LA STREET CLASSIFICATION AND BENCHMARKING SYSTEM

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EXECUTIVE SUMMARY

LOS ANGELES’ GREAT STREETS

As one of the most prominent and memorable public spaces in every city, streets are fundamentally designed to serve people. We expect and require our streets to serve a multitude of purposes and objectives. Within our urban areas, streets shape the neighborhoods they pass through and support many different modes of transportation. Conventional systems of classifying streets – titles like “arterial”, “collector”, and “local” – define streets through only one of their many functions: their emphasis on the through movement of automobiles. The complex relationships and interplay between active street uses and design for pedestrians, bicycle, transit, and auto access need to be understood in order to effectuate great streets. Good design enhances the sense of overall activity and energy without creating unwanted speed conflicts. The City of Los Angeles already benefits from many individual “Great Streets” that reflect these design objectives, such as Wilshire, Ventura, Hollywood, and Crenshaw Boulevards. The best streets in the city share a series of characteristics that work in concert to achieve both functional mobility and a great sense of place.

Great streets serve all modes of transportation. Streets must work not only for motorists, but also for transit riders, bicyclists, and pedestrians; this directly impacts all of the other measures of success. Relative priorities for different street types and different land use and urban design contexts flow from this concept. This idea is well articulated in the City’s downtown planning efforts and physically expressed in many of Los Angeles’ best public streets and places.

Great streets provide a consistent level of quality throughout the places they define. A comprehensive set of street standards is critical to provide both the movement and the placemaking we expect from streets. A consistent standard allows development to occur over time with a certainty that new phases will continue to maintain the same or higher levels of public investments in the street elements.

Great streets are defined by their doorways, not their driveways. Vibrant and inviting streets draw people into a community or neighborhood and provide a memorable experience. Their adjacent land uses and associated activities have a direct relationship to that experience, whether they are places to live, work, shop, or play. Great streets bring people to these front doors and serve as public spaces, owned and enjoyed by all.

Great streets enhance the places they serve. Streets are not a design objective in their own right, but are meant to enhance and support the adjacent land uses and their unique context. Accordingly, many jurisdictions are looking for a new functional classification or street typology that relates street design directly to the places, contexts, and functions they serve.
Great streets are a form of civic art. In urban centers, the street right-of-way can account for as much as 40% of the total land area. The design and character of these spaces will leave a lasting impression on residents and visitors for years to come. The City of Los Angeles has the opportunity to guide, direct, and define these spaces in a way that uplifts and inspires through a sense of civic art and stewardship of the public realm.

**STUDY PURPOSE**

With funding from the Southern California Association of Governments (SCAG), this study serves the City of Los Angeles’ interest in researching different street classification and benchmarking systems to better inform the City policies and standards needed to achieve great streets. The scope included researching the possibilities of what a new paradigm for street classification and typologies and appropriate system performance measures could look like in the City of Los Angeles. The study facilitated a staff-level dialogue around street classification concepts and performance measurement options. The process examined the City’s current policies, standards and practices related to street classification and performance measurement.

**STUDY FINDINGS**

The City’s existing classification system and performance measures reflect a long standing and consistent emphasis on standards for efficient movement of vehicles, with modifications over time to address specific locations and modal concerns. As the short list of existing standard cross sections remains the starting point for any proposed changes, numerous modifications have been implemented to reflect Community Plan interests and other context sensitive changes. This has led to a wide variety of design responses to similar issues, a lack of network continuity for facilities such as bike lanes that serve longer trips, and potential for inequity in the city’s provision of transportation infrastructure.

There is a need for a more robust street classification system and performance benchmarks that accommodate all street users in Los Angeles. Three new classification systems (Modified, Context Sensitive Solutions, and a Layered Network Approach) and three new approaches of performance measurement (Mode-Specific, Multi-Modal and System-based) were researched as potential candidates to address the growing need for new street standards and measurement tools.

**NEXT STEPS**

The research provided through this study provides the initial information necessary to start a dialogue on the next steps required to shift the paradigm for street classification and system performance measures to improve the City’s ability to create and maintain great streets. With the research into innovative solutions used by jurisdictions to create new street classifications and benchmarks done, the next steps include additional research and implementation steps involving City departments, community stakeholders and the general public. Some action
steps include, but are not limited to: defining essential and supporting elements of each street network type; conducting benchmarking case studies to gather more information; amending the Transportation Element to reflect the new standards and benchmarks; and applying new standards and establishing context-sensitive overlays through the New Community Plan implementation overlays.
1A. EXISTING STREET CLASSIFICATION SYSTEM

The City’s existing street classification system reflects a consistent emphasis on standards that prioritize the efficient movement of vehicles. Current street classifications, existing transportation policies, the departments that manage street improvements and the current demand for street modifications were examined. In addition, alternative classification approaches that could provide the City with a more comprehensive street classification strategy and reduce street by street modifications were explored.

PLANNING CONTEXT

While the specifics of street classification systems vary widely across communities, nearly all systems are rooted in the nationally mandated “functional classification system” established in the Federal Aid Highway Act of 1973. In the City of Los Angeles, the various street types or categories are referred to as “street functions” or “street classifications.” The specifications and design standards for the Los Angeles street functions are included in the Transportation Element (adopted in 1999) of the City’s General Plan.

EXISTING FUNCTIONAL CLASSES

Chapter VI of the Transportation Element describes the framework for specifying highway designations for the existing City of Los Angeles street classification system. The five street functions are described with operational criteria below:

Major Highway – Class I
- More than 50,000 vehicles per day (VPD) average daily traffic (ADT)
- Up to 3,200 vehicles per hour (VPH) in both directions peak hours
- Accommodate 4 travel lanes in each direction – peak hour

Major Highway – Class II
- 30,000 to 50,000 ADT
- Up to 2,400 VPH in both directions peak hour
- Accommodate 3 travel lanes in each direction- peak hour
- System spacing one mile apart on a grid

Secondary Highway
- 20,000 to 30,000 ADT
- Up to 1,400 VPH in both directions peak hour
- Accommodate 2 travel lanes in each direction – peak hour
- System spacing one mile apart on a grid (midway between Major Highway grid)

Collector Street
- Up to 10,000 ADT
- Up to 600 VPH in both directions peak hour (500 VPH in both directions for Hillside Collector)
- System spacing no greater than one-quarter mile intervals between major or secondary highways

Local Street
- There are no such criteria for Local Streets.

The operational boundary between Local Streets and Collector Streets is not explicit. Likewise there is some ambiguity as to the upper boundary of a Collector Street (i.e., there is a gap of ADT between 10,000 and 20,000). Review of other City policies has shown that the Secondary Highway designation can include roadways with an ADT above 10,000.
Roadway design standards for the above street types are summarized in Table 1.1 and are depicted in Figure 1.1: Standard Plan No. S-470-0 which is used regularly at the building permit counters to inform architects and civil engineers of minimum street widening standards.

**STREET IMPROVEMENTS**

Multiple departments within the City structure use the designated street functions to implement programs and projects.

