KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING / PLANNING
155 Grand Avenue, Suite 900, Oakland, CA 94612 P 510.839.1742 F 510.839.0871

MEMORANDUM

Date: September 9, 2013 Project #: 12383

To: Sarah Jepson, Metro

cc:

From: Alice Chen, Darryl DePencier, and Bruce Appleyard

Project: Smart Mobility Framework: Pilot Area 2

Subject: Approach, Data Needs, and Sources - Final

INTRODUCTION

This memorandum presents our approach to applying the Smart Mobility Framework (SMF) principles and performance measures to assess a sub-regional long range transportation plan for the South Bay Cities area. The selected Pilot Area is the area covered by the South Bay Cities Council of Governments (SBCCOG) which is a sub-region in Los Angeles County. This work builds off of Metro's existing performance measures and an alternative Smart Mobility assessment framework. The SMF principles will be used to inform and more fully integrate this work on sub-regional long range transportation plans with local land use plans and the Southern California Association of Governments' (SCAG) Sustainable Communities Strategy (SCS).

This effort involved two subtasks:

1. To develop portfolio scenarios in consultation with the South Bay Cities Council of Governments (SBCCOG) that illustrate the benefits of using the SMF at a sub-regional level to identify transportation improvements in combination with land use strategies to attain sustainable community objectives.

2. To identify the appropriate performance measures, data needs, and recommended analysis approach starting with Metro's system-level and project-level performance measures included as part of Metro's Countywide Sustainable Planning Policy (CSPP).

This memo documents this effort and presents the portfolio scenarios and the recommended approach.

BACKGROUND

The goal for this pilot area work is to develop a suite of easy-to-use processes and tools (e.g., Excel spreadsheets) to apply the framework toward best practices for sub-regional planning products, project analysis, and ultimately, infrastructure decision making. The product should allow local planners to dynamically understand the trade-offs, costs and benefits of various components of the transportation project portfolios to optimize a comprehensive set of beneficial economic, environmental, and social equity outcomes based on Metro's Countywide Sustainability Planning Policy (CSPP) principles and priorities as well as the SBCCOG sub-regional priorities.

Countywide Sustainability Planning Policy

Metro recently completed the Countywide Sustainability Planning Policy (CSPP) that builds on the SMF to create a sustainability assessment framework that is unique to land-use, transportation, and demographic conditions in Los Angeles County. The CSPP consultant effort was completed in the summer of 2012, and the policy was adopted by the Metro Board in December 2012. The CSPP defines and maps four place-types, referred to as Accessibility Clusters, by census tract across the county, and provides planning guidance specific to each Cluster to support Metro's project managers in integrating sustainability into program and project development. The framework provides guidance to more fully integrate sustainability into Metro's planning functions. It is also a resource for collaborating with regional and local agencies to implement California's climate change laws and encourage local policies and projects that will contribute to a more sustainable countywide transportation system.

While the CSPP has its own principles and priorities, unique place types, and performance measures, it follows the same general SMF framework. The SMF identifies seven place types and the desired objectives of preserving or transitioning these place types with strategic transportation investments and land use development goals.

PORTFOLIO SCENARIOS

The purpose of the portfolio scenarios is to illustrate the benefits of using the SMF at a subregional level to identify transportation improvement projects in combination with land use strategies to attain sustainable community objectives as presented in Metro's Countywide Sustainability Planning Policy (CSPP). The intent is to assess the effectiveness of the SMF on the analysis of a portfolio of projects in a sub-regional long range plan rather than the assessment of a single project or multiple alternatives for a single corridor.

As originally intended, a key initial step was to develop three planning scenarios to be analyzed using Metro's CSPP principles and place typologies and the SMF performance measures, specifically:

1. Business-as-usual: 5 to 8 unfunded strategic projects in the South Bay subregion from Metro's Long Range Transportation Plan.
2. CSPP transportation investments: 5 to 8 projects from the Metro's CSPP guide.
3. Integrated land use and transportation: 5 to 8 CSPP projects and land use from Sustainable South Bay.

Total transportation improvement investment dollars be approximately equivalent across all scenarios.

However, after discussions with the Project Team during meetings in April and May 2013, the three scenarios were redefined as the following four scenarios.

- **Scenario One** assumes only traditional infrastructure and improvements that have already been identified in SBCCOG's Measure R as well as the Congestion Management Fee (CMF) program that are not fully funded with current "traditional" land use patterns.
- **Scenario Two** will include innovative projects (e.g., NEV subsidy, mobility hubs, charging stations, shared lane; multi-lane boulevards), but traditional land use patterns.
- **Scenario Three** will focus only on SBBCOG's proposed sustainable land use changes, but with traditional transportation improvements.
- **Scenario Four** will evaluate the SBBCOG's innovative project proposals and land use changes in the Sustainable South Bay plan.

The land use from the *Sustainable South Bay* calls for concentrated development at nodes within the sub-region. The performance measures will need to be sensitive to these land use changes.

