brochures, websites, etc.)	L.A. partners' outreach materials
	Radio, TV and newspaper coverage	• Internet-based tracking of media coverage • L.A. partners' files
Does the public support the CRD strategies as effective and appropriate ways to reduce congestion?	Public opinion	Survey or other source of opinions of general public about the CRD projects and congestion

The Los Angeles partners themselves will be the source of much of the information needed to address the first hypothesis/question. Input from the Los Angeles partners will be collected using the formal mechanisms shown in Table 4-14. The first round of interviews would take place before the operational phase of the CRD projects so that the partners can reflect on their experience up to that point. In addition, a group workshop will be held for further discussion of findings about non-technical factors that emerged in the individual interviews. Once the projects have been in operation for a full year, the partners will be interviewed again to draw additional lessons from their experience.

The national evaluation team will also examine various written material for further insight into the role of non-technical factors. Partnership documents, outreach materials, and media coverage will serve as sources of information.

The second question guiding the analysis of non-technical success factors assesses public reaction to the Los Angeles County CRD projects and whether they were generally viewed as effective and appropriate ways to reduce congestion. While information gleaned from media coverage may provide insight into the public's opinion about the CRD projects, public opinion surveys can measure this directly. Of special interest is the public's perception of HOT lane tolling. Does it generally view this as a useful solution to the region's widely recognized congestion problems?

4.1.11 Cost-Benefit Analysis

The purpose of the cost-benefit analysis (CBA) is to quantify and monetize the potential costs and benefits that will be incurred from implementing the Los Angeles County CRD projects. The net benefit from the CRD projects, which is the difference between the total benefits and the total costs, represents the probable net return that the public will realize from this 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.

The cost-benefit analysis will reference Office of Management and Budget (OMB) Circular 94[8]. will be performed using a 10-year time frame, which includes the first year after implementation of the Los Angeles County CRD projects and a 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 and after implementing the Los Angeles County CRD projects.

Since the CRD projects focus on reducing congestion in the I-10 and I-110 corridors, the expected benefits include travel-time savings, vehicle operating cost savings, safety cost savings, and increases in travel time reliability. This will include any change in travel costs by people who switch modes. The capital costs of the CRD projects will be included, as will operating and maintenance costs, compliance costs, and replacement and reinvestment costs for technology components such as toll facilities. For communities, the potential benefits include reduction in emissions.

[8] http://www.whitehouse.gov/omb/rewrite/circulars/a094/a094.html.

The cost-benefit analysis for the Los Angeles County CRD 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 from the U.S. DOT and the state and local government agencies.

Table 4-15 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. Some of the important benefits realized from the project, such as improved comfort, reliability, simplicity, and other attributes related to improvements to transit services, will not be included in the cost-benefit analysis because it will be impractical to monetize those benefits. However, those benefits will be summarized and reported as non-monetized benefits in the final evaluation report.

Table 4-15. Hypotheses/Questions and Data for the Cost Benefit Analysis

Hypotheses / Questions	Measures of Effectiveness	Data[9]
Will the Los Angeles County CRD projects be net beneficial?	Net benefit (benefits minus costs)	**Potential Benefits** • Travel time savings • Vehicle operating cost savings • Safety cost savings • Improvement in travel time reliability • Reduction in travel time and travel costs for telecommuters • Reduction in emissions • Changes in travel cost savings for people who switch from driving to taking transit or switch to HOT lanes
		Anticipated Costs • Capital and operation and maintenance costs • Replacement and re-investment cost

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 personal 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 Los Angeles County CRD project, 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.

[9] The cost-benefit evaluation will use data derived from many of the other analyses.

4.2 Preliminary Evaluation Test Plans

The nine Data Test Plans in the following pages address the kinds of data required by the analyses described under Section 4.1 of this document and the potential sources of these data. They test plans also document the time periods for which the data are required. Each test plan discusses a specific data source and type as follows:

- Traffic
- Tolling
- Transit
- Ridesharing
- Safety
- Surveys and Interviews
- Transportation Modeling
- Environmental
- Content
- Cost-Benefit
- Exogenous Factors.

Table 4-16 describes the relationship between the analysis approaches and the data test plans. Most of the data test plans support more than one analysis. The "Surveys and Interviews" test plan is particularly cross-cutting. Data derived under this plan will support all but one of the analyses.

The data test plan scopes are mutually exclusive. Each describes the potential source of a data element, its information content, and the time periods for which it is sought. The relevant time periods include:

- **Historical –** A multi-year, pre-deployment period that provides long-term context for any changes that are observed after the project is deployed
- **Pre-deployment –** A period of one year or less immediately before the project deployment which provides an initial baseline against which post-deployment data can be compared
- **Post-deployment –** A period of roughly one year after the project deployment during which the project impacts will be initially observed
- **Long-term Future –** Data projections extending up to 10 years into the future that provide a foundation for long-term cost-benefit computations.

Table 4-16. Relationships among Data Test Plans and Evaluation Analyses

Data Test Plans	Evaluation Analyses										
	Tolling	Technology	Transit	Travel Demand Management	Congestion	Safety	Environmental	Equity	Business Impacts	Non-Technical Factors	Cost - Benefit
Traffic	●	●	○		●	●	●	○	○		●
Tolling	●	●			○						●
Transit			●		○	○	○	○			●
Ridesharing				●	○		○	○	○		○
Safety					○	●					●
Transportation Modeling											●
Environmental							●	○			○
Surveys and Interviews	●	●	●	●	○	○	○	●	●	●	
Content										●	
Cost Benefit											●
Exogenous Factors	○	○	○	○	○	○	○	○	○	○	

● Major Input ○ Supporting Input

The individual data test plans describe data requirements and the Evaluation's approach to meeting those requirements in considerable detail. In fact, there is so much detail that it may be difficult to discern the total data requirement. Table 4-17 remedies that problem by providing a higher-level summary view of the data requirements presented in the individual test plans.

Table 4-17. Summary View of Data Requirements for L.A. Evaluation Analyses

Data	Analyses										
	Tolling	Technology	Transit	Travel Demand Management	Congestion	Safety	Equity	Environment	Business Impacts	Non-Technical Factors	Cost - Benefit
Traffic– Freeway											
Travel time	X				X		X	X			X
Travel speeds	X				X			X			X
Volume	X		X		X			X			X
Lane occupancy	X				X						
Occupants per vehicle	X		X		X						X
Types of vehicles / fleet composition					X	X		X			X
Traffic– Arterial											
Lane occupancy	X				X			X			X
Volume	X				X			X			X
Travel times					X			X			X
Speeds					X			X			
Tolling											
HOT transactions	X				X						X
IPM transactions	X				X						X
IPM citation data	X										
IPM parking guidance system website sessions and phone calls		X									
Transit											
Ridership	X		X		X			X			X
Travel time	X		X		X		X	X			X
Reliability and schedule adherence	X		X								
Farebox data			X								
Service characteristics data			X								
Park-and-ride lot use			X								

Table 4-17. Summary View of Data Required for L.A. Evaluation Analyses (Continued)

Data	Analyses										
	Tolling	Technology	Transit	Travel Demand Management	Congestion	Safety	Equity	Environment	Business Impacts	Non-Technical Factors	Cost - Benefit
Ridesharing											
Vanpool registration data				X							X
Other major employer-based ridesharing program data				X							X
Safety											
Number of incidents/crashes					X	X					X
Types of incidents/crashes					X	X					X
Severity of crashes					X	X					X
Incident duration					X	X					
Incident response times					X	X					
Clearance times					X	X					
Transportation Modeling											
Projected traffic											X
Environmental											
Alternative vehicle fuel use inputs								X			
Air quality model outputs								X			X
Survey and Interview											
Travel modal behavior	X		X	X			X		X		X
Traveler costs							X				X
Public/travelers			X	X	X	X	X	X	X	X	
Employers				X					X	X	X
Special populations (e.g., 511, HOV, CVO)				X			X				
Stakeholders		X		X			X	X		X	X
Enforcement officers, first responders, bus operators						X					

Table 4-17. Summary View of Data Required for L.A. Evaluation Analyses (Continued)

Data	Analyses										
	Tolling	Technology	Transit	Travel Demand Management	Congestion	Safety	Equity	Environment	Business Impacts	Non-Technical Factors	Cost - Benefit
Content											
Partner outreach materials										X	
Media Content										X	
Cost-Benefit											
L.A. CRD project cost data											X
Exogenous Factors											
Unemployment			X	X	X	X	X		X		
Fuel Prices			X	X	X	X	X	X	X		
Road Construction			X	X	X	X			X		
Weather Events			X	X	X	X					
Special Events			X	X	X	X					

Figure 4-1 summarizes the schedule for the evaluation data collection effort and relates those data collection activities to the deployment schedule of the Los Angeles County CRD projects. Note that the CRD bus operations and maintenance facilities project is not scheduled for completion until December, 2011. Since this project will not directly affect corridor travelers, it is regarded as outside the scope of the evaluation effort.