The Departments of Public Works (DPW) and Transportation (DOT) particularly utilize the street function designations in their respective programs.

The DPW is responsible for construction of the transportation system and uses the specifications for street functions in capital improvement programs and administering dedication and widening requirements for new development. The DPW, as the designated recipient and manager of gas tax funds, also sets priorities for highway repair and maintenance based upon the street function designations.

The DOT, responsible for operation of the transportation system, utilizes street functions in its regulation of traffic controls, access management (site plan review), bicycle planning, transit planning, and capital improvement programming. DOT provides traffic forecast support to the Department of City Planning’s New Community Plan Program and other requests to amend street designations.

The City’s ability to utilize regional and federal transportation funds is also impacted by the street function designations. Use of federal gas tax funds is limited to a designated system of regionally significant arterials and the Los Angeles County Metropolitan Transportation Authority (Metro) biannual “Call for Projects” assigns priorities to the principal arterial routes that are identified as part of the Congestion Management Plan (CMP) Highway and Roadway Network (included as Table 18 of the Transportation Element). The upcoming 2011 Call for Projects is expected to include a new performance measurement for Regional Surface Transportation Improvements (RSTI) category, awarding additional points to projects that make improvements that achieve “complete streets” objectives.

**STREET CLASSIFICATIONS FOR MULTIPLE MODES**

While some of the street types described above are further augmented in the Transportation Element to reflect the growing interest in pedestrian, transit and bicycle mobility options, the standards for these types of streets were never adopted. Nonetheless, there are several policies, corresponding guidelines and generalized street types in the Transportation Element that support enhancing the street classifications for multiple modes of mobility.

In 1993, the City of Los Angeles adopted a policy to coordinate land use and circulation priorities surrounding rail transit stations (see Appendix F of the Transportation Element). The policy calls for the adoption of a transit-first policy for these districts and specifies minimum sidewalk widths that are wider than the standard cross-sections of the Transportation Element.
The City’s Bicycle Plan was originally adopted in 1977, updated in 1996 and re-adopted in 2002. The Bicycle Plan is Chapter IX of the Transportation Element. Currently, a 2010 update of the Plan is underway. The objective of the update is to guide the development and implementation of bicycle policies, programs and infrastructure citywide.

Although numerous policies in the Bicycle Plan have been around since 1977, design standards for the standard street cross-sections contained in the Transportation Element do not include bicycle lanes. For example, bicycle lanes on Secondary Highways cannot be implemented without (1) full dedication and improvement of the street to standard; or (2) eliminating parking or reducing the number of through lanes for automobiles.

See Box 1.1 for a sample of the City’s pedestrian, transit and bicycle policies.

TABLE 1.1 – FEATURES OF EXISTING CITY OF LOS ANGELES STREET CLASSIFICATIONS

Note: The Pedestrian Priority Streets are generalized street types, and not adopted as standards in S470.

<table>
<thead>
<tr>
<th>Designation</th>
<th>Right of Way</th>
<th>Minimum Sidewalk/Parkway</th>
<th>Curb Lane</th>
<th>Full-time lanes</th>
<th>Part-time lanes</th>
<th>Median/Left Turn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major Class-I</td>
<td>126’</td>
<td>12’</td>
<td>13’</td>
<td>6</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Major Class-I Ped Priority</td>
<td>126’</td>
<td>12’</td>
<td>13’</td>
<td>6</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Major Class-II</td>
<td>104’</td>
<td>12’</td>
<td>13’</td>
<td>4</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Major Class-II Ped Priority</td>
<td>104’</td>
<td>17’</td>
<td>8’</td>
<td>4</td>
<td>All day parking</td>
<td>1</td>
</tr>
<tr>
<td>Secondary</td>
<td>90’</td>
<td>10’</td>
<td>19’</td>
<td>4</td>
<td>All day parking</td>
<td>1</td>
</tr>
<tr>
<td>Secondary Ped Priority</td>
<td>90’</td>
<td>15’</td>
<td>8’</td>
<td>4</td>
<td>All day parking</td>
<td>-</td>
</tr>
<tr>
<td>Collector</td>
<td>64’</td>
<td>10’</td>
<td>-</td>
<td>2</td>
<td>All day parking</td>
<td>-</td>
</tr>
<tr>
<td>Collector – Industrial</td>
<td>64’</td>
<td>8’</td>
<td>-</td>
<td>2</td>
<td>Restricted parking</td>
<td>-</td>
</tr>
<tr>
<td>Collector- Hillside</td>
<td>50’</td>
<td>5’</td>
<td>-</td>
<td>2</td>
<td>All day parking</td>
<td>-</td>
</tr>
<tr>
<td>Local</td>
<td>60’</td>
<td>12’</td>
<td>-</td>
<td>2</td>
<td>All day parking</td>
<td>-</td>
</tr>
</tbody>
</table>
### Box 1.1: Sample City Policies Regarding Pedestrians, Transit and Bicycles

#### Pedestrian Policies

**Policy 4.4 of the Transportation Element:**

Identify pedestrian-priority street segments (through amendments to the Community Plans) in which pedestrian circulation takes precedence over vehicle circulation, and implement guidelines to develop, protect, and foster the pedestrian-oriented nature of these areas.

**Policy 10.3 of the Transportation Element:**

Identify pedestrian-priority street segments in Community Plans and implement guidelines to develop, protect, and foster the pedestrian-oriented nature of these areas.

Pedestrian-priority Segments require wider sidewalks for Major Highways (Class I and Class II) and for Secondary Highways and are considered suitable when:

- Located in a designated Community Center, Neighborhood District or Mixed Use Corridor node or adopted Pedestrian Oriented District (LAMC 13.07)
- Not located along a Major Highway Class I; a Transit-priority Street; or along the Los Angeles County CMP Highway and Roadway Network
- Less than five blocks or .62 miles long.
- Adjacent land use of commercial activities characterized by ground floor retail and services oriented to pedestrians

#### Transportation Policies

**Policy 2.21 of the Transportation Element**

Identify and develop transit-priority streets which serve regional centers, major economic activity areas and rail stations to enhance the speed, quality and safety of transit service.

Transit-priority Streets are applicable on Major Highways (Class I and Class II), shall have 13 foot curb lanes and peak hour parking restrictions. Primary Transit-priority Streets may include bus only lanes during peak hours. Transit-priority Streets are considered suitable when:

- Must be on a Major Highway (Class I or II)
- Minimum of three bus lines serving the street segment
- Less than 10-minute headway for at least one of the MTA lines
- 5-minute or less headway for one of the MTA lines in order to be designated Primary Transit Priority
- More than 1.5 miles in length

#### Bicycle Policies

**Policy 1977 Plan:** Where the pavement is sufficiently wide, a lane for the exclusive use of bicycles may be designated and identified by striping and signs.

**Policy 1.1.7 1996 Plan:** Prioritize Class I and Class II (bicycle lanes) facilities that serve Regional/transit centers or a major economic activity.