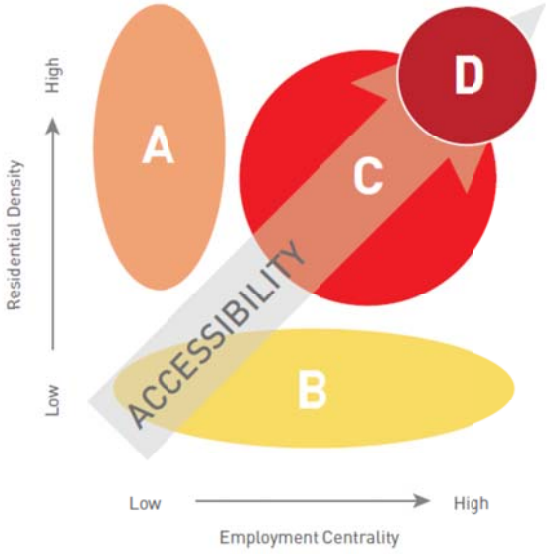
The innovative project categories are:

- Livable Boulevard;
    - Includes bus lane or other transit priority amenity
- New Transit Service or Increased Frequencies
- South Bay Personal Electric Vehicle (PEV) Readiness Plan;
- Mobility Hub;
    - Related to Metro Path defined by Metro
- Bike Lanes;
- Neighborhood Electric Vehicle (NEV) Lanes;
- Neighborhood Electric Vehicle (NEV) Subsidy / Incentive Program;
- Safe Routes to School; and
- Neighborhood Vanpool.

Each scenario will be subjected to the currently preferred performance measures and broader SMF performance measures. The test will be to see how outcomes for these scenarios may change using a broader performance measurement system.

Study Areas

Given the geographic size of the South Bay cities and the need to identify a subset of transportation projects and land use changes within the subregion, the SMF place types and Metro's Accessibility Clusters were used to focus our efforts. The two study areas were selected because they amongst the places within the sub-region with the greatest potential to transition to more sustainable transportation planning.



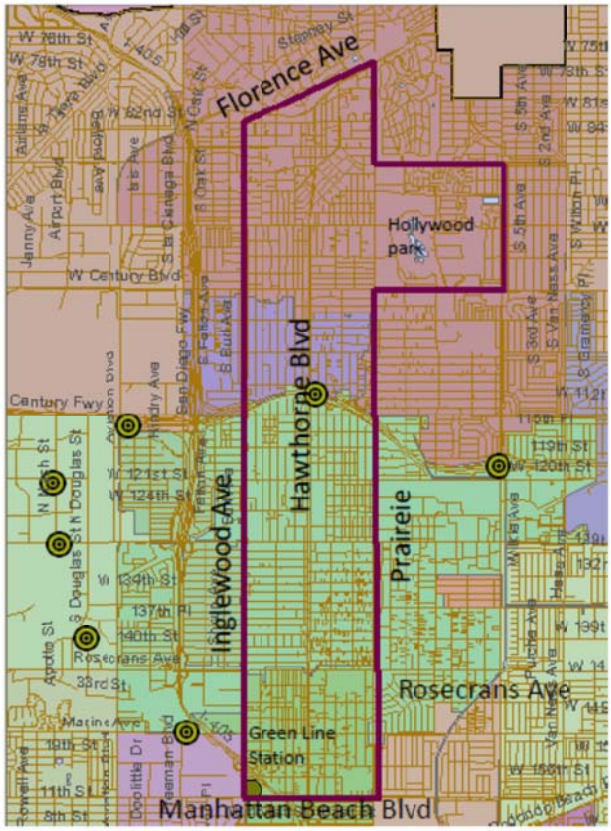
A key component of the SMF is the place types, which can be used to identify areas with the greatest potential to transition to more sustainable transportation planning. Similar to the SMF place types, Metro has developed an index of accessibility clusters at the census tract level based on population and employment density. Rather than Location Efficiency, the CSPP uses an Accessibility Index and related Accessibility Clusters for place types based on residential density and "job centrality" (defined as employment accessibility) calculated for each census tract.

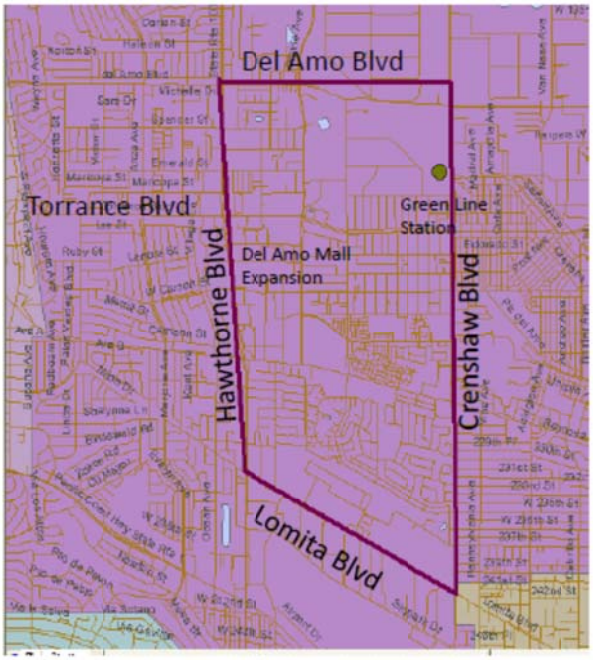
The place types and study area boundaries are intended to provide a consistent geographical scope for which all of the performance metrics will be evaluated. The consistency in geographic coverage for each measure will help to minimize error when analyzing the sensitivity of measures relative to each other for specific project types.