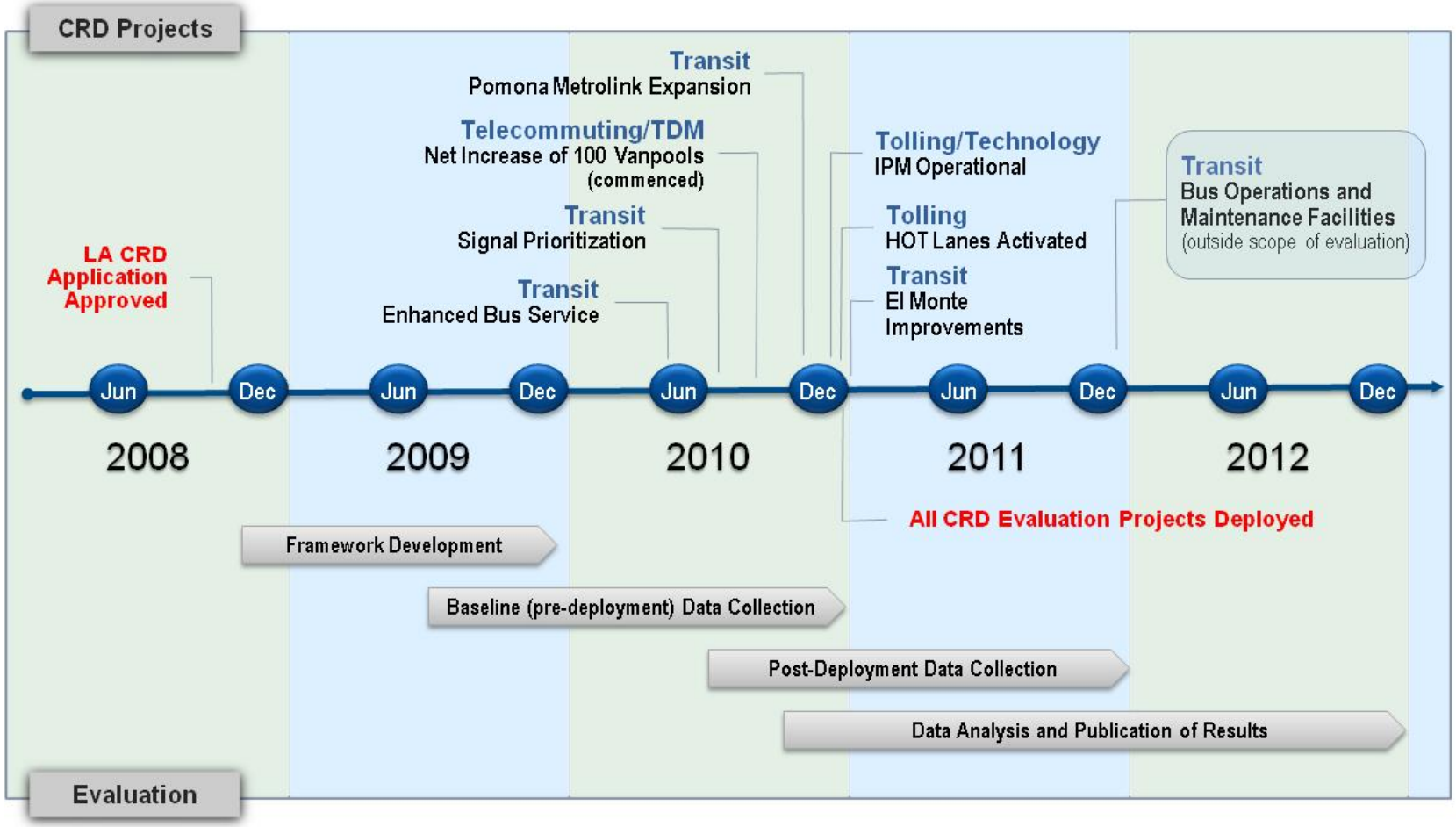

Figure 4-1. L.A. Project Deployment Timeline and Evaluation Data Collection Timeline

4.2.1 Traffic System Test Plan

The traffic system data derived under this traffic system test plan will be an essential input to the majority of evaluation analyses including tolling, transit (mode shift), safety, environment, and cost-benefit. The evaluation will require traffic data describing:

- Freeway and arterial traffic volumes and lane occupancy
- Average vehicle speeds and vehicle occupancy[10].

These types of data will be required for the I-10 and I-110 freeways, for arterials that parallel these freeways, and for downtown L.A. streets. Comparable data are also needed for control facilities—freeways and arterial streets that are outside the treatment corridors but have similar characteristics—to estimate CRD project impacts.

Data on the average number of occupants per vehicle class are needed in several of the CRD evaluation analyses. They are central to the estimation of the transportation facility productivity effects of the CRD projects. Vehicle occupancy data are needed for both freeway main lanes and HOV/HOT lanes because the introduction of HOT tolls has a significant potential for changing average vehicle occupancies on these freeways.

While there may also be some average vehicle occupancy effects on parallel arterials from the CRD projects, there is no reason to expect these effects to be large. The evaluation will make the simplifying assumption that average vehicle occupancy on the parallel arterials has not changed significantly as a consequence of the CRD projects.

Data Sources

The evaluation will require traffic data from four sources: (1) Caltrans, (2) L.A. DOT, (3) the County of Los Angeles in cooperation with municipalities traversed by the I-10 corridor, and (4) Metro.

Freeway Traffic Volumes, Traffic Speeds, and Lane Occupancy. Caltrans District 7 was one of the first agencies in the United States to deploy a freeway management system. This system uses a combination of loop detectors installed in the freeway approximately every ½ mile and video surveillance cameras to monitor traffic flow and detect incidents on the freeway system in Los Angeles areas. Loop detectors have been installed in the main lanes and the HOV lanes of both I-10 and I-110 and provide 30-second traffic counts (i.e., the number vehicle crossing each loop detector) and occupancy (the average fraction of time a vehicle was present over the loop during that 30-second interval). Where not measured directly, average travel speed in each lane at each detector station can be estimated using volume and occupancy measures. Link travel times can be derived by assuming that travel speeds remain constant between detector stations. Segment and corridor level travel times can be computed by aggregating link travel times.

Currently, Caltrans has deployed loop detectors in each of the HOV and main lanes in the I-10 and I-110. Although part of I-110 will be under construction during the pre-deployment period, Caltrans is requiring their contractor to install temporary sensors to ensure that traffic

[10] Speed data will be used to compute link travel times which are needed in the congestion analyses.

performance data is available through the data collection period. Furthermore, Caltrans is exploring options for installing sensors in that portion of the I-110 Viaduct that does not currently have detectors. Caltrans is exploring the potential of installing radar-based detectors in these areas. These data are expected to be integrated into Caltrans' normal detector data stream. These detectors are expected to be installed at the standard spacing used by Caltrans in their freeway management system.

Freeway Vehicle Occupancy. Caltrans District 7 develops annual estimates of vehicle occupancy on the I-10, I-110, and other L.A. freeways. These data are published in its "HOV Annual Report" which is prepared for each California state fiscal year. It is recommended that Caltrans specifically collect freeway vehicle occupancy data in those sections of I-10 and I-110 freeway where HOT conversions and related changes are occurring. The national evaluation team, the local partners and U.S. DOT will work together to finalize the locations and data collection schedule (frequency) in the development of the detailed Traffic System Data Test Plan document. Those discussions will also explore the availability of any arterial street vehicle occupancy data, which if available, would allow the corridor person throughput calculations (in the Congestion Analysis) to consider major parallel arterials in addition to I-10 and I-110.

Arterial Street Traffic Volume and Lane Occupancy Data for the I-110 Corridor and Control Arteries. Some of the required traffic volume data will be obtained from the City of Los Angeles' Automated Traffic Surveillance and Control (ATSAC) computer-based traffic signal control system databases. In areas where no ATSAC data is available, the local partners have agreed to deploy temporary detectors such as tube counters to collect traffic data. The specific count locations and data collection frequency will be specified in the detailed Traffic System Data Test Plan. The evaluation team recommends that these counts be performed quarterly during the one pre- and one post-deployment year.