**Policy 1.1.6/1.1.7 Draft 2010 Bicycle Plan:** Increase the number of bicycle lanes and/or improve the quality of the street right-of-way for bicyclists.
**COMPLETE STREETS ACT**

While local interest has existed for improving pedestrian, bicycle, and transit facilities within the City’s streets, state policy also now requires that a complete streets approach be utilized in any substantive revision of the City’s Transportation Element. The Complete Street Act (AB 1358) specifies that any revisions must:

“…plan for a balanced, multimodal transportation network that meets the needs of all users of streets, roads, and highways, defined to include motorists, pedestrians, bicyclists, children, persons with disabilities, seniors, movers of commercial goods, and users of public transportation, in a manner that is suitable to the rural, suburban, or urban context of the general plan.”

This language is notable both in its requirement that the network must meet the needs of all users, modes, and abilities, and in its call to consider the land use context of the general plan.

The Complete Streets Act also contains specific language directing cities to shift toward walking and bicycling in order to reduce greenhouse gas emissions:

“Shifting the transportation mode share from single passenger cars to public transit, bicycling, and walking must be a significant part of short and long-term planning goals if the state is to achieve the reduction in the number of vehicle miles traveled and in greenhouse gas emissions required by current law.”

The Complete Streets Act (AB 1358), which calls for an approach that is both multimodal and suited to the specific rural, suburban, or urban context of the general plan, provides another rationale for expanding the number of cross-sections.

**MODIFIED STREET STANDARDS**

In the ten years since the Transportation Element was adopted in 1999 the City Planning Commission has been asked to adopt “modified” standards to the established street designations in a significant number of instances. Most of the modifications have been made during the update of the City’s 35 Community Plans (which together comprise the Land Use Element of the General Plan) in which the generalized standards contained in the Transportation Element are modified with the help of more specific community input and analysis to meet the specific needs of a particular street segment. Changes include both specific design elements for the pedestrian realm as well as context sensitive classifications that identify specific design elements for various adjacent land uses.

Modifications to the street designations can also occur outside of the CPU process. For instance, a specific development project or community concern may warrant City Council to initiate an investigation through a Council Motion. Staff reviews the request within the parameters of the Transportation Element and submits a recommendation to the City Planning Commission as to whether the street should be modified or not, and if so, how.

There have been a considerable number of these modification requests. Appendix D of the Transportation Element lists 39 arterial street segments that have modified street designations. Since the adoption of the Transportation Element in 1999, there have been an additional 39 motions to re-designate various street segments per special...
Existing Street Classification System

request of the City Council. In addition, all of the
arterials in Downtown have been reclassified with
modified standards and several other street
segments citywide have been reclassified as part of
Community Plan Updates (CPU) that have taken
place after 1999. Modified street standards are also
being proposed for most of the arterial streets in
Hollywood as part of the Hollywood Community
Plan Update that is nearing completion.

The Central City Community Plan was modified in
April 2009 to reflect a new typology of land use
(Retail, Residential, Other) and function (Transit-
priority, Automobile Street, Bicycle Route, Truck
Route and Local Truck Route). Additional
pedestrian-friendly features, such as curb
extensions, bump outs, and retail paseos were added
to the list of programs. Instead of amending the
Transportation Element, the action adopted a
district of “modified” standards that are referenced
on a block-by-block basis in Navigate LA, the
City’s GIS data base, taking into account specific
constraints relative to the existing built environment
of significant buildings. Wider sidewalks are called
for to facilitate pedestrian movement and to
enhance public open space (i.e. encourage outdoor
dining).

One common concern with the highway standards
is how to implement them in older parts of the City
with significant historic buildings along the
alignment. For example, the adoption of the City’s
Adaptive Re-Use Ordinance encourages the
restoration of the older buildings for mixed use
development. This policy is often in direct contrast
with the desire to implement the highway
development standards contained in Chapter VI of
the Transportation Element. The approach taken
through the Central City Community Plan’s
Downtown Street Standards and Design Guidelines
has been one solution to this dilemma.

In addition to the multiple modification requests
residents along arterial and collector streets often
contact the Department of Transportation about too
much traffic and/or excessive traffic speeds. The
Department has developed a tool-box of traffic
calming devices to address these issues. The
implementation of these devices is dependent upon
the street designation. Some devices are approved
only for designated local streets; hence, there are
persistent requests to downgrade street designations
in the hopes that the Department will agree to
install the desired traffic controls.

CONCLUSION

Although numerous policies supporting pedestrian,
bicycle, and transit activities within the
Transportation Element have the potential to
effectuate “Great Streets,” a relatively short list of
standard cross-sections remains the starting point
for any proposed changes because those policies
have not been translated into appropriate standards
and performance measures. Many of the
modifications implemented in the City’s 35
Community Plans have been tailored to reflect
specific area or community interests and other
context sensitive changes. Reliance on street-by-
street modifications has led to a wide variety of
design responses to similar issues, a lack of network
continuity for facilities such as bike lanes that serve
longer trips, and potential for inequity in the city’s
provision of transportation infrastructure. An overall revamping of the street standards at a citywide level is necessary to take a system-wide approach to creating livable streets and neighborhoods.
NEW STREET CLASSIFICATION SYSTEM

FIGURE 2.1 – STANDARD PLANS NO S-470-0

ARTERIAL STREETS

MAJOR HIGHWAY—CLASS I
At intersections with other Major Highways, the larger widths shown in parentheses should be provided, as determined by LADOT, utilizing a Standard Flare Section.

MAJOR HIGHWAY—CLASS II
At intersections where LADOT has determined that dual left turn lanes are required, the larger widths shown in parentheses shall be provided, utilizing a Standard Flare Section.

NON-ARTERIAL STREETS

COLLECTOR STREETS
For use in quarter mile streets and school areas.

INDUSTRIAL COLLECTOR STREET
For use in industrial areas to assist the flow of local truck traffic within these areas to adjacent arterials streets. A 35' curb return radius is required.

HILLSIDE COLLECTOR STREET

HILLSIDE STREET LOCAL

LOCAL STREET
In commercial and multiple residential areas, a 40-foot roadway with 10-foot parkways, and full width sidewalks shall be required.

HILLSIDE STREET LIMITED
(Parking on one side only)

ACCESS ROADWAY CONDITIONAL
(Limited to 4 dwelling units, and a maximum length of 300 feet, Private Street only)

STANDARD WALKWAY CROSS SECTION

TRANSITIONAL EXTENSIONS
Where a designated Major Highway (Class I or II) or a Secondary Highway crosses another designated arterial street and then changes in designation to a street of lesser standard width, the street of lesser standards width shall be widened on both sides from the intersection to the width of the higher designation and tapered in a Standard Flare Section, as shown below, to provide an orderly transition.

STANDARD FLARE SECTION (Plan View)

ALLEYS

STANDARD TURNING AREA (Plan View)

STANDARD CROSS SECTION

MINIMUM TURNING AREA (Plan View)

STANDARD CUT-CORNERS FOR 90° INTERSECTION (Plan View)

CUL-DE-SAC

NOTE: Dimensions shown herein are not to scale.