The Pilot Area Study will focus on two specific areas:

- Hawthorne Boulevard corridor between Manhattan Beach Boulevard and Florence Avenue which passes through the cities of Lawndale, Hawthorne, and Inglewood as well as unincorporated Los Angeles County.
- Neighborhood in the City of Torrance that is bounded by Del Amo Boulevard, Crenshaw Boulevard, Lomita Boulevard, and Hawthorne Boulevard.

Both study areas have been identified by SBCCOG in *Sustainable South Bay: An Integrated Land Use and Transportation Strategy* as representative of higher density locations that have high potential for redevelopment and land use redistribution.





Torrance Study Area

Hawthorne Study Area

PERFORMANCE MEASURES

Our recommended approach is based on the review of the 17 SMF performance measures and their recommended metrics, as described in Exhibit 11 of the Smart Mobility 2010: Call to Action.[1] (see Table 1.) Our initial assessment and recommendation are based upon review of the recommended metrics, the relevance of the performance measure to the scale of the subregional analysis and portfolio scenarios, and available tools and data to calculate the performance measures specific to the South Bay Cities. Our recommendations for performance measures for this study are based on the following set of criteria:

- **Relevance** – Do the performance measures reflect the subregional scale and the portfolio scenarios? Are the performance measures directly related to the CSPP principles and SBCCOG strategy?
- **Tools and Data** – Are tools and sufficient data available to determine the performance measures now and to forecast them in the future?

SMF Performance Measures

The Smart Mobility Framework includes a standard set of 17 performance measures that can be used to help local and regional governments evaluate and prioritize transportation projects. These performance measures are related to the SMF principles and can be used for evaluating the level of success at achieving the objectives of the SMF process. However, the tools and data required to evaluate all 17 performance measures for each contemplated transportation improvement (or bundle of improvements) are not trivial and is probably the single greatest obstacle to the implementation of SMF in current transportation planning practice. SMF requires a significant planning analysis infrastructure (e.g. regional travel demand models) be already in place (and accessible) to support the computation of all 17 performance measures, and SMF requires significant investment of professional effort to perform the computations for a variety of possible transportation improvement projects. So, the intent is not to analyze all 17 SMF performance measures, but to identify and prioritize those measures that best support the principles and priorities established by Metro and informed by the sustainability performance measures included in the CSPP.

Table 1: Smart Mobility Framework Performance Metrics

Principle	Performance Measure	Recommended Metrics
Location Efficiency	Support for Sustainable Growth	Consistency with regional Sustainable Communities Strategy or Alternative Planning Strategy meeting regional performance standards.

[1] Caltrans. *Smart Mobility 2010: A Call to Action for the New Decade*, February 2010.

		Comparison of alternatives based on acres of land consumed, and relative reductions in induced VMT through: compact land use strategies, demand management, and network management.
	Transit Mode Share	Percentage of trips within a corridor or region occurring by bus, rail or by other form of high-occupancy-vehicle.
	Accessibility and Connectivity	Number of households within 30 minute transit ride of major employment center, within 20 minute auto ride of employment, within walking distance of schools.
		Weighted regional travel time and cost among trip producers and trip attractors.
Reliable Mobility	Multi-Modal Travel Mobility	Travel times and costs by mode between representative origins and destinations, aggregated over corridor or region.
	Multi-Modal Travel Reliability	Day-to-day variability of travel times between representative origins and destinations by mode, aggregated over corridor or region.
	Multi-Modal Service Quality	Mode-specific and blended LOS measures of pedestrian and bicycle accommodation and comfort, transit availability and reliability, and auto travel efficiency.
Health and Safety	Multi-Modal Safety	Collision rate and severity by travel mode and facility, compared to statewide averages for each user group and facility type.
	Design and Speed Suitability	Conformance with guidance identifying suitable design elements and traffic speed with respect to mix of modes and adjoining land uses and area character.
	Pedestrian and Bicycle Mode Share	Percentage of trips within a corridor or region occurring by walking or cycling.
Environmental Stewardship	Climate and Energy Conservation	VMT per capita by speed range relative to State and regional targets.
	Emissions Reduction	Quantities of criteria pollutants and GHGs.
Social Equity	Equitable Distribution of Impacts	Impact of investments on low-income, minority, disabled, youth and elderly populations relative to impacts on population as a whole.
	Equitable Distribution of Access and Mobility	Comparative travel times and costs by income groups and by minority and non-minority groups for work/school and other trips.
Robust Economy	Congestion Effects on Productivity	Time lost to congestion by trips that are economically productive and/or sustaining of essential mobility, measured as vehicle hours of delay.
	Efficient Use of System Resources	Additional VMT that are associated with economic productivity and/or sustaining of essential mobility compared with system expansion cost and impact.
	Network Performance Optimization	VHD per capita, per lane mile, per private vehicle mile, per freight vehicle mile, per transit revenue mile, and in total.
	Return on Investment	Person miles and revenue per lane mile of road, per transit revenue mile and per dollar invested.
		Comparison of alternatives based on benefits per dollar invested relative to: a) system user benefits (time and expense), and b) other Smart Mobility Performance Measures.