Arterial Street Speeds and Travel Times. While the ATSAC and screen line data will be useful for measuring arterial traffic volume and occupancy, they do not provide arterial street travel times or speeds. The L.A. CRD local partners have investigated their data collection options and have indicated that their best sources of arterial street travel times and speeds are the Metro BRT buses' automatic vehicle location data (in which dwell times can be removed). The local partners' have indicated that their resource constraints preclude any special data collection, like floating car studies, or installation of license plate readers or other detectors. They also report that they have used the BRT-AVL data other analyses and have found them satisfactory.

Data Availability

Most of the traffic system data from the freeway system is readily available either from Caltrans directly or through the PeMS system which is Caltrans preferred portal for distributing freeway traffic data.

PeMS Freeway. PeMS (which stands for Performance Measurement System) is a software system developed by Caltrans, the University of California at Berkeley, and the Partnership for Advanced Technology on the Highways (PATH) designed as a traffic data collection, processing, and analysis tool to assist in assessing the performance of the freeway system. PeMS extracts information for a number of real-time and historical traffic data sources stores this

information in a database that various entities (both public and private) can use to compute performance measures. The PeMS software performs the following steps:

- Performs diagnostics on the data to determine if the loop detector is faulty
- Aggregates the raw loop lane-by-lane loop detector data into 5-minute values
- Calculates the speed for each lane based on individual g-factors for each loop detector in the system
- Imputes values for any missing data
- Aggregates the lane-by-lane value for flow, occupancy, and speed across all lanes at each detector station
- Computes performance measures
- Aggregates across geographical boundaries.

PeMS does allow some performance measures to be computed automatically from the database. The types of performance measures that can be computed include the following:

- Flow
- Occupancy
- Speed
- Vehicle –Miles Traveled (VMT)
- Vehicle-Hours of Travel (VHT)
- Travel Time Index (TTI).

The PeMS system can also estimate truck volumes at each detector station based on the measured 5-minute, lane-by-lane values of flow and occupancy. The PeMS algorithm attempts to break down the total flow into passenger cars and large trucks. While the system cannot classify trucks into the 13 classes as defined by FHWA, it can estimate the proportion of trucks in each lane and when aggregated over multiple days and detector stations, can capture overall trends in truck volumes.

Arterial Volume and Lane Occupancy Data. Data from the arterial street system is not as readily available. When possible, the evaluation team plans to use data from the City of Los Angeles' ATSAC system, which provides volume and occupancy information from signalized intersections. The ATSAC data is primarily available in the I-110 corridor ATSAC system data are primarily available in the I-110 corridor for:

- Vermont Boulevard
- Grand Avenue
- Main Street
- Figueroa Street
- Broadway Avenue
- Western Avenue.

Most of the I-10 corridor is outside the coverage area of the ATSAC system. Arterial data for this corridor will need to be collected through special studies. The national evaluation team recommends that these special studies be conducted at least quarterly both before and after the conversion of the HOV lanes.

Arterial Speed and Travel Time Data. The local partners have indicated that his data will be available via the Metro BRT AVL-equipped buses.

Data Analysis

Most of the evaluation analyses require peak period traffic system data. Peak period analyses will be performance as this is the time period when the CRD improvements are most likely to

have a significant impact on congestion. For the purposes of this study, the a.m. peak period will be defined as 5:00 a.m. to 9:00 a.m. while p.m. peak period will be defined as 2:00 p.m. to 7:00 p.m. Table 4-18 lists the traffic system data elements and analysis periods used in calculating the primary evaluation performance measures used in these analyses.

Table 4-18. Traffic Test Plan Data Sources and Availability

Performance Measure	Analysis Type				Data Element						
	Congestion	Technology	Environment	Safety	Speed / Travel Time	Volume	Link Length	Average Vehicle Occupancy	Parking Space Occupancy	Parking Search Time	Parking Info Dissemination
Travel Time/ Speeds	✔		✔		✔		✔				
Travel Time Index	✔				✔		✔				
Buffer Time	✔				✔		✔				
Planning Time Index	✔				✔		✔				
Total Vehicle Throughput	✔			✔		✔					
Total Passenger Throughput	✔					✔		✔			
VMT	✔		✔	✔		✔	✔				
PMT	✔					✔	✔	✔			
# of Hours Congested	✔				✔						
# of Lane-Miles Congested	✔				✔		✔				
Increase in Number of Parking Sessions									✔		
Increase in Parking Space Occupancy Rate									✔		
Reduce Cruising					✔					✔	✔
Increase Parking Dissemination											✔

Data Collection Schedule and Responsibility

As Table 4-19 indicates, the evaluation will require pre- and post-deployment data for all of the data types described in this section. Table 4-19 also lists the organization that the evaluation expects to provide the needed data based. Figure 4-1 (presented in the introduction to Section 4.2), describes the pre- and post-deployment time periods. Certain data collection

activities will require sampling plans that describe where and when within the collection period these data need to be acquired. These sampling plans will be developed in consultation with the L.A. partners and included in the full data test plan document.

Table 4-19. Traffic Data Collection Schedule

Data Type	Historical	Pre-Deployment	Post-Deployment	Provider
Freeway Volume, Lane Occupancy, and Travel Times (PeMS/ATMS)	✔	✔	✔	Caltrans
Freeway Vehicle Occupancy		✔	✔	Caltrans
Arterial Volume and Lane Occupancy				
• I-10 Corridor		✔	✔	TBD
• I-110 Corridor		✔	✔	L.A. DOT
Arterial Travel Times and Speeds from Metro BRT AVL data				
• I-10 Corridor		✔	✔	TBD
• I-110 Corridor		✔	✔	TBD

4.2.2 Tolling Test Plan

Data Sources

The tolling test plan identifies, obtains, and analyzes data on the HOT lanes on I-10 and I-110 and the downtown IPM program for use in the tolling, environmental, equity, goods movement, and cost benefit analyses. Additional information needed for the tolling analysis will be obtained from the traffic system data test plan.

Based on the Los Angeles County CRD project schedule, the HOT lanes on I-10 and I-110 and the downtown IPM program will be operational by December 31, 2010. The two primary data sources for the tolling test plan are the HOT lane tolling system and the downtown IPM program Central Management System. In addition, the evaluation will need data relating to the enforcement of the HOT lane tolling policies, downtown parking regulations, and estimated violation rates. These data will be obtained from the California Highway Patrol (CHP) for the HOT lanes and from the Los Angeles Department of Transportation for downtown parking.

HOT Transaction Data. The tolling system installed on the I-10 and I-110 HOT lanes will acquire data on the date, time, and amount of toll charges. It will also record the transponder identification number of the vehicle incurring the charge. The evaluation will be seeking summary data on a monthly basis from the HOT database for use in the toll analysis and other analyses. The data sought include (but may not be limited to):

- The quantity of transponders sold and activated in the I-10 and I-110 catchment areas
- User counts by home zip code and frequency of transponder use

- Transponder penetration rates in targeted geographic communities
- The number of tolled trips by hour
- The number of tolled trips by day of the week
- Number and dollar amount of transactions by hour and day of the week
- The average toll
- The highest toll
- Estimated non-payment violation rate
- The total revenue generated.

The evaluation will not be seeking any data that personally identify specific HOT lane users. These data will be needed in electronic format on a monthly basis. The data protocol will be defined more fully in the final Los Angeles County CRD Tolling Test Plan.

HOT Toll Violation Data. The evaluation will seek data from the CHP on the number of citations issued for violations of toll payment and HOT lane operating requirements.

IPM System Data. Various parking system data will be collected, including:

- Parking rates by time-of-day for each zone
- Parking payment methods by time-of-day for each zone
- Average length of stay and turnover by time-of-day for each zone
- Parking revenues by zone
- Parking space occupancy data
- Travelers' use level of real-time parking guidance system (number of website sessions and number of phone calls)

These data will be needed in electronic format on a monthly basis from the Central Management System. The data protocol will be defined more fully in the final Los Angeles County CRD Tolling Test Plan.

IPM Parking Citation Data. Data on parking citations the project target zones will be used in the tolling analysis as general information that will aid in the interpretation of evaluation findings. Although not directly linked to a particular hypothesis, with the introduction of any new pricing scheme it is useful to track violations/citations.

Data Availability

The data for the tolling analysis will come from automated systems, which will be provided to the national evaluation team. The detailed test plan will outline the protocol for providing this data to the national evaluation team.

Data Analysis

The evaluation will use the HOT and IPM transaction and toll violation data to compute various measures of effectiveness contained in the tolling, congestion, equity, and cost benefit analyses. Examples of the measures of effectiveness to which these data will contribute include:

- Characterizing the revenue generating abilities of HOT and IPM facilities and the ways that these revenues were reinvested
- Assessing pricing's effectiveness in increasing vehicular and person throughput on the I-10 and I-110, and maintaining minimum vehicle speeds on HOT lanes
- Examining potential accessibility, affordability, and equity issues associated with the HOT lanes and IPM projects on disadvantaged socio-economic communities
- Examining changes in parking revenue and average occupancy attributable to IPM.