STANDARD STREET DIMENSIONS

BUREAU OF ENGINEERING
DEPARTMENT OF PUBLIC WORKS
CITY OF LOS ANGELES

STANDARD PLAN S-470-0

APPROVED: 4/6/99
GENERAL MANAGER, DEPT. OF TRANSPORTATION

ADOPTED: MAY 13, 1999
CITY PLANNING COMMISSION

VAULT INDEX NUMBER
B-4428

THIS STANDARD PLAN BECOMES EFFECTIVE ON NOVEMBER 10, 1999

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While the City has adopted policies that have the potential to create “Great Streets,” existing standards and piecemeal approaches, such as individual street modifications, have not effectuated a citywide approach to better street outcomes. Los Angeles is not alone in this regard: many jurisdictions are grappling with similar issues, and some have made much progress in developing new street classification systems. Research was conducted to investigate best practices in classification systems that are providing alternatives to vehicle-only standards.

**Classification Systems**

A wide range of classification systems developed and used by cities around the country to meet multiple planning and engineering objectives can be grouped into three broad categories:

1. Modified Functional Classification System;
2. Context Sensitive Solutions approach; and
3. Layered Network with an emphasis network for each mode of travel.

**Modified Functional Classifications**

This classification system typically maintains the existing street classification systems and modifies existing street standards to incorporate space and features for pedestrians, bicycles, and transit. The following are examples of modified functional classification street standards that incorporate complete streets principles into the street standards:

- Los Angeles, CA - Downtown Street Standards and Design Guidelines
- Sacramento, CA – Pedestrian Friendly Street Standards
- Portland, OR – Creating Livable Streets
- Tacoma, WA – Mixed Use Center Complete Streets Design Guidelines & Residential Complete Street Design Guidelines
- Roanoke, VA – Street Design Guidelines

**Pros:**
- Builds on existing system
- Maintains predictability and consistency with routine adherence to standards
- Simple set of standards
- Works with most existing procedures

**Cons:**
- Requires modified cross-sections for constrained right-of-way
- Limited flexibility with routine adherence to standards
- Requires retrofitting long stretches of roadway
**Context Sensitive Solutions**

Context sensitive solutions allow street designs along a corridor to vary to accommodate different levels of through movement and local access based on adjacent land use. New functional classification or typologies that relate street design directly to the places they serve, such as “residential”, “retail”, “industrial”, and “civic” are often designated. The following cities have used context-sensitive solutions to incorporate complete street principles into their street standards:

- San Francisco, CA – Better Streets
- Contra Costa, CA – Design Guidelines for Livable, Multi-Modal Streets
- Charlotte, NC – Urban Street Design Guidelines
- Indianapolis, IN – Multi-Modal Corridor and Public Space Design Guidelines
- NYDOT – Street Design Manual

**Pros:**
- Allows the function and design of a roadway to change along its length
- Street design directly supports adjacent land use and development needs

**Cons:**
- Often results in complicated systems of roadway design and land use matrices
- May benefit shorter, local trips at the expense of through traffic or transit
- Can require more case-by-case analysis of street design and changing land uses

**Layered Networks**

This typology uses a network approach that designates modal emphasis by street to create a complete streets network. While each street should still routinely accommodate all modes as a complete street, layered network standards are designed to emphasize particular modes on particular streets in the context of a larger system. This approach facilitates the creation of city wide bicycle, transit, and auto emphasis routes in contrast to a pure context sensitive approach that might preclude connectivity due to local interests. This approach can also use context sensitive land use and mode overlays to enhance additional transportation modes. The following cities have used the layered network approach to incorporate complete streets principals into their street standards:

- Glendale, CA – Downtown Glendale Mobility Plan
- Alameda, CA – Street Functional Classification
- Denver, CO – Blueprint Denver
- Austin, TX – Downtown Great Streets

**Pros:**
- Helps mitigate the challenge of accommodating all users on every roadway
- Creates flexibility and options with multiple travel routes providing flexibility to accommodate different travel modes on different streets
- Allows network layout and roadway design for ideal bicycle or transit networks

**Cons:**
- When connectivity and redundancy are not present in the street network, certain streets may not easily accommodate all modes
- Less effective if land use does not support design of ideal modal networks
- Requires retrofitting long stretches of roadway to complete networks
After reviewing the three alternative approaches to the existing classification system the technical advisory committee weighed the pros and cons for each approach along with the experiences from other communities that have utilized the various approaches. The committee selected the layered network approach with a context sensitive overlay component as the desired approach for further study. This approach would maintain the primary functions of the street system that already exist in Los Angeles, but would enhance the street system for alternative transportation modes, and maintain consistency with complete streets requirements.

The layered network approach will create four network layers in the Transportation Element:

- Automobile-Emphasis Network
- Transit-Emphasis Network
- Bicycle-Emphasis Network
- Pedestrian-Emphasis Network

Each of these networks contributes to a complete street system that accommodates all mode choices and advantages specific modes on key network links. The intention of these networks is to create connected systems for travel throughout the city for each travel mode. Together, these networks can be implemented to create a complete street system for the City. While each of the cross-sections prioritizes a specific mode, other modes are routinely accommodated. Individual streets will still accommodate all modes per the Complete Streets requirements under AB 1358.

A key challenge with this approach will be the process to define the various networks and to update the street design standards for the various street types in the layered network. This effort will require extensive stakeholder input and is recommended as part of the next update to the City’s Transportation Element.

In addition to the layered network approach, the technical advisory committee was interested in applying elements of the context sensitive design approach. Since this is currently expressed in many of the adopted modifications to the existing standards in Community Plans, the committee explored the use of a more consistent “Context Based Overlay” that would define a series of land use contexts and define overlay design elements on a specific street or region to support the adjacent land uses while recognizing the street’s designation in the layered network. One current example of this is the modification of Chatsworth St at Encino Ave in the Granada Hills New Community Plan. While the layered-network approach will be applied system-wide to better assign design and other features that emphasizes certain modes (auto, transit, bicycle and pedestrian), the context-based overlay will be tailored to respond to the specific conditions on a particular section of the street or to respond to common problems.

One implementation option for this approach could be the Community Plan Implementation Overlay (CPIO). When adopted, the CPIO could be used as a tool to apply context-sensitive treatments in designated areas within the greater layered-network.
system. The CPIO will enable a new type of overlay district that regulates development standards such as uses, design, open space, density and parking in specified portions of the plan area or for specific types of development. CPIOs could be written to include standards for the public right-of-way, based on the context of each chosen subarea. For example, design treatments and standards that effectuate or preserve “main street” areas could be required, making the land use and street characteristics of the particular stretch of the roadway compatible.