Our initial assessment on whether or not to include the performance measure in this study is based on the available data and tools for forecasting and assessing the scenarios. For some performance measures, we also have recommended simplifying the metric in order to make the evaluation more understandable, as noted in the comments column. Each was reviewed for its purpose utility in monitoring/validating current conditions and forecasting/evaluating future conditions, whether or not it or something similar is already in use within the greater region, and the geographical scale the metric is best suited to measure.

Relevance

The recommended performance measures should reflect on the objectives of Metro and the SBCCOG as described in the CSPP and the Sustainable South Bay.

CSPP principles:

- Connect people and places
    - Access
    - Prosperity
    - Green Modes
- Create community value
    - Healthy Neighborhoods
    - Community Development
    - Urban Greening
- Conserve resources
    - Context Sensitivity
    - System Productivity
    - Environmental Stewardship

SBCCOG Sustainable South Bay principles:

- Reduce criteria pollutants
- Reduce congestion
- Reduce gasoline consumption
- Improve safety

The specific metrics that are recommended are intended to be supportive of these principles as well as the overarching principles of the Smart Mobility Framework.

The CSPP uses 15 performance measures in support of the three broad CSPP principles to evaluate projects. Performance measures from CSPP are used for monitoring purposes at the regional level rather than for evaluation or prioritization, but some of them could be appropriate for the sub-regional analysis. Additional project-based metrics were developed through consultant efforts related

to the CSPP, but are meant to be used to compare and contrast the performance of different project alternatives rather than to compare and prioritize different projects as part of a subregional planning effort. Table 2 lists the metrics used by the CSPP and compares them to the SMF principles.

In addition, the SBCCOG has identified several strategies for sustainable development that would not generally score very well using traditional performance measurement packages that are often focused on measuring increased system performance for automobiles, which was considered in the selection of performance measures.

Table 2: CSPP Performance Metrics

CSPP Metric	Potential SMF Principles Supported					
	Location Efficiency	Reliable Mobility	Health and Safety	Environmental Stewardship	Social Equity	Robust Economy
Vehicle Miles Traveled	✕			✕		
Accidents		✕	✕			
Transportation Fuel Usage	✕		✕	✕		✕
Congestion		✕		✕		✕
Emissions			✕	✕		
Transit Ridership	✕	✕		✕	✕	
Transit Travel Time	✕	✕			✕	
Transit Travel Speed		✕				✕
Walking/Biking Trips	✕		✕	✕		
Respiratory Health			✕	✕		
Environmental Enhancements				✕		
Jobs Adjacent to Transit	✕				✕	✕
Population Adjacent to Transit	✕				✕	
Transit Service in Strong and Very Strong Accessibility Clusters	✕	✕				✕
Population and Employment in Strong and Very Strong Accessibility Clusters	✕	✕			✕	✕

Source: Kittelson & Associates, Inc., 2013.

Tools and Data Needs

Our recommendation will focus most closely on metrics that have already been used at the regional and local level, and that can be analyzed using available tools and existing data sources.

- Assess available and alternative tools and methodologies for analysis
    - Sketch Planning Tools
    - Tools used by Metro and SCAG in the development of the current transportation plans

- Assess data quality and availability

Sketch Planning Tools

For testing the transportation and land use scenarios, the team reviewed the sketch planning tools (see Table 3). For testing these transportation and land-use scenarios, we reviewed the current forecasting and sketch-planning tools available, including Envision Tomorrow Plus (ET+), Urban Footprint and Rapid Fire Models, and other applicable tools. This section summarizes our review of sketch planning tools and provides a recommendation for which tool should be used for the Smart Mobility Framework Implementation project for the South Bay Cities subregion. A range of planning support software tools were reviewed based on a variety of criteria outlined below.

Background

With the rise in digital data and computer power has come the increasing availability planning support tools (PSTs) that can be used in processes to measure and plan for Smart Mobility. Moreover, the increasing power of Geographic Information Systems (GIS) that interface with finer grained, digital land use (parcel) and transport (street centerline) data have led to a number of innovative tools to support planning activity. A movement towards open-sourcing has also made these capabilities more readily available.[2, 3]

---

[2] Holway, Gabbe, et al. 2012. Opening Access to Scenario Planning Tools. Policy Focus Report • Lincoln Institute of Land Policy

[3] Previous evaluations have included:

Planning Support Systems for Cities and Regions (Lincoln Institute of Land Policy, 2008)

This book is focused on technology and the social context in which technology is employed. It is rooted in a Lincoln Institute convening that took place in September 2007. This volume covers the state of tools in 2008 and offers a glimpse at future tools.

Urban Planning Tools for Climate Change Mitigation (Lincoln Institute of Land Policy, 2009)

This policy focus report was designed to be a resource for city and regional officials facing new emissions reduction requirements through land use, transportation and urban design. The report finds that though a wide spectrum of tools currently exists, few have the capacity to work simultaneously at both the regional and local scale, or to capture both building performance and transportation demand analysis. This policy focus report reviews existing tools by scope, scale, methodology, and policy support, and presents four case studies illustrating how existing tools at various stages of development have been used.