Data Collection Schedule and Responsibilities

Table 4-20 describes the data collection schedule for HOT- and IPM related data. It also lists the organization that the evaluation expects to provide the needed data. Figure 4-1 (presented in the introduction to Section 4.2), describes the pre- and post-deployment time periods for which the data are being sought.

Table 4-20. Tolling Data Collection Schedule

Data Type	Historical	Pre-Deployment	Post-Deployment	Provider
HOT Transaction Data			✔	Metro
HOT Toll Violation Data			✔	CHP
IPM Area System Data		✔	✔	LADOT
IPM Area Parking Citation Data		✔	✔	LADOT

4.2.3 Transit System Data Test Plan

The data acquired under the transit system data test plan will primarily be used by the transit analysis. However, these data also feed into the congestion, equity, environmental, and cost-benefit analyses.

Data Sources

The data required by the transit analysis and the anticipated providers of these data are summarized in the following paragraphs.

Ridership Data. Metro collects ridership data using APCs which are installed on 100 percent of its fleet. These data are stored at a very disaggregate level which should be more than sufficient for the assessment of the ridership effects of the CRD projects. Metro ridership data will be supplemented by similar data from other municipal operators serving the treatment corridors. Metro will coordinate the collection of these data. In addition, system-wide ridership data will be obtained to track regional ridership trends.

Transit Service Characteristics Data. The evaluation requires basic descriptive data and productivity metrics for all evaluated transit routes. Examples include revenue hours/miles, cost per passenger mile, boarding per revenue mile, service capacity (seats per hour), etc. This will allow us to evaluate service quantity and operating efficiency changes over time resulting from CRD projects.

Transit Travel Time Data. Travel time data will be extracted from the AVL units that Metro has installed on 100 percent of its fleet. These data are stored at a high level of granularity which should be more than sufficient for evaluation purposes. These data will also used in conjunction with segment length information to calculate commercial service speeds. Pre- and post-deployment published schedule information will be used to cross-reference any observed changes in travel times between time points.

Transit Reliability Data. This information will be extracted for the pre- and post-deployment periods from Metro's AVL system. Reliability of services operating at under 12 minutes frequency will be evaluated using the headway variance measure, while services operating at frequencies of over 12 minutes will be evaluated on the basis of schedule adherence.

Park-and-Ride Lot Utilization. Park-and-ride lot utilization data are required to evaluate the impact of parking capacity additions and to support the assessment of mode shift. Up-to-date capacity information and average weekday utilization samples are required for all parking lots within the treatment corridors on a monthly basis during the pre- and post-deployment periods. This will require a special data collection effort by the L.A. partners.

Survey Data. On-board rider survey data will be very important to the transit analysis. The "Survey and Interview Data Test Plan" covers the planned approach to acquiring these data.

Data Availability

Table 4-21 below summarizes the availability of each of the data sources defined in the pervious section.

Table 4-21. Transit System Test Plan Data Sources and Availability

Data Type	Source	Available?	Comment
Transit Ridership	Metro and Other Muni's	Yes	
Transit Service Characteristics	Metro and Other Muni's	Yes	
Transit Travel Time	Metro	Yes	
Transit Reliability	Metro	Yes	
Park-and-Ride Lot Utilization	Metro	Yes	Manual counts required

The table shows that most the required data is expected to be available. It is envisioned that the data will be delivered to the Battelle team via email in spreadsheet format for analysis. Some data may be in other formats such as PDF or SPSS data files.

Data Analysis

The evaluation team will then develop measures of effectiveness (MOE), typically based on weekday average values that are computed on a monthly basis in order to be able to assess overall trends during the pre- and post-deployment periods.

The bus ridership, travel time and on-time performance, and park-and-ride lot use data available from Metro are expected to show a high level of accuracy. Metro personnel inspect the data for outliers and suspect data, which is checked against other information. Outliers and suspect data are flagged and discarded or adjusted as appropriate. Members of the evaluation team will conduct a second inspection of the data received from Metro. Any identified concerns will be discussed with Metro and appropriate actions will be taken to adjust or discard suspect data.

Examples of the calculation approaches to be used in the transit analysis are summarized below:

- **Change in ridership by trip.** This measure, which is calculated as the total and percentage increase or decrease in ridership by trip, will be computed and compared pre- and post-deployment.
- **Change in ridership by route.** This measure, which is calculated as the total and percentage increase or decrease in ridership by route, will be computed and compared pre- and post-deployment.
- **Change in utilization of park-and-ride lots.** This measure, which is calculated as the increase or decrease in use of the park-and-ride lots, will be computed and compared pre- and post-deployment.
- **Changes in bus travel time by trip.** Changes in bus travel times will be calculated pre- and post-deployment. This information will also be used in conjunction with route segment length data to calculate commercial service speeds.
- **Changes in bus on-time performance.** Bus on-time performance will be recorded and compared pre- and post-deployment, measured in terms of headway variance or schedule adherence depending on service frequency.
- **Changes in perceived security.** Changes in user perceptions of transit services and perceived security while using these services will be assessed pre- and post-deployment
- **Changes in security incident frequency.** Changes in the number and severity of reported incidents on the study corridors
- **Transit mode share.** Transit mode share is measured in terms of the proportion of total person throughput carried on the corridor by transit services versus other modes during specific peak travel periods.
- **Person throughput.** Person throughput measurement requires samples of average vehicle occupancy (AVO) data, which is multiplied by associated traffic volumes to obtain person throughput. APC data will be sufficient for this purpose.

Data Collection Schedule and Responsibilities

The Table 4-22 summarizes the proposed data collection schedule for each data source. Four of the needed data sets are being acquired continuously by Metro as part of its routine data

collection and archival activities. The national evaluation team will need updates of these data on a monthly basis.

Table 4-22. Transit System Test Plan Data Collection Schedule

Data Type	Collection Intervals	Delivery Rate	Historical	Pre-Deployment	Post-Deployment
Ridership	Continuous	Monthly or Quarterly	✔ (Metro only)	✔	✔
Transit Service Characteristics	Continuous	Monthly or Quarterly	✔ (Metro only)	✔	✔
Transit Travel Time	Continuous	Monthly or Quarterly	✔ (Metro only)	✔	✔
Transit Reliability	Continuous	Monthly or Quarterly	✔ (Metro only)	✔	✔
Park-and-Ride Lot Utilization	Continuous	Monthly or Quarterly		✔	✔

Some municipal bus operators in the I-10 and I-110 corridors (Gardena, Torrance, and Foothill) will also be providing data of these types. Metro has agreed to coordinate the data collection effort by these municipal operators. Since their data collection systems are not as highly automated as Metro's, monthly data deliveries may not be practical in which case quarterly delivery will be acceptable.

The CRD transit operations projects are among the first that will be deployed in L.A. Therefore, the evaluation will require pre-deployment data for the ridership, transit service characteristics, transit travel time, and transit reliability beginning in July, 2009. The park-and-ride lot and related transit security projects have a target completion date of December, 2010. The pre-deployment data collection period for these latter projects begins in January, 2010.

4.2.4 Ridesharing Data Test Plan

Data Sources

The TDM analysis will utilize data from a variety of sources (several of which are covered under other test plans, e.g., the survey data test plan) to assess CRD-related changes in carpooling and vanpooling. The two data sources covered under this test plan are:

Metro-Subsidized Vanpool Program Data. Metro provides subsidies and various types of in-kind support to promote the formation and maintenance of vanpools. Metro maintains a database of applicant/vanpool data required for its internal needs and for National Transit Database Reporting. Key elements of information in this data are the numbers of:

- "Unlinked Trips" (the number of passengers who boarded vanpools vehicles inbound and outbound) on each service day
- "Passenger Cars [in] Operation" the highest number of vanpool vehicles in operation on any given service day during the month.

Metro Data on Other Major Employer-based Ridesharing Programs. Metro maintains records on non-Metro subsidized employer vanpool programs that are registered with Metro's Commute Services Group. Those and any other Metro data on ridesharing (above and beyond the Metro subsidized vanpools) will be utilized in the evaluation to document CRD-related changes.

Data Availability

The data described in this preliminarily test plan will be available from Metro. Details, including data collection and transmittal frequency, will be resolved through the development of the full, detailed Ridesharing Data Test Plan.

Data Analysis

Spreadsheets will be used to organize and analyze data and to generate tables and charts showing changes in ridesharing activity over the course of the evaluation period.