The layered network approach to complete streets uses a variety of street types that prioritize different travel modes. Each type of street has design features that enhance the travel experience for the prioritized mode. For example, transit-emphasis streets might have wider curb lanes and signal prioritization while bicycle-emphasis streets will have a section of the street set aside for their use through striped bicycle lanes and bicycle detection at signals. While each of the cross-sections prioritizes a specific mode, other modes are not abandoned. Individual streets will still routinely accommodate all modes per the Complete Streets requirements under AB 1358.

The compilation of each mode’s prioritized street types creates the mode’s network. The intention of these networks is to create connected systems for travel throughout the city for each travel mode. Together, these networks can be implemented to create a complete street system for the City that connects to individual neighborhoods. They will support and inform local transportation decisions at the Community Plan level to ensure both context sensitivity and system connectivity.

The project team also explored the City’s desire to establish a process for anticipating a percentage of use for each mode of travel. Discussion focused on methods that might help to characterize travel or the mix of travel on various street types and a review of the City’s current data collection practices. Other large cities like Denver, CO have moved toward a “person trip” approach for measuring travel, which categorizes the various modes using a street by the number of people they are serving rather than just the number of vehicles. In this example, the mix of travel can be evaluated as a function of the average vehicle occupancy for private autos, transit ridership counts, and bicycle and pedestrian counts for a given segment of roadway.

Two approaches could be further explored, either (a) collecting and evaluating multi-modal count data, or (b) establishing a connection to the regional model. The first approach is more robust and defensible, though it requires data collection on pedestrian and bicycle activity that is not part of the current City practice. Additionally, a method for forecasting changes in the mix of travel would need to be established. Another challenge with multi-modal count data is establishing auto occupancy and accounting for transit ridership on specific routes and times of day. The second approach can be useful in linking transit ridership and vehicular travel forecasts from the model to the discussion, but it is limited by the model’s sensitivity and accuracy regarding bus ridership and the lack of bicycle or pedestrian travel forecasts, which are more closely linked to local land use rather than model socioeconomic data.
Additional steps utilized by other jurisdictions that could be pursued to improve multi-modal data collection in Los Angeles include:

- Processing transit smart card or electronic pass data
- Utilizing automated passenger count (APC) systems
- Utilize video detection or signal actuation data for bicycle and pedestrian activity
- Infrared bicycle and pedestrian count stations [Copenhagen]
- GPS or Smart Phone based travel tracking (all modes) [New York]
Automobile-Emphasis Network

The automobile-emphasis network is comprised of streets that prioritize automobile and truck traffic. This emphasis is consistent with the majority of the existing standards. For these streets, first emphasis is given to meeting automobile performance measures. Other modes are still accommodated; however, they are a second emphasis to automobile travel. The automobile-emphasis streets are designed to accommodate automobile travel and efficiently convey large volumes of traffic through the network.

Examples of emphasis design elements for automobile-emphasis streets include:

- Access consolidation (e.g. minimize driveway access)
- Signal spacing for optimal progression
- Dedicated lanes for turning traffic
- Sight distance (allow visual clarity for motorists)

The current street typology is focused on automobile travel. The street types are classified by the number of lanes and vehicle capacity available on those streets. The automobile-emphasis network is comprised of the existing Los Angeles Street Standards, with some modifications to enhance the street. Automobile-emphasis streets can include:

- Major Highway Class I
- Major Highway Class II
- Secondary Highway
- Collector
- Industrial Collector
- Hillside Collector

Transit-Emphasis Network

An important component of a complete street network is a connected transit service that is reliable and provides travel times competitive with the automobile. To provide this level of transit service, it is important to continue to prioritize transit on specific corridors and protect transit from increasing congestion.

The transit-emphasis network will be made up of streets that prioritize the speed and comfort of travel by transit while still accommodating other modes of travel. This network can include treatments such as transit signal priority and dedicated transit lanes. The physical cross-sections recommended in the Automobile-emphasis section can accommodate transit-emphasis routes with transit enhance signalization, signage, and lane designation, especially those shown as Highway Class I and II.

Examples of emphasis design elements for transit-emphasis streets include:

- Dedicated transit lane
- Pedestrian access to stops
- Transit signal priority

The transit-emphasis streets establish a clear priority for transit vehicle operations and have convenient and accessible transit stops. They also have a strong pedestrian accommodation to ensure that people using transit have appropriate walk access and accommodations when their transit trip ends. This could mean, for example, that wider sidewalks for bus users should take priority over
roadway widening for right-turn lanes. Transit-emphasis streets can include the following classifications:

- Major Highway Class I
- Major Highway Class II
- Secondary Highway

**BICYCLE-EMPHASIS NETWORK**

Bicycle-emphasis streets give first priority to enhancing the comfort and safety of bicyclists on the street. The goal is to create an interconnected system of streets, dedicated rights-of-way, and transit corridors to enable bicyclists to access employment centers, transit stations and stops, as well as education, retail, entertainment, and open space and recreational resources.

Some key challenges to developing a Bicycle-emphasis Network include high traffic volumes, motorist speed, allocation of roadway lanes to automobile traffic and parking, and physical barriers that break the continuity of the street grid such as flood control channels, freeways, and gated communities.

Examples of emphasis design elements for bicycle-emphasis streets include:

- Dedicated bicycle lane
- Speed suitability
- Network connectivity
- Detection at signals

The Draft 2010 Bicycle Plan identifies streets that may serve as bicycle-emphasis streets in the future. Potential bicycle-emphasis street types contain a wide variety of options for accommodating bicycles on the City’s existing roadway. The street types below are appropriate for potential bicycle-emphasis streets:
Pedestrian-emphasis streets give first priority to enhancing the pedestrian experience on a street. The pedestrian-emphasis network will be made up of segments that are designated for pedestrian-emphasis. These segments will be most important along retail and transit corridors as well as in residential areas. Pedestrian-emphasis street segments will have wider sidewalks, on-street parking to provide a buffer between pedestrians and vehicle traffic, and street trees that enhance this buffer and provide shade.

On pedestrian-emphasis street segments, on-street parking should not be removed to accommodate additional automobile traffic. Also, the curb-to-curb distance should not be expanded for vehicle travel. Curb cuts for vehicle access should also be limited. Highest priority on these street segments is to enhance the pedestrian realm.

Examples of priority design elements for pedestrian-emphasis streets include:

- Sidewalk width
- Accessible design (ADA, Universal Design)
- Frequent and safe crossings
- Speed suitability and/or buffer

Frequent, clearly marked pedestrian crossings should be provided on all pedestrian-emphasis street segments. Intersections should be marked with highly visible pavement markings. In addition, pedestrian crossing distance should be
minimized by using appropriate curb radii and/or providing curb extensions. Pedestrian countdown signals should also be used to increase information provided to pedestrians. Pedestrian-emphasis segments can be designated on:

- Major Highway Class II
- Secondary Highway
- Collector
- Local
Layered Network: Representative Network Cross-sections

Standard street dimensions used today are based upon standards that were adopted in 1999; they are consistent with Chapter VI of the Transportation Element of the General Plan. The Transportation Element also established, but never standardized, transit-priority and pedestrian-priority treatments for designated arterial street classifications.