From our review, advancements in tools often follow the specific needs of the agency or agencies responsible, the planning tasks and goals at hand, and the spatial unit of analysis. The underlying goal of the majority of these tools is to support better coordination of transportation and land use planning.

Review of sketch planning tools:

A range of sketch planning support software tools were evaluated on a variety of criteria, including:

- data access and flexibility;
- functionality in calculating advanced performance measures *(functionality)*;
- programming expertise required to develop new calculations for the tool; and
- overall transparency, adaptability and flexibility afforded to users.

We also considered current SCAG or Metro tools in place and in development. A summary of this evaluation is provided in Table 3.

The tools reviewed can be organized into the following categories:

- Scenario planning tools
    - Purpose: transportation and land use planning; current and future year "what-if" scenario building.
- Transportation Agency Planning Tools
    - LA MTA Congestion Management Fee (CMF) tool
    - CSPP Sustainability Evaluation Tool (SET)

Data Available and Metrics

In the ecosystem of Planning Support Tools reviewed for field testing SMF performance measures, they mostly support analyses along similar dimensions of performance. This has much to do with how they normalize on the best available research and practice. Facing similar data constraints also normalize capabilities.

For the purposes of this project, here are three key areas where they differ:

1. The calculations they can perform on the data (*functionality*);
2. The programming expertise required to develop new capabilities; and
3. Their transparency, adaptability and flexibility of the tool.

Balancing Functionality with Transparency/Adaptability/Flexibility

There has been an intentional move by consultants developing and employing Planning Support Tools to start calling them "open-source". As we evaluated various Planning Support Tools to serve in the

SMF analysis and development, we found that the true nature of open-source varies greatly when examining in greater detail the key capabilities of the tools and core functionality. For the purposes of these deliberations, we refer to "open-access" as the flexibility afforded to end-users to understand (and possibly modify) content and functionality of a certain planning support tool. We believe these are important considerations in determining the tool for the SMF project.

As the Table 3 shows, a Planning Support Tool can be built on a non-proprietary (open-source) software platforms (such as GRASS or QGIS, etc.), but can actually be strongly dependent on consultants with high levels of computer programming expertise and, if the programmers so choose, provide limited "open access". This appears to be the case with most of the available Planning Support Tool Packages, except for Envision Tomorrow Plus (ET+), which offers transparency, adaptability and flexibility, while also providing the functionality to calculate the necessary measures for the Smart Mobility Framework development and testing.

Current SCAG SPM Development

We also considered SCAG's current Scenario Planning Model (SPM) efforts to determine if we could use this tool in testing and refining the SMF in PA2. We found the timing is not right as SCAG is currently in the beginning stages of developing its Scenario Planning Model (SPM) in conjunction with Calthorpe Associates and based on Urban Footprint.

SCAG hopes to release a pilot test version of the SPM by mid-Fall 2013. This will be an online tool which will provide allow local governments the ability to:

- View data and limited forecast information.
- Facilitate data gathering from the local governments.

According to Amy Volz of SCAG, assuming all goes well with the pilot testing, a more flexible version of the SPM will be available by late winter (February or March) so that end-users can perform more dynamic analyses.

Our work to develop the SMF pilot framework will keep an eye on this framework to ensure integration within what is developed from the SPM. The open access capabilities of ET+ allow this to happen.

A brief overview of SCAG's Scenario Planning Model (SPM) effort can be found here: http://www.scag.ca.gov/modeling/scenarioplanning.htm.

Table 3: Summary of Planning Support Tool Packages and their Open-Source Status

Platform	Summary of Approach	Scale	Travel Model Dependence	Open Source Status			
				Developer Access	Data Compilation Access	Software Platform	End-User Access
Envision Tomorrow	Spatial, GIS and Excel	Building to Regional	Dependent of Interface	Open Source	High	ArcGIS / Excel	High
Urban Vision	Spatial, GIS	Building to Regional	Partial Dependence	Consultant Dependent	Medium	Open Source	High
Urban Footprint	Spatial, GIS	5.5 Acre Cell to Regional	Dependent on Interface	Consultant Dependent	Low	Open Source	High
Rapid Fire	Spreadsheet	City / Region / State	Dependent on Interface	Consultant Dependent	Medium	Open Source	
INDEX	Spatial, GIS	Place-Type to Regional	Dependent on Interface	Proprietary, moving to open source	Low	Proprietary, moving to open source	Medium
I-PLACE3S	Spatial, Web-based	Place-Type to Regional	Dependent on Interface	Consultant Dependent	Low	Spatial, Web-based	Consultant Dependent
Community Viz	Spatial, GIS	Place-Type to Regional	Dependent on Interface	Proprietary	High	Proprietary	High
Sketch 7 (VMT Estimation)	Compares Land Use Scenarios	Parcel to Regional	Dependent on Interface	Open Source	High		High
TXD	Travel Mode Processor	Sub-Regional to Regional	Dependent on Interface	Open Source	Source Dependent	Excel	High
CMF Calculator	Spatial, GIS	Building to Regional	Partial Dependence	Consultant Dependent	Medium	Open Source	High

Congestion Mitigation Fee (CMF) Tool

As part of its approval of the 2003 Short Range Transportation Plan, the Metro Board authorized work on a nexus study to explore the feasibility of working with local jurisdictions to implement a congestion mitigation fee. The CMF developed methodologies to determine a reasonable relationship ("nexus") between projects fully or partially funded by the Congestion Mitigation Fee (CMF) and development that would pay the fee.