Data Collection Schedule and Responsibilities

As Table 4-23 indicates, the ridesharing data are expected to be available for both pre-deployment and post-deployment periods.

Table 4-23. Vanpooling Data Collection Schedule

Data Source	Historical	Pre-Deployment	Post-Deployment
Metro-Subsidized Vanpool Program Data	Not Needed	✔	✔
Metro Data on Other Major Employer-based Ridesharing Programs	Not Needed	✔	✔

4.2.5 Safety Data Test Plan

The data acquired under the Safety Data Test Plan will primarily be used by the Safety Analysis but it will also be used as an input to the cost-benefit analysis and in conjunction with the traffic data analysis. The primary interest is in whether infrastructural and procedural changes associated with the HOT lanes created safety problems at HOT lane entry points and transition zones, or whether new types of safety events emerged (e.g., incidents involving boundary jumping to evade tolls).

Three types of safety data are required by the evaluation: violation reports, incident reports, and personnel interviews. The interview data requirements are covered under the Surveys and

Interviews data test plan. This current section discusses required safety violation and incident report data. The evaluation team expect the latter to provide the:

- Locations of safety violations and mishaps on the I-10 and I-110 freeways
- Reasons that safety citations were issued
- Descriptions of the basic facts of safety incidents
- Indications of incident severity such as the presence or absence of bodily injuries.

Data Sources

The Traffic Collision Report (TCR) is the basic element of accident data collected in California. Local police units are required to forward TCRs for the previous month to the California Department of Highway Patrol (CHP) by the fifth day of each month. The most widely used accident report form in California is the form CHP-555 whose use is actively promoted by CHP to achieve data standardization.

SWITRS. California developed the "Statewide Integrated Traffic Records System" (SWITRS) as a repository for TCR reports. SWITRS is maintained by CHP. SWITRS holds data for all fatal and injury motor vehicle traffic accidents. In addition, data relating to a large proportion of the reported property damage-only accidents also reside in SWITRS. The evaluation expects SWITRS to contain records of all fatal and injury accidents occurring in the I-10 and I-110 corridors on both freeways and arteries. However, there may be a lag of six to nine months between the date of accidents and the appearance of relevant data in SWITRS.

TASAS. Caltrans developed the Traffic Accident Surveillance and Analysis System (TASAS) to summarize and analyze SWITRS data. SWITRS are transferred to Caltrans where they are post-processed and inserted into Caltrans own accident database (AXDB). AXDB is linked to a highway data base (HDB) which contains descriptions and locational identifiers of highway segments, intersections, and ramps. HDB also contains traffic volume and other data for these transportation facilities.

TASAS' Accident Database (AXB). AXDB contains ten historical years of accident data plus data for the most recent year. The individual records in the AXDB contain two basic types of data, those describing accidents themselves and those describing the parties involved in the accidents. The national evaluation is only interested in the first set of data elements which include:

- Location
- Severity
- Environmental Features
- Collision Type
- Time and Date
- Primary Collision Factor
- Roadway Conditions
- Number of Involved Vehicles.

The locational data in AXDB records point to highway kilometer posts, ramps, intersections, or other transportation facility elements that are recorded in the HD database.

TASAS' Highway Data Base (HDB). The Highway Data Base (HDB) contains the current and historical descriptions of approximately 20,000 intersections, 13,000 ramps, and 24,400 km of highway segments in the California road system it includes the following data elements:

- Location including district, route, county, kilometer post marker identification
- Descriptions: Bridges, ramps, intersections, etc.
- Average daily traffic (ADT)
- Detailed Facility Characteristics (e.g., geometry, crossing streets, etc.).

Data Availability

The evaluation does not foresee any major obstacles to gaining access to the required data, although there will be a six to nine month delay between the occurrence of safety events and the availability of data in the SWITRS and TASAS repositories describing these events.

It is possible that the locational data in these repositories may not be as precise as desired for the evaluation and the causal information recorded for low severity events is likely to be minimal. The national evaluation team recognizes these data limitations. The information obtained from interviews with law enforcement, FSP personnel, and from professional drivers who travel in the I-10 and I-110 corridors may help to fill gaps left by the data in the incident databases.

Confidentiality. California law states that the data contained in raw accident reports is for the confidential use of the CHP, Caltrans, and local authorities with jurisdiction over relevant highways. The evaluation does not expect to gain access to raw incident data. The standardized summary reports generated by TASAS may meet many of the evaluation's needs. Beyond this, the evaluation will need either CHP or Caltrans to summarize the incident data needed by the evaluation at a level consistent with the confidentiality requirements of California law.

Data Analyses

The evaluation will compare pre- and post-deployment crash and incident data for the I-10 and I-110 corridors to assess the effects of the CRD projects on corridor safety. Measures of effectiveness described under the Safety Analysis Plan will be computed. These are concerned with the frequency, type, cause, time, and location of accidents in the treatment corridors with special regard to the features of the CRD project infrastructure (HOT lane transition zones and boundaries, narrowed lanes, etc.) which might be a factor in crashes.

The quantitative information derived from the preceding analyses will be augmented with the information gathered through interviews. The interview data will help to illuminate causal and locational details which may be difficult or impossible to obtain the from the numeric accident data alone. The data acquired under this Safety Data Test Plan are also expected to be used as an input to the Cost-Benefit analysis and in analysis of the traffic data in the Traffic Data Test Plan.

Data Collection Schedule and Responsibility

The collection schedule for safety analysis data are summarized in Table 4-24. These data are routinely collected and archived by the State of California for a period of ten years. The evaluation does not anticipate any special data collection effort that will be required to support the evaluation.

Table 4-24. Safety Data Collection Schedule

Data Source	Historical	Pre-Deployment	Post-Deployment
CHP Violation Reports	Not Needed	✔	✔
CHP Incident Reports	Not Needed	✔	✔

4.2.6 Surveys and Interview Data Test Plan

This section provides a summary of the surveys and interview data sources required for evaluation of the CRD projects; current understanding of their availability; basic analysis approach; collection schedule; and responsibility for data collection. Full details will be presented in the separate document Survey and Interview Data Test Plan.

Data Sources and Availability

Surveys and interviews are critical for obtaining information needed to assess the influence of the Los Angeles County CRD projects on changes in travel behavior and other impacts. Possible travel behavior changes include shifting travel modes (to transit, carpools or vanpools), paying to use the HOT lanes, 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 CRD projects is to ask them. Surveys and interviews can also be used to obtain information about individuals' perceptions of different strategies and projects; the ease or difficulty of using technologies and services; and concerns over safety or equity.

This test plan outlines the surveys and interviews needed for the national evaluation. Planning and conducting special surveys can be costly and so the national evaluation team has, aided by the Los Angeles partners, inventoried existing survey data sets and surveys planned for the near future for possible use in the CRD evaluation. The recommended approach identifies potential opportunities for using the local partners' existing data or currently planned data collection by local partners. This test plan also identifies the additional CRD-specific surveys and interviews needed to fully evaluate the Los Angeles County CRD deployment.

Table 4-25 identifies the information needed from various populations/stakeholders and summarizes the recommended approach. A total of seven population groups and their associated information needed for the evaluation are shown. The table identifies five potential opportunities for using the inventoried surveys, although these need to be explored further.

The sections that follow briefly discuss each survey/interview/focus group to be used, first presenting the existing or planned local partner surveys and followed by a discussion of all the recommended data collection. Details on questions and survey protocols (recruitment, sampling method, etc.) will be resolved in the full test plan documents to be developed later and will include consultation with the local partners. Although not listed as a specific data element in Table 4-25, respondents' socio-demographic data will be collected in every survey.