To further accommodate multiple modes of mobility the City recently adopted the Downtown Design Guidelines in 2009 and is currently preparing the Draft 2010 Bicycle Plan.

The Downtown Design Guidelines increase sidewalk widths and set specific standards for street tree spacing and pedestrian lighting. The Draft 2010 Bicycle Plan recommends bicycle accommodation on all standard streets, specifies streets where new facilities should be created and includes a Technical Design Handbook that provides sample cross-sections, guidance on accommodating facilities on non-standard streets and non-standard treatments.

The representative network cross-sections in the following section build upon all of these plans. The cross-sections are based on the existing classifications with modifications that enhance the streets for different users. In all cases, the current sidewalk/parkway widths have been preserved or expanded to ensure routine accommodation of pedestrians under the Complete Streets Act and to meet ADA requirements. The following graphic shows the potential emphasis designations for each of the existing street standards.
**MAJOR HIGHWAY CLASS I – AUTOMOBILE-EMPHASIS**

The Major Highway Class I is designed for more than 50,000 vehicles per day (VPD) average daily traffic (ADT). It has six full-time travel lanes with the alternative of the curb lane converting to a travel lane during peak hours. The cross-section maintains the right-of-way (R.O.W.) and sidewalk space shown in the Transportation Element of the General Plan. A median is recommended for access control and to provide a vertical separation between the two directions of travel. Medians, when appropriately designed, can have a secondary effect of slowing traffic.

![Diagram of Major Highway Class I](image)

**Automobiles:** Automobile travel is accommodated with three full-time travel lanes in each direction. In addition, the curb lane can also be converted to a travel lane during peak hours to accommodate increased automobile travel demand.

**Transit:** Transit travel on the Major Highway Class I will be subject to the same conditions as automobile traffic. The cross-section can accommodate transit-emphasis treatment without lane or roadway modification. Signage and red curb will be needed to restrict parking at bus stops.

**Bicycle:** While bicycle travel on this roadway type is allowed, facilities should be designed with careful attention to the speed differences between bicycles and vehicles. Bicycle-emphasis streets should also be designated on parallel facilities with direct connections to destinations along this roadway type. The Draft 2010 Bicycle Plan’s Technical Design Handbook provides guidance for accommodating bicycle travel on a Major Highway Class I.

**Pedestrian:** Pedestrian travel is accommodated on wide (12 foot) sidewalks with trees planted to separate people on the sidewalk from vehicles on the roadway, provide shade and enhance pedestrian comfort.
**MAJOR HIGHWAY CLASS I – TRANSIT-EMPHASIS**

The Major Highway Class I – Transit-Emphasis Street is designed for high capacity transit travel. It has designated transit travel lanes with the alternative of a parking lane during non-peak hours. The cross-section maintains the right-of-way and sidewalk space shown in the existing standards. A median is recommended for access control and to provide a vertical separation between the two directions of travel.

**Automobiles:** Automobile travel is accommodated with three full-time travel lanes in each direction.

**Transit:** Transit travel will have a dedicated lane during congested periods. Additionally, transit signal emphasis can be installed along Major Highway Class I – Transit-emphasis corridors.

**Bicycle:** Bicycle travel could be accommodated on a bus/bike only lane if there is adequate right-of-way. The Draft 2010 Bicycle Plan provides guidance for the application of bus/bike lanes on Major Highway Class I. On a Transit Emphasis Street with many destinations, it will be important to ensure high quality bicycle access to transit stops as well as bicycle parking.

**Pedestrian:** Pedestrian travel is accommodated on wide (12 foot) sidewalks with trees planted to separate people on the sidewalk from vehicle on the roadway. It will be important to ensure high quality pedestrian accommodations on Transit-emphasis streets with many key of destinations.
**MAJOR HIGHWAY CLASS II – AUTOMOBILE-EMPHASIS**

The Major Highway Class II is designed for traffic levels between 30,000-50,000 vehicles per day (VPD) average daily traffic (ADT). It has four full-time travel lanes with the alternative of the curb lane converting to a travel lane during peak hours. The cross-section maintains the right-of-way and sidewalk space shown in the existing standards. A median is recommended for access control and to provide a vertical separation between the two directions of travel. Medians, when appropriately designed, can have a secondary effect of slowing traffic.

**Automobiles:** Automobile travel is accommodated with two full-time travel lanes in each direction. In addition, the curb lane can also be converted to a travel lane during peak hours to accommodate increased automobile travel demand.

**Transit:** Transit travel on the Major Highway Class II will be subject to the same conditions as automobile traffic. The cross-section can accommodate transit-emphasis treatment without lane or roadway modification. Signage and red curb will be needed to restrict parking at bus stops.

**Bicycle:** Enhanced signing and shared lane markings are recommended where bicycle travel is expected. Bicycle-emphasis streets should be designated on parallel facilities. The Draft 2010 Bicycle Plan provides guidance for accommodating bicycle travel to destinations along a Major Highway Class II.

**Pedestrian:** Pedestrian travel is accommodated on wide (12 foot) sidewalks with trees planted to separate people on the sidewalk from vehicle on the roadway.
**MAJOR HIGHWAY CLASS II – TRANSIT-EMPHASIS**

The Major Highway Class II – Transit-emphasis Street is designed for high capacity transit travel. It has designated transit travel lanes with the alternative of a parking lane during non-peak hours. The cross-section maintains the right-of-way and sidewalk space shown in the existing standards. A median is recommended for access control and to provide a vertical separation between the two directions of travel.

**Automobiles:** Automobile travel is accommodated with two full-time travel lanes in each direction.

**Transit:** Transit travel will have a dedicated lane during congested periods. Additionally, transit signal emphasis can be installed along Major Highway Class II – Transit-emphasis corridors.

**Bicycle:** Bicycle travel could be accommodated on a bus/bike only lane if there is adequate right-of-way.

**Pedestrian:** Pedestrian travel is accommodated on wide (12 foot) sidewalks with trees planted to separate people on the sidewalk from vehicles on the roadway. It will be important to ensure high quality pedestrian accommodations on Transit-emphasis streets with many key of destinations.
**Major Highway Class II – Bicycle-emphasis**

The Major Highway Class II – Bicycle-emphasis Street is designed to accommodate bicycle travel on higher capacity automobile streets. The street has 7 foot or wider, separated bicycle lanes that provide bicyclists with a dedicated section of the roadway. The recommended section can include a curb separated cycle track design as shown in the figure below or similar facility that provides enhanced speed separation and a physical buffer between bicyclists and vehicular traffic.

**Automobiles:** Automobile travel is accommodated with two full-time travel lanes in each direction.

**Transit:** Transit travel on the Bicycle-emphasis Secondary Highway can be accommodated with special consideration for stop area design to minimize conflicts between bicyclists and transit patrons.