The CMF Tool was developed to demonstrate the nexus study. The CMF Tool estimated congestion as vehicle hours of delay for a range of transportation project. Projects are categorized as shown in Table 4 (note that not all project types use the CMF tool).

Table 4: South Bay Cities Submitted Project Types and Analysis Methods

Project Type	Project Count	Analysis Method
Roadway Capacity Improvement	72	Travel Demand Model
Intersection Improvement	46	Congestion Mitigation Fee Analysis Tool
Railroad Grade Separations	0	Congestion Mitigation Fee Analysis Tool
Corridor System Operations / ITS	18	Congestion Mitigation Fee Analysis Tool
Park-and-Ride Lots	0	Research Literature
Highway On/Off-Ramps	0	Congestion Mitigation Fee Analysis Tool
Bike/Pedestrian Improvements	32	Research Literature
Transit Improvements	1	Research Literature
Other Projects	0	Research Literature
TOTAL	**169**	

Congestion mitigation benefits: 133 out of 169 were quantitatively analyzed for the nexus causing a 50% reduction in VHD in subregion from 2010 to 2030.

CSPP Sustainability Evaluation Tool (SET)

The CSPP also developed Metro Sustainability Evaluation Tool (SET), intended to compare alternatives for a transportation project through the lens of sustainability, as defined by the Principles and Priorities articulated in the CSPP. The SET is a quick-response tool implemented through Microsoft Excel which can be used by agency staff to evaluate the benefits of various project alternatives.

Overall Data Issues

Our analysis will use data from a variety of sources. Generally most of the data will be from free or low-cost publicly-available data from city, county, MPO or federal government sources. All the Planning Support Tools (PSTs) reviewed for this project can use these same governmental or official data sources. The SMF framework will use local data where possible, 1) so that information is reported consistently within the region, and 2) to take advantage of local refinements to the data.

DATA SOURCES

National Household Travel Survey – California Data (NHTS-CA)

As part of the 2009 NHTS-CA, additional households were surveyed to better understand non-motorized travel behavior throughout the state. A total of 18,000 additional samples were added for a total of 21,000 samples. Using the data, on-going research includes exposure rates for pedestrians and bicyclists by MPO. This sample size and level of detail is not applicable for local planning efforts, but provides information on non-motorized travel in the region.

California Active Transportation Safety Information Pages (CATSIP)

CATSIP is a state-supported site that provides resources to promote safety for pedestrian, bicyclists and other non-motorized road users in California.[4] The site includes crash data, such as the Transportation Injury Mapping System (TIMS) as well as laws and policies, such as a link to the California Strategic Highway Safety Plan, which has goals specific to bicycle and pedestrian safety under Challenge Areas 8 and 13.

Statewide Integrated Traffic Records System (SWITRS)

SWITRS is a statewide database on traffic crashes. The system provides detailed data on crash type, time, location, and lighting and weather conditions at the time of the crash.

Highway Safety Manual[5]

The Highway Safety Manual (HSM) contains a set of crash modification factors (CMFs) that quantify the change in expected average crash frequency as a result of geometric or operational modifications

[4] http://www.catsip.berkeley.edu/

[5] American Association of State Highway and Transportation Officials. Highway Safety Manual (3 vols.). 2010.

to a site that differs from set base conditions. Part D of the Highway Safety Manual provides a catalog of treatments organized by site type:

- Roadway segments
- Intersections
- Interchanges
- Special facilities
- Road networks

SCAG

Table 5 below provides a sample of the key data available, requested, and/or gathered thus far from SCAG for the SMF PA2 project that can be used for the analytical tasks. The full dataset can be found on the project website (http://sites.kittelson.com/SMF).

Table 5: Available Data for Analysis

Subject	**Applicable SMF Principles**						**Version**	**Data Source**
Administrative District	Reliable Mobility	Location Efficiency	Social Equity	Environmental Stewardship	Robust Economy	Health & Safety		
Census \ Data								
American Community Survey (ACS)	✓	✓	✓	✓	✓		2005, 2005-2009, 2006-2010, 2010	Places over 65,000
Census Transportation Planning Package (CTPP)	✓	✓	✓	✓	✓		1990, 2000	Census
County Level Business Patterns		✓	✓	✓	✓		2001, 2002, 2003	Census
Current Population Survey (CPS)		✓	✓	✓	✓		2006 (Monthly to October)	Bureau of Labor Statistics
Decennial Census	✓	✓	✓	✓	✓		1990, 2000, 2010	Census
PUMS data		✓	✓	✓	✓		2000, 2010	Census Bureau
Vehicle Inventory and Use Survey	✓			✓	✓		2002	Census Bureau