Table 4-25. Los Angeles County CRD Evaluation – Recommended Surveys and Interviews

Population Group / Information Needed	Recommended Approach	
	Baseline	**Post-Deployment**
General Public. General public's expectations and reaction to the Los Angeles County CRD projects related to reducing congestion, equity of pricing, (if questionnaire space allows) perceptions of CRD corridor transit security and influence on their mode choice decisions, and environmental quality pre- and post-deployment.	• General Public Survey by Metro in fall 2009 possible baseline survey. • Otherwise, a special baseline general public survey is needed and/or CRD questions can be incorporated in other traveler surveys	• General Public Survey in 2011 by Metro possible post-deployment survey • Otherwise, a special post-deployment general public survey is needed and/or CRD questions can be incorporated in other traveler surveys
Transit Riders. I-10 and I-110 corridor transit riders' length of bus use, prior mode, reason for using transit, perception of CRD transit improvements and congestion, perception of equity of pricing, O-D locations and travel times.	• On-board Customer Satisfaction Survey by Metro in August 2009 and the On-board O/D Survey by Metro in Fall 2009 are possible baseline • Otherwise, special on-board CRD transit survey needed	• Special on-board CRD transit survey needed
Corridor Drivers • **HOT Lane Users.** Reported travel behavior in terms of prior travel (HOV lanes, general-purpose freeway lanes, etc.), trip length, travel time, travel time reliability, reason for use, frequency of use, O-D. Perception of the impact of the Los Angeles County CRD strategies on reducing congestion, safety, and equity of pricing. • **Travelers Using the I-10 and I-110 General-Purpose Freeway Lanes.** Reported travel behavior in terms of trip length, travel time, travel time reliability, mode, O-D, route, frequency, reason for not using HOT lanes and transit. Perception of the impact of the Los Angeles County CRD strategies on reducing congestion, safety, and equity of pricing.	• SCAG Congestion Pricing Project Survey, 2009 – 20011/12 possible baseline survey • Otherwise, special CRD survey needed	• SCAG Congestion Pricing Project Survey, 2009 – 20011/12 possible and post-deployment survey • Otherwise, special CRD study needed

Table 4-25. Los Angeles CRD Evaluation – Recommended Surveys and Interviews (Continued)

Population Group / Information Needed	Recommended Approach	
	Baseline	Post-Deployment
Workers Changing to Ridesharing. Prior mode of travel; changes in trip length, O-D locations, VMT and travel times; reasons changing to ridesharing.	Baseline survey	Post-deployment survey
California State Patrol and Bus Operators. Perceptions of changes in safety, traffic levels, and travel patterns resulting from Los Angeles projects.	No baseline data needed.	Post-deployment interviews
Partnership Agency Representatives and Other Key Stakeholders. Information on perception of factors influencing the success of the Los Angeles partnership, project benefits, and lessons learned.	Interviews and group meetings included prior to operation of CRD projects.	Interviews and group meetings after one year of operation of CRD projects.

Use of Los Angeles Partners' Existing and Planned Surveys

Three surveys were identified as potentially useful to the evaluation: the General Public Survey and the On-Board Transit Surveys conducted by Metro; and the Congestion Pricing Project Survey conducted by the Southern California Association of Governments (SCAG). These surveys are discussed in the following paragraphs.

General Public Survey by Metro. Every two years Metro conducts this telephone-based survey among a random sample of Los Angeles County residents. The objectives are to assess the public's service and brand awareness and to document travel mode and employment status. In 2006, 888 households completed the survey. The next survey is planned for the fall of 2009 with a target of 1,200 responses. The timing of the 2009 survey and the next survey in 2011 could align with the pre- and post-deployment data collection planned for the national evaluation. The national evaluation team will investigate with Metro the possibility of incorporating CRD-specific questions to gauge public opinion about the CRD projects.

SCAG Congestion Pricing Project Survey. A potential source of data relevant to the CRD evaluation is surveys planned for SCAG's Congestion Pricing Project. It will examine the effectiveness and impact of various congestion pricing scenarios to better understand the bases of mode choices and travel price elasticities among L.A. drivers. The surveys are slated to begin in the summer of 2009 with completion in 2011/12. Stated preference surveys of 1,200 to 1,500 persons will be conducted with drivers in-person and will be supplemented with additional telephone surveys. The national evaluation team will investigate with SCAG the questions to be asked and the sufficiency of the sampling in the I-10 and I-110 corridors to determine whether the survey would yield data appropriate for either pre- or post-deployment analysis of CRD corridor travelers' behavior.

On-board Transit Surveys by Metro. Two types of on-board surveys of transit riders are fielded by Metro. A customer satisfaction survey is administered once a year in the spring to Metro bus and rail riders on a sample of bus runs. This self-administered bilingual intercept survey is planned for August 2009; Metro expects an estimated 15,000 returns. The other type of on-board survey is a self-administered origin-destination survey provided to Metro bus and rail riders and to municipal bus riders. Although scheduled every five years, the last survey was conducted in 2001/2002. The next O-D survey is planned for fall of 2009; Metro estimates that it will receive 35,000 returns from this survey.

Needed Surveys and Interviews

General Public (pre- and post-deployment). This survey will gather input from travelers throughout the region—inside and outside the I-10 and I-110 corridors—on their perceptions of the HOT lanes and other CRD projects after they have been operational for some time. Telephone is a likely method for this survey. Data collection should be conducted prior to the operation of the HOT lanes "going live" and near the end of the one-year, post-deployment period.

On-Board Transit Survey (pre- and post-deployment). The evaluation team will explore Metro's on-board customer satisfaction and O-D surveys for suitability for use in the CRD evaluation. It may be possible to "piggy-back" CRD-specific questions in the planned surveys. A key consideration will be the sufficiency of sample size for surveys on the bus routes in the CRD corridors and the timing of the surveys for the pre- and post-deployment evaluation. It may be necessary to conduct special CRD project-specific on-board surveys of transit riders to meet the needs of the national evaluation. Its purpose would be to explain any observed changes in transit mode share, assess the impacts of the CRD transit projects on customer satisfaction, and identify any changes in transit user demographics.

Corridor Drivers: Motorists in HOT Lanes and General-Purpose Freeway Lanes (pre- and post-deployment). These surveys will provide details on travel behavior in response to the CRD strategies as well as travelers' perception of the impact and value of the projects for addressing congestion issues. They will reveal the perceived personal advantages and disadvantages of the CRD strategies to the traveler, such as improved travel time reliability, and the perceptions of the broader societal implications (e.g., equity, safety, and environment).

It is essential to collect information on travel behavior, including changes in travel patterns (e.g., different origins and or destinations, time of travel or route) and the reasons for the changes for several reasons. The data will be very useful in differentiating the impact of the CRD from the influence of various exogenous factors and in understanding how travelers responded to specific CRD strategies. There are several options for conducting a survey of corridor drivers including cross-sectional and panel studies. Other methodological options pertain to the method of recruiting participants (e.g., license plate readers on corridor roads) and conducting the survey (e.g., telephone versus mail out/mail back). These methodological details will be addressed in the development of the full test plan document and in consultation with the local partners and U.S. DOT.

Surveys of Ridesharers (pre- and post-deployment). The objective of this survey is to assess the response to the CRD elements that promote car and vanpooling, including both Metro's outreach and promotion efforts as well as to the implicit benefit of free HOT lane access to high occupancy (3 or more occupants) vehicles. It is also important to determine whether the HOT lanes or transit improvements had the unintended consequence of breaking up existing vanpools. Due to the low incidence of the population of employees who are candidates for this survey, a broad-based sample like the survey of corridor drivers will not suffice. Special sources will need to be tapped, such as Metro's registration lists for vanpools and other potential sources such as large employers' lists of employees using car and vanpools. Information sought would include number of days using carpools or vanpools, prior mode of travel, changes in trip lengths, O-D locations, VMT, and travel times, reasons for changing travel modes, and satisfaction with the change in travel behavior and perceived advantages and disadvantages of the CRD projects on them and the region in general.

Interviews with California State Highway Patrol Officers and Bus and Vanpool Operators (post-deployment). These interviews will target the California State Highway Patrol (CHP) officers who patrol the I-10 and I-110 freeways and are responsible for enforcing the HOT lanes. The bus operators and vanpool operators using the HOT lanes also need to be interviewed. The purpose of the interviews is to ask questions about these persons' perceptions of changes in safety, traffic levels and traffic patterns resulting from the CRD projects. The CHP officers will also be asked about any changed enforcement procedures and their effects.

Interviews with Key Partnership Agency Representatives (pre- and post-deployment). Members of the national evaluation team will interview key L.A. partner representatives who are playing important roles in planning, deploying, and/or operating the CRD projects. This will include those organizations instrumental in the institutional, technical or public outreach aspects of the CRD. As the full test plan is developed the national evaluation team will work with the local partners to further specify interviewees. Two sets of interviews will be conducted, one each near the end of the pre- and post-deployment periods. Each set of interviews will be followed by 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 measure of effectiveness in various evaluation analyses. In the case of interviews, key points from each interview will be compiled, summarized and discussed. Areas of agreement, disagreement and recurring themes cutting across multiple interviews will also be identified.

Survey data analysis will begin with an examination for anomalies, outliers, or other data peculiarities. Any problems identified will be resolved. A second step in the analysis will be to prepare the data, including application of any necessary weighting to adjust for selection bias, unequal response rates in various strata, etc. Descriptive statistics such as means, median, standard errors, and percentiles for continuous variables, will be prepared to characterize outcomes of interest such as the percentage of respondents that report using the HOT lanes as well as potential predictor variables such as the length of the commute.