**Bicycle:** Bicyclists have a designated lane of travel in each direction. Seven foot or larger bike lanes should be used wherever ROW permits. Vertical elements such as a curb, flexible bollards, or a floating parking lane are recommended to provide separation between bicyclists and vehicular traffic. Designated bike route signage should be included along the corridor. Protected bicycle lanes must have separate signal phases for bicyclists. Bicycle signal heads may be installed to give cyclists a green phase in advance of vehicle signal phases. Demand-only bicycle signals can be installed to reduce delay from an empty signal phase.

**Pedestrian:** Pedestrian travel is accommodated on wide (12 foot) sidewalks with trees planted to separate people on the sidewalk from vehicle on the roadway.
**Major Highway Class II - Pedestrian-emphasis**

The Major Highway Class II – Pedestrian-emphasis Street is designed for use along segments of streets with a pedestrian oriented land use context and high demand for pedestrian activity. The cross-section maintains the right-of-way and sidewalk space shown in the existing standards which includes 17 feet of space for the pedestrian zone. A median is recommended for access control and to provide a vertical separation between the two directions of travel.

**Automobiles:** Automobile travel is accommodated with two full-time travel lanes in each direction.

**Transit:** Transit travel on the Major Highway Class II will be subject to the same conditions as automobile traffic. The cross-section can accommodate transit-emphasis treatment without lane or roadway modification. Signage and red curb will be needed to restrict parking at bus stops.

**Bicycle:** Enhanced signing and shared lane markings are recommended where bicycle travel is expected. Bicycle-emphasis streets should be designated on parallel facilities. The Draft 2010 Bicycle Plan provides guidance for accommodating bicycle travel to destinations along a Major Highway Class II.

**Pedestrian:** Pedestrian travel is accommodated on wide (17 foot) sidewalks with trees planted to separate people on the sidewalk from vehicle on the roadway. The wide sidewalks provide opportunities for benches, outdoor seating at cafes, information kiosks, and other features that enhance the pedestrian experience on a street.
**Secondary Highway – Automobile-emphasis**

The Secondary Highway Automobile-Emphasis Street is designed for 10,000-30,000 vehicles per day (VPD) average daily traffic (ADT). It has four full-time travel lanes with two full-time parking lanes. The cross-section maintains the right-of-way and sidewalk space shown in the existing standards. A median is recommended for access control and to provide a vertical separation between the two directions of travel. Medians, when appropriately designed, can have a secondary effect of slowing traffic.

**Automobiles:** Automobile travel is accommodated with two full-time travel lanes in each direction. A parking lane provides for convenient access to adjacent land uses.

**Transit:** Transit travel on the Secondary Highway will be subject to the same conditions as automobile traffic. The cross-section can accommodate transit-emphasis treatment without lane or roadway modification. Signage and red curb will be needed to restrict parking at bus stops.

**Bicycle:** Bicycles are accommodated as vehicles in shared travel lanes on this roadway. Enhanced signing and shared lane markings are recommended where bicycle travel is expected. Bicycle-emphasis streets should be designated on parallel facilities to accommodate bicycle travel to destinations along a Secondary Highway.

**Pedestrian:** Pedestrian travel is accommodated on 10 foot sidewalks with shade trees and on-street parking to separate people on the sidewalk from vehicles on the roadway.
**SECONDARY HIGHWAY – TRANSIT-EMPHASIS**

The Secondary Highway – Transit-Emphasis Street is designed for high capacity transit travel. Parking remains permanent on these roadways and one lane of travel is dedicated to transit all times of the day.

**Automobiles:** Automobile travel is accommodated with one full-time travel lane in each direction.

**Transit:** Transit travel on the Secondary Highway – Transit-Emphasis Street will have a dedicated lane. Additionally, transit signal emphasis can be installed along Transit-emphasis corridors. Curb extensions can be used at bus stops to provide more convenient access as well as additional space for bus stop shelters and/or benches.

**Bicycle:** Bicycle travel could be accommodated as a shared bus/ bike lane.

**Pedestrian:** Pedestrian travel is accommodated on wide (15 foot) sidewalks with trees planted to separate people on the sidewalk from vehicle on the roadway. It will be important to ensure high quality pedestrian accommodations on Transit-emphasis streets with many key of destinations.
**SECONDARY HIGHWAY - BICYCLE-EMPHASIS**

The Secondary Highway – Bicycle-Emphasis Street is designed to accommodate bicycle travel on streets that have traditionally had higher capacity automobile traffic. The street has 5-7 foot striped bicycle lanes that provide bicyclists with a dedicated section of the roadway. The recommended section is similar to the section shown in the Draft 2010 Bicycle Plan’s Technical Design Handbook under Secondary Highway.

**Automobiles:** Automobile travel is accommodated with two 10- to 11-foot travel lanes in each direction.

**Transit:** Transit travel on the Bicycle-emphasis Secondary Highway can be accommodated but is not recommended if the bike lane is only five feet wide, or the adjacent travel lane is less than eleven feet wide.

**Bicycle:** Bicyclists have a designated lane of travel in each direction. The bike lane width can vary from five-seven feet depending on available right-of-way. Seven foot bike lanes should be used wherever ROW permits. Designated bike route signage should be included along the corridor.

**Pedestrian:** Pedestrian travel is accommodated on sidewalks with shade trees planted between the parking and sidewalk.
**SECONDARY HIGHWAY – PEDESTRIAN-EMPHASIS**

The Secondary Highway – Pedestrian-Emphasis Street is designed for use along segments of streets with a pedestrian oriented land use context and high demand for pedestrian activity. The ROW is consistent with the current Secondary Highway with expanded width allocated to the sidewalk/parkway area.

**Automobiles:** Automobile travel is accommodated with two travel lanes in each direction.

**Transit:** Transit service can be accommodated on the Secondary Highway – Pedestrian-Emphasis Street. In areas with many destinations and transit stops, curb extensions can be installed in the parking lane to enhance the pedestrian access to transit.

**Bicycle:** Bicycles are accommodated as vehicles in shared travel lanes on this roadway. Enhanced signage and shared lane markings are recommended where bicycle travel is expected. The Draft 2010 Bicycle Plan’s Technical Design Handbook provides guidance for bicycle accommodation on this street type.

**Pedestrian:** Pedestrian travel is accommodated on wide (15 foot) sidewalks with trees planted to separate people on the sidewalk from vehicles on the roadway. The wide sidewalks provide opportunities for benches, outdoor seating at cafes, information kiosks, and other features that enhance the pedestrian experience on a street.
COLLECTOR – AUTOMOBILE-EMPHASIS

The Collector is designed for up to 10,000 vehicles per day (VPD) average daily traffic (ADT). It has two travel lanes as well as a full-time parking lane on each side. The right-of-way remains the same as the current standard recommended in the General Plan. The sidewalk/parkway area is recommended to be widened beyond what is shown in the current standard to provide a larger buffer between the travel way and the walkways without minimizing the vehicular capacity of the roadway. The parkway can be narrowed or removed at intersections that need left turn or right turn pockets.

Automobiles: Automobile travel is accommodated with one full-time travel lane in each direction. On-street parking provides convenient access to adjacent land uses.