Subject	**Applicable SMF Principles**						**Version**	**Data Source**
Zip Code Business Patterns		✓	✓		✓		2006	Census Bureau
Cultural Resources								
Population Estimates		✓					1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007,2008, 2009,2010, 2011,2012	Cal. Dept. of Finance
Population Density		✓					2000	SCAG
Economic								
Current Valuation Report					✓		2005	State Controllers Office
EDD					✓		2000, 2001, 2003, 2004, 2005	Employment Development Department
Employment Profile by City		✓	✓		✓		2009	Employment Development Department
Employer Locations		✓	✓		✓		1994, 1997, 2000, 2008	Dun & Bradstreet, InfoUSA
Economic Census		✓	✓		✓		2002, 2007	Census
Energy								
Air Basin				✓			2004	Cal. Air Resources Board
Air Districts				✓			2000	Cal. Air Resources Board
Non-Attainment Areas CO			✓	✓			2001-06	
Non-Attainment Areas Lead			✓	✓			2001-07	
Non-Attainment NOX			✓	✓			2001-08	
Non-Attainment PM10			✓	✓			2001-09	
Air Quality: Ozone			✓	✓			2004-06, 2007-09	ARB
Air Quality: PM 2.5			✓	✓			2004-06, 2007-09	ARB
Modeled Vehicle Emissions from 2012-2035 RTP/SCS			✓	✓			2035	SCAG
Land Use								

Subject	**Applicable SMF Principles**						**Version**	**Data Source**
Compass 2% Areas		✓					2005	Fregonese Calthorpe
General Plan Data		✓	✓				2002, 2004,2006, 2008	SCAG Subregion
Land Use Data	✓	✓	✓	✓	✓		1990, 1993, 2000, 2005, 2008	SCAG
SCS Land Use Planning Scenario		✓	✓	✓	✓		2008, 2020, 2035	SCAG
Parcel Data		✓	✓	✓	✓		2007, 2008, 2009, 2010, 2011	Digital Map Products
Residential								
Building Permit					✓		2000, 2001, 2002, 2003, 2004, 2005, 2006,2007, 2008, 2009, 2010, 2011	Construction Industry Research Board
Comprehensive Housing Affordability Data							2000	US Census & HUD
Housing Estimates		✓	✓		✓		1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011	Cal. Dept. of Finance
Home Foreclosures		✓	✓				September 2007-September 2011	DataQuick
Socioeconomic Forecast								
Integrated Growth Forecast	✓	✓	✓		✓		RTP04, RTP08, RTP12	SCAG
Transportation								
Bike Routes	✓						2006, 2010	OCTA, VCTC, MTA
Bus Routes	✓						2007, 2010 for LA County only	MTA
Freeway Exits	✓						2007, 2008	
High Quality Transit Corridors	✓						2008, 2020, 2035	
Highway, Highway Shields							2007, 2008	
HPMS DATA	✓						2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009	Caltrans
HOV	✓						2004, 2010	Caltrans
Intermodal Stations	✓						2010	SCAG

Subject	**Applicable SMF Principles**						**Version**	**Data Source**
Licensed Drivers	✓						2008	Cal. Dept. of Motor Vehicles
Loop Detectors	✓						2006	Caltrans
Metro Routes	✓						2003, 2006, 2010, 2011	MTA
Metrolink Routes	✓						2008	Metrolink
PEMS	✓						2003, 2004, 2005	
Regional Household Travel Survey	✓						1991, 2001	SCAG
Registered Vehicles	✓						2008, 2009, 2010	Cal. Dept. of Motor Vehicles
Street Network	✓						2007, 2008	
Transit Stops	✓						2006, 2009	
Current and Planned Transit Network	✓						2008, 2020, 2035	SCAG
Current and Planned Roadway Network	✓						2008, 2020, 2035	
PEMS and INRIX Freight Bottlenecks	✓						2012	Cambridge Systematics
Travel Demand Model								
Regional Transportation Analysis Zones (TAZs)	✓	✓	✓		✓		2001, 2004, 2006, 2009, 2010	SCAG
Accessibility measures: # of Emp in each SBCCOG TAZ a. 10, 20, 30 minutes drive b. 30 minutes of transit	✓	✓	✓		✓		2001	SCAG

RECOMMENDED PERFORMANCE MEASURES

The list of recommended performance measures is highlighted in Table 6.