Data Collection Schedule and Responsibilities

Table 4-26 summarizes expected general time frames for the recommended survey and interview activities. The Los Angeles partners will be responsible for conducting surveys and performing the interviews, with the exception of the stakeholder interviews which will be conducted by the national evaluation team. The national evaluation team will, through the full Survey and Interviews Test Plan document, provide the local partners specific guidance and recommendations on the key aspects of the survey methodology and interview protocols, including specific information to be collected.

All dates assume that all of the Los Angeles projects are operational according to the current schedule. Baseline surveys should be conducted shortly before the bulk of the CRD strategies (e.g., tolling, transit enhancements, etc.) become operational. Post-deployment surveying should occur near the end of the one-year, post-deployment operational period.

Table 4-26. Data Collection Schedule for Surveys and Interviews

Survey/Interview	Baseline	Post-Deployment
General Public	Winter/Spring 2010	Winter/Spring 2012
Transit Riders	Winter/Spring 2010	Winter/Spring 2012
Corridor Drivers	Winter/Spring 2010	Winter/Spring 2012
Workers Changing to Ridesharing	Winter/Spring 2010	Winter/Spring 2012
California Highway Patrol and Bus and Vanpool Operators	None	Winter/Spring 2012
Stakeholders	Winter/Spring 2010	Winter/Spring 2012

4.2.7 Environmental Data Test Plan

Outputs from the environmental data test plan will be used by the environmental analysis. They will also contribute to the congestion, equity, and cost-benefit analyses. The national evaluation team is currently in discussions with U.S. DOT regarding the specifics of the environmental analysis approach. The outcome of those discussions may impact data needs and will be reflected in the full Environmental Data Test Plan to be completed over the next few months.

As previously noted, the environmental analysis for the national CRD evaluation involves the calculation of changes in air and noise emissions, and fuel consumption. No direct monitoring of air, noise, or energy impacts is planned as part of the Los Angeles evaluation.

All of estimates accomplished under the environmental test plan will be driven by VMT and vehicle speed inputs acquired under the traffic and transit data test plans. The VMT estimates may be adjusted to account for exogenous factors, such as gas prices and economic conditions that might impact traffic levels independent from the CRD projects. These exogenous inputs

will be acquired through the exogenous factors data test plan. This environmental test plan is concerned only with the acquisition of the LA-specific air emission, noise emission, and fuel consumption factors. These factors will be combined with the VMT and vehicle speed data to accomplish the environmental analysis.

Data Sources

The evaluation expects to get the needed air emissions factors from the California Air Resource Board (ARB). SCAG or the Caltrans Division of Environmental Analysis may be an alternate source of these data since both have environmental analysis capabilities to derive these factors from EMFAC 2007.

The FHWA maintains a Traffic Noise Model which includes noise emissions factors for various facility types, vehicle classes, and speeds. This is the anticipated source of the required noise emission factors.

Vehicle fuel consumption factors will be acquired from consumer sources such as the Auto Club of Southern California or federal websites such as www.fueleconomy.gov.

Data Availability

Observational data on vehicle volumes, speed and derived VMT will acquired from the traffic analysis. The evaluation team expects the required air, noise, and fuel use inputs to be available to the evaluation effort as requested from the organizations listed above.

Data Analysis

The air emission, noise emission, and fuel use factors will be applied to the VMT data (obtained from the traffic data test plan) to compute emissions and fuel consumption changes link-by-link based on the estimated congested speed of each link. If time-of-day shifts are observed, emissions by different time periods may be calculated. The results of these link-by-link calculations will then be aggregated to the corridor total.

Data Collection Schedule and Resources

Battelle team members will work with staff from ARB (or SCAG/Caltrans), the Auto Club, the FHWA website, and other websites to obtain the required inputs. This work will be done in the post-deployment time period since no special pre-deployment data collection is required.

4.2.8 Content Analysis Test Plan

The content analysis test plan focuses on collecting and analyzing information on the Los Angeles 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, and it could support analysis of data from other test plans. Information from this test plan also plays a supporting role in all the other analyses except the cost benefit analysis.

Data Sources and Availability

Two primary data sources will be used in this test plan. The first is the on-line search engines Google Alerts and Vocus. The second is information provided by the L.A. partners, such as press releases and public educational materials.

Google Alerts and Vocus. Google Alerts is a free on-line search engine that tracks news articles, web-based information, blogs, videos, and other media information based on search terms. Members of the Battelle team, including the Los Angeles County CRD site leader, have signed up with Google Alerts and have entered key terms based on each of the UPA/CRD sites. Examples of key terms for the Los Angeles County CRD projects include I-10 HOT lanes, I-110 HOT lanes, tolling, park-and-ride lots, L.A. DOT parking pricing, and Los Angeles County CRD. Vocus is a private company providing a range of web-based products and services. The Texas Transportation Institute's (TTI) Media Relations Group contracts with Vocus for a variety of services, including tracking media and on-line coverage based on search terms. The key words noted above for the Los Angeles County CRD have been added to TTI's search terms at no cost to the national CRD evaluation.

Los Angeles County CRD Partnership Agency Information. Press releases and outreach, public education, and marketing materials issued by the Los Angeles County CRD agencies represent the second source of information for the content analysis test plan. Metro, Caltrans, and other partners use these methods to communicate with the public, travelers in the targeted corridors, policy makers, and other groups. The evaluation has requested to be 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. Members of the Battelle team will also obtain information from the agencies on letters, e-mails, telephone calls, and other input received about the CRD projects to the extent this information is available. For example, the agencies monitor, but do not preserve, television media coverage.

As Table 4-27 highlights, partial pre-deployment information is available from the two sources used in this test plan. Due to the timing of entering the Los Angeles County CRD key words into Vocus, which occurred in June, 2009, not all pre-deployment media and on-line coverage may have been captured. 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.

Table 4-27. Partner Outreach – Media Content Data Sources and Availability

Data Source	Information Sought
Google Alerts	News items related to L.A. UPA/CRD projects
Vocus	News items related to L.A. UPA/CRD projects
L.A. Stakeholders	Media releases and other UPA/CRD-related PR documents

Data Analysis

The information obtained in this test plan will be used in the non-technical success factors 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 Los Angeles County CRD partners?
- What was the extent and nature of media coverage of the Los Angeles County CRD projects?
- What was the reaction of travelers in the corridors and areas affected by Los Angeles County CRD projects as reported in the media and in communications to the agencies?
- What the reaction of policy-makers to the Los Angeles County CRD projects as reported in the media?

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 4-28 illustrates how the information will be tracked, categorized, and analyzed.

Schedule and Responsibilities

Members of the Battelle team have already begun data collection activities related to this test plan. The site team leader has registered with Google Alerts and Los Angeles County CRD search terms have been entered into Vocus. Members of the Battelle team will continue to monitor Google Alerts and Vocus over the course of the pre- and post-deployment periods. Team members will also request being added to agency lists for press releases and information relating to the Los Angeles County CRD projects.

Table 4-28. Content Analysis Tracking Log

Date of Item	Source	Audience (if available)	UPA/CRD 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.)	

4.2.9 Cost-Benefit Test Plan

The test plan focuses on obtaining and analyzing data related to the costs of the various CRD projects and improvements in travel conditions on highways, transit services, and the environment. Data sources include the other test plans (e.g., traffic, tolling, etc.) and the SCAG Regional Travel Forecasting Model.

Data Sources

The cost benefit analysis test plan will use three major sources of data. The first source is the detailed costs associated with the CRD projects. These data will be provided by Metro, Caltrans, LADOT, and other participating agencies. The second source of data is the SCAG Regional Travel Forecasting Model, which will provide the traffic forecasts needed for years 2-10 of the cost-benefit analysis. The third source of data is a number of the other LA CRD evaluation test plans. The first and second data types—those that will be collected via this plan—are discussed below. The particulars for collecting the other data—the data that will be provided through the traffic, tolling and other test plans—are discussed in those other test plans.

Cost Data from Participating Agencies. The project costs of interest to this test plan include the capital costs associated with various projects; operating and maintenance costs; and replacement and re-investment costs. Here are some specific examples of the data that are being sought:

Capital investment costs:

- Construction on I-10 and I-110: building HOT lanes and other facilities
- Transit expansion: purchasing new buses
- HOT lanes: installing gantries and purchasing communication equipment and computer software and hardware.

Operating and maintenance costs:

- Operating and maintaining transit services
- Operating and maintaining HOT lanes
- Compliance costs for enforcing HOT lanes
- Maintaining the highway infrastructure.

Replacement and re-investment costs:

- Replacing components of facilities used by HOT lanes
- Replacing and/or updating computer hardware and software for HOT lane management
- Replacing and/or updating communication equipment for HOT lane management
- Replacing vehicles and equipment used in transit services.

SCAG Regional Forecasting Model. As the MPO for the region, SCAG has responsibility for maintaining, updating, and running this model, which was peer-reviewed in 2002. Reviewers concluded that it provided a good example of state-of-the-practice modeling techniques and should provide a reliable tool for evaluating the transportation impacts of regional land use scenarios and transportation system alternatives. In January 2008, SCAG completed a validation of the model, which included the comparison of base year model outputs with traffic count and transit ridership data.

SCAG's Regional Forecasting Model is a trip-based convergence model which covers the entire Southern California region. The model was developed on the TransCAD software platform and uses an integrated highway and transit network system based on a GIS approach. It was calibrated to Year 2000 travel behavior and validated to Year 2003 travel statistics. The model's

highway network includes detailed coding of the region's freeway system (mixed-flow lanes, auxiliary lane, HOV lanes, toll lane, truck lane, etc.) as well as arterials, major collectors, and some minor collectors. Parking and time-of-day travel restrictions (such as directional flows) were modeled by developing separate transportation networks for each of the following modeling time periods:

- A.m. Peak Period (6:00 a.m. to 9:00 a.m.)
- P.m. Peak Period (3:00 p.m. to 7:00 p.m.)
- Midday Period (9:00 a.m. to 3:00 p.m.)
- Night Period (7:00 p.m. to 6:00 a.m.).

TransCAD does have the capability of modeling HOV lanes, toll roadways, and HOT lanes, and SCAG's model network includes all toll facilities and HOV lanes. Toll facilities included in the model are the SR-91 Express lane, the San Joaquin Eastern, and Foothill Toll Roads, all of which are located in Orange County. Currently, the I-10 and I-110 HOV lanes are modeled as HOV lanes, not HOT lanes.

Data Availability

All of the required cost data is expected to be available from the local partners. The SCAG Model is currently being further enhanced to improve its ability to model HOV activity in the Los Angeles basin. This work is being coordinated with a SCAG regional congestion pricing study. Accordingly, the national evaluation team expects the SCAG model to be able to generate the 10-year projections of treatment corridor traffic that are required by the cost-benefit analysis.

Data Analysis

The cost benefit analysis will be performed using a 10-year time frame, which includes the first year after implementation of the Los Angeles County CRD projects and a 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 and after implementing the Los Angeles County CRD projects.

In addition to the data described in this test plan, key data will be derived from other data test plans to support the cost benefit analysis. Examples of these other data include:

- Reduction in travel time from the transportation modeling test plan and traffic system data test plan
- Improvement in travel time reliability from the traffic system 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 transit system data test plan
- Tolls paid by travelers who use the HOT lanes from the tolling test plan
- Improvement in the environment such as improvement in air quality from the environmental test plan

- Changes in safety conditions from the safety test plan
- Reduction in travel time and travel costs for ridesharers from the ridesharing data test plan

Data Collection Schedule and Responsibilities

Table 4-29 summarizes the data that will be acquired under the cost-benefit data test plan, the expected provider, and the time frames to which they apply.

Table 4-29. Cost-Benefit Test Plan Data Collection Schedule

Data Source	Provider	Historical	Pre-Deployment (1- year)	Post-Deployment (1 year)	10-Year Projections
Transit Project Capital Costs	Metro		✔		
Transit Project Incremental Operating Costs	Metro			✔	✔
Transit Project Incremental Revenues	Metro			✔	✔
Total Transit Operating Costs	Metro	✔	✔	✔	✔
Total Transit Revenues	Metro	✔	✔	✔	✔
HOT Revenue	Caltrans			✔	✔
IPM Revenue	LADOT			✔	✔
Traffic Forecasts	SCAG				✔

4.2.10 Exogenous Factors Data Test Plan

The exogenous factors test plan will be used to monitor elements un-related to the Los Angeles County CRD projects that may influence travel in the I-10 and I-110 corridors, use of the various project elements, and changes in travel modes. The data obtained in the exogenous factor test plan supports all of the analysis areas with the exception of the cost-benefit analysis.

Data Sources

Exogenous factor data elements included in the test plan are unemployment rates, gasoline prices, non-CRD roadway construction, and non-typical weather conditions, traffic incidents, and special events. The Los Angeles area experiences more than 3,000 special events per year

including major sports and entertainment events; police actions; film shootings; etc. Of course, only a fraction of these will affect either the treatment corridors or downtown L.A.

The details regarding the exogenous factors data that will need to be collected will be specified during the development of the full exogenous factors test plan. The following describe data sources under consideration.

California Employment Development Department (EDD) and U.S. Department of Labor Unemployment Rates. Data will be examined from 2000 to the conclusion of the CRD evaluation.

U.S. Department of Energy (DOE) Gasoline Prices. The U.S. DOE monitors gasoline prices. Historical data on the weekly price of retail gasoline for various grades has been available online since 2000. Data will be monitored over the course of the evaluation. Various commercial Internet sites that provide Los Angeles region gas prices will also be consulted.

Construction, Weather, and Special Event Conditions. Los Angeles has an abundance of real-time online resources describing highway traffic speeds, SigAlerts, weather conditions, construction activities, and special events. In addition, Caltrans maintains a website with information on any planned construction that might potentially impede traffic flow. Here are just a few of the resources available over the net:

- Current Road Conditions
  http://www.dot.ca.gov/cgi-bin/roads.cgi
- Planned Construction
  http://www.dot.ca.gov/hq/roadinfo/plannedwork.htm
- SigAlerts, Incidents, Traffic Volume
  http://map.commuteview.net/CommunityView/html/es_main.html
- Traffic Speeds, Weather, Incidents, Construction
  http://www.beatthetraffic.com/ajax/traffic/map.aspx?regionid=2&viewname=Los+Angeles

Not all of these data are archived. This limitation is being remedied by L.A County's Regional Integration of ITS Information System (RIITS). RIITS integrates traffic, incident, special event, and other traffic data from Caltrans, Metro, CHP, LADOT, and Long Beach Transit. RIITS streams that data in real-time to various portals (including some of those listed above) which then make those data available to the traveling public. RIITS is undertaking the long-term archival of these extensive data resources. This archival capability is expected to come on-line sometime in 2010. The CRD evaluation is expected to make extensive use of the RIITS archives in the post-deployment period. During the pre-deployment period, the evaluation will use the limited archives maintained by Metro and Caltrans to establish a baseline of construction, incident, and special event data in the pre-deployment period.

Data Availability

Historical, pre-deployment, and post-deployment data is available for unemployment rates and gasoline prices. Historical and pre-deployment data on other exogenous factors are not as complete, but post-deployment data will be available on all of the elements in the test plan.

Data Analysis

The factors included in this test plan will be used as comparison checks in all of the analysis areas. The information on the exogenous factors will assist in identifying elements that may influence and explain changes in travel patterns, traffic conditions, mode changes, and use of the freeways and arteries in the treatment corridors.

Data Collection Schedule and Responsibilities

Table 4-30 presents the anticipated data collection schedule for the exogenous factors test plan. Historical data and pre-deployment data are available for some factors, while post-deployment data are available for all factors. Historical data are not essential to the evaluation but help to strengthen confidence in any adjustments to findings that are based on exogenous factor data.

In regards to the construction, weather, incident and special event data that are the evaluation is seeking from its L.A. partners, in most cases, the evaluation will be able to adjust its methods to utilize whatever data are currently being archived. If the baseline archival levels are very incomplete it is hoped that the local partners can find low-cost ways to preserve more detailed and comprehensive data for the evaluation during the pre-deployment period. The RIITS archival capability planned for 2010 is expected to provide a comprehensive and permanent solution to this need in the post-deployment period.

Table 4-30. Exogenous Factors Data Collection Schedule

Data Source	Source	Historical	Pre-Deployment	Post-Deployment
Unemployment Rates	Published	✔	✔	✔
Gasoline Prices	Published	✔	✔	✔
Non-CRD Road Construction	L.A. partners	Not Needed	✔	✔
Non-typical Weather Conditions	L.A. partners	Not Needed	✔	✔
Special Events	L.A. partners	Not Needed	✔	✔

5.0 NEXT STEPS

The next steps in the Los Angeles County CRD National Evaluation are highlighted below.

- The detailed test plans will be developed based on this L.A. CRD National Evaluation Plan. It is anticipated that the test plans will be developed and reviewed individually by December, 2009
- Pre-deployment data collection, including developing trend lines, 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 Los Angeles County CRD projects and will provide assistance with elements of the evaluation plan 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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