Table 6: Recommended Performance Measures and Metrics

SMF Performance Measure	SMF Recommended Metric	Purpose	Current Use of Measure	Scale
Support for Sustainable Growth	Consistency with SCAG Sustainable Communities Strategy	Forecast		Regional
	Acres of Land Consumed	Monitor / Forecast	SCAG RTP	Regional / Sub-Regional
	VMT Reduction Due to Land Use Strategy	Monitor / Forecast		Regional
Transit Mode Share	Percentage of Trips by Transit	Monitor / Forecast		Regional / Sub-Regional
Accessibility and Connectivity	Average Proximity to Employment (30 min Transit)	Monitor / Forecast	SCAG RTP	Regional / Sub-Regional / Local
	Average Proximity to Employment (20 min Drive)	Monitor / Forecast	SCAG RTP	Regional / Sub-Regional / Local
	NEV, Bicycle, Walking Facilities	Monitor / Forecast		Regional / Sub-Regional / Local
	Regional Travel Time and Cost	Monitor / Forecast		Regional
	Average Trip Distance	Monitor / Forecast		Regional / Subr-Regional
Multi-Modal Travel Mobility	Modal Travel Time and Cost between Representative Locations	Monitor / Forecast	SCAG RTP	Regional / Sub-Regional
	Average Vehicle Occupancy	Monitor / Forecast		Regional / Sub-Regional
Multi-Modal Travel Reliability	Day to Day Travel Time Variation	Monitor / Forecast	SCAG RTP	Regional / Sub-Regional
Multi-Modal Service Quality	Multi-Modal Level of Service	Monitor / Forecast		Local
Multi-Modal Safety	Crash Rates Compared with Statewide Average	Monitor / Forecast*	SCAG RTP	Regional / Sub-Regional / Local
	Number of Crashes	Monitor / Forecast*		Regional / Sub-Regional / Local
	Crash Severity Compared with Statewide Average	Monitor / Forecast*	SCAG RTP	Regional / Sub-Regional / Local
Design and Speed Suitability	Consistency Between Roadway Design, Posted Speed and Intended Function	Monitor		Local
Pedestrian & Bicycle Mode Share	Percentage of Trips by Walking	Monitor / Forecast		Regional / Sub-Regional / Local
	Percentage of Trips by Cycling	Monitor / Forecast		Regional / Sub-Regional / Local
Climate and Energy Conservation	VMT per Capita by Speed Range Relative to State and Regional Goals	Monitor / Forecast	SCAG RTP	Regional / Sub-Regional
Emissions Reduction	Quantities of Criterion Pollutants and GHG's	Monitor / Forecast	SCAG RTP	Regional / Sub-Regional
Equitable Distribution of Impacts	Proportion of Disadvantaged Persons Impacted	Forecast		Regional / Sub-Regional / Local
Equitable Access and Mobility	Travel Time and Cost for Disadvantaged Persons to Total Population	Forecast	Metro LRTP	Regional
Congestion Effects on Productivity	Vehicle Hours of Delay	Monitor / Forecast	SCAG RTP	Regional / Sub-Regional
Efficient Use of System Resources	VMT Associated with Economic Productivity	Forecast		Regional
Network Performance Optimization	Vehicle Hours of Delay	Monitor / Forecast	SCAG RTP	Regional / Sub-Regional
Return on Investment	Person miles per Investment	Monitor / Forecast	SCAG RTP	Regional / Sub-Regional / Local

*Crashes are rare and random events that cannot be directly forecasted. Crash modification factors based on proposed improvements can allow estimates of the change in crash probability.

SUMMARY OF APPROACH

Table 7 summarizes the approach, including the recommended performance metrics, tools and data sources.

Table 7: Recommended Performance Metrics

Performance Metric	Principles							Project Type	Tool/Data	Data Acquired
	CSPP			SSB						
	Connect	Create Community	Conserve	Reduce pollutants	Reduce Congestion	Reduce Gas Consumption	Improve Safety			
Average Proximity to Employment (30 min by Transit)	×	×						Land Use Change	Travel Demand Model	Y
Average Proximity to Employment (20 min Drive)	×	×						Land Use Change	Travel Demand Model	Y
Average Vehicle Occupancy (AVO)			×	×	×	×		Park-and-ride lots; Neighborhood Vanpool	2001 Regional Household Travel Survey	Y
Modal Travel Time and Cost	×							Various	Travel Demand Model	Y
NEV, Bicycle, Walking Facilities	×		×	×	×	×	×	NEV lanes, NEV subsidies; bike lanes; PEV Readiness Plan; bike/ped improvements	GIS	Y
Percentage of Trips by Transit				×	×	×		Mobility Hub, Neighborhood vanpool, transit improvements	Travel Demand Model	Y
Percentage of Trips by NEV				×	×	×		NEV lanes, NEV Subsidy; PEV Readiness	SBCCOG Research	Y
Percentage of Trips by Bicycling				×	×	×		Bike lanes, safe routes to school	Census/ACS/LA Bike Model	?
Percentage of Trips by Walking		×		×	×	×		Livable Boulevard, safe routes to school	Census/ACS	Y
Quantities of Criteria Pollutants and GhGs			×	×		×		Various	Travel Demand Model, EMFAC	Y
Vehicle Hours of Delay (VHD) or Person Hours of Delay			×	×	×			Intersection Improvements, Railroad Grade Separations, Corridor System Operations/ITS, Hwy on/off-ramps,	CMF Tool, Travel Demand Model	Y

Vehicle Miles Traveled (VMT) or Person Miles Traveled			×	×		×		Various	ET+, Travel Demand Model	Y
Vehicle Hours Traveled (VHT)			×		×	×	×	Various	ET+, Travel Demand Model	Y
VMT per Capita by Speed Range			×	×		×		Various	Travel Demand Model	Y
Number of Crashes							×	Various	SWITRS, Travel Demand Model, ET +	N
Number of Vulnerable User Crashes							×	Various	SWITRS, Travel Demand Model, ET +	N

NEXT STEPS

This final approach memo serves to finalize the recommended performance metrics based on comments received on the draft memo dated July 24, 2013 allowing the team to move forward with the following steps:

- Provide additional details on innovative projects based on level of analysis required for performance metric and tool, specifically locating projects within the two study area.
- Identify additional data needs based on the tools selected.
- Refine/adapt existing tools for subregional-level analysis that is sensitive to the differences in land use and transportation projects from the four portfolio scenarios.