Transit: Transit travel on the Collector will be accommodated and subject to the same conditions as automobile traffic. Bulb-outs can be used at intersections or bus stops on the roadways that carry transit vehicles to enhance the transit/pedestrian experience.

Bicycle: Bicycles are accommodated as vehicles in shared travel lanes on this roadway. Enhanced signing and shared lane markings are recommended where bicycle travel is expected. Bicycle-emphasis streets should be designated on parallel facilities to accommodate bicycle travel to destinations along a Collector.

Pedestrian: Pedestrian travel is accommodated on 13-14 foot sidewalks with trees planted and on-street parking to separate people on the sidewalk from vehicles on the roadway.
The Industrial Collector Street is designed for streets with heavy truck traffic and loading/unloading. The street has two wide travel lanes with loading/unloading along the curb. The cross-section maintains the right-of-way and sidewalk space shown in the existing standards.

**Automobiles:** Automobile travel is accommodated with a single travel lane in each direction. The focus of the street is industrial truck traffic.

**Transit:** Transit travel can be accommodated on the Industrial Collector.

**Bicycle:** Bicycles are accommodated in shared travel lanes on this roadway. Enhanced signing and shared lane markings are recommended where bicycle travel is expected. It will be important to designate a bicycle-emphasis street parallel to Industrial Collectors to ensure adequate access to destinations. The Draft 2010 Bicycle Plan’s Technical Design Handbook provides guidance for accommodating bicycle travel on Industrial Collector streets.

**Pedestrian:** Pedestrian travel is accommodated on eight- to ten-foot sidewalks. Sidewalk widths can be increased if right-of-way is available.
**Hillside Collector**

The Hillside Collector is designed for physically constrained right-of-way due to a hillside location. The street has two travel lanes with a parking lane and narrowed sidewalks. The cross-section maintains the right-of-way and sidewalk space shown in the existing standards.

**Automobiles:** Automobile travel is accommodated with a single travel lane in each direction. If parking is not required for adjacent land uses, two 10 foot travel lanes could be accommodated in each direction.

**Transit:** Transit travel on the Hillside Collector will be subject to the same conditions as automobile traffic. However, it is rare for transit vehicles to operate on designated Hillside Collector streets in the City.

**Bicycle:** Bicycle travel is accommodated as a shared roadway. If vehicle parking is not needed for adjacent land uses, the parking lane could be converted into a bike lane for better bicycle accommodation.

**Pedestrian:** Pedestrian travel is accommodated on 5 foot sidewalks. Sidewalk widths can be increased if right-of-way is available.
**Collector – Bicycle-emphasis**

The Collector – Bicycle-emphasis Street has six-foot, striped bicycle lanes that provide bicyclists with a dedicated section of the roadway. The right-of-way remains the same as current standards. However, in this example, parking has been removed to create a more comfortable environment for bicyclists. This section is one of the four collector street cross-sections shown in the Draft 2010 Bicycle Plan’s Technical Design Handbook.

**Automobiles:** Automobile travel is accommodated with one travel lane in each direction as well as a center median.

**Transit:** Transit can be accommodated on the Collector – Bicycle-emphasis Street.

**Bicycle:** Bicyclists have a designated lane of travel in each direction. Designated bike facility signage should be included along the corridor. The ground markings make it clear to drivers that bicyclists will be on the road. The Draft 2010 Bicycle Plan provides alternatives for bicycle accommodation on Collector Streets.

**Pedestrian:** Pedestrian travel is accommodated on ten- to twelve-foot sidewalks with a landscaped parkway. The parkway is slightly narrowed to create room for the bicycle lane.
**COLLECTOR – PEDESTRIAN-EMPHASIS**

The Collector – Pedestrian-emphasis Street is designed for use along segments of Collector Streets where pedestrian activity is high. The cross-section is modeled after the Downtown Design Standards. The right-of-way is consistent with current collector street standards, but the roadway is narrowed and sidewalks widened to allow a six-foot continuous travel path for pedestrians.

**Automobiles:** Automobile travel is accommodated with one travel lane in each direction. The travel lanes are narrowed to accommodate the additional width of the sidewalk.

**Transit:** Transit typically does not travel on Collector Streets, but where transit is present, curb extensions could be installed to better accommodate transit stop benches and shelters.

**Bicycle:** Bicycles are accommodated as vehicles in shared travel lanes on this roadway. Enhanced signing and shared lane markings are recommended where bicycle travel is expected. The Draft 2010 Bicycle Plan provides guidance for accommodating bicycle travel on a Collector street.

**Pedestrian:** Pedestrian travel is accommodated on wide sidewalks (14 foot) with trees planted to separate people on the sidewalk from vehicle on the roadway. The wide sidewalks provide opportunities for benches, outdoor seating at cafes, information kiosks, and other features that enhance the pedestrian experience on a street.
**LOCAL – BICYCLE-EMPHASIS**

The Local – Bicycle-emphasis Street is a bicycle-friendly street as defined by the LA City Bicycle Plan, and generally known as a bicycle boulevard. It is designed for lower capacity automobile travel and access streets. It has two full-time travel lanes with parking. The right-of-way remains the same as the current standard recommended in the General Plan. Bicycle-friendly features on the street, such as traffic circles and diverters, create a more comfortable environment for cyclists. The landscaped parkway can be narrowed or removed at intersections that need left turn or right turn pockets.

**Automobiles:** The local street is designed to accommodate low capacity, slower speed automobile travel.

**Transit:** Transit typically does not travel on Local Streets, but where transit is present, curb extensions could be installed to better accommodate transit stop benches and shelters.

**Bicycle:** Slower vehicle speeds and less traffic will make this a more comfortable street for bicycling. Local Bicycle-emphasis Streets must have at least 2 or more bicycle-friendly treatments. Treatment options are delineated in the Bicycle Plan Technical Design Handbook.

**Pedestrian:** Pedestrian travel is accommodated on 12-foot sidewalks with a landscaped parkway next to on-street parking to separate people on the sidewalk from moving vehicle.
**LOCAL – PEDESTRIAN-EMPHASIS**

The Local- Pedestrian-emphasis Street is designed for lower capacity automobile travel and access. It has two full-time travel lanes with a parking lane. The right-of-way remains the same as the current standard recommended in the General Plan. The sidewalk/parkway area is recommended to widen slightly to 12-foot sidewalks to provide a larger buffer between the travel way and the walkways without minimizing the vehicular capacity of the roadway. The landscaped parkway can be narrowed or removed at intersections that need left or right turn pockets.

**Automobiles:** The local street is designed to accommodate low capacity, slower speed automobile travel

**Transit:** Transit typically does not travel on Collector Streets, but where transit is present, curb extensions could be installed to better accommodate transit stop benches and shelters.

**Bicycle:** Slower vehicle speeds and less traffic will make this a more comfortable street for bicycling than other automobile-emphasis streets. Shared lane markings and signage can be used to increase awareness of bicyclists.

**Pedestrian:** Pedestrian travel is accommodated on 12-foot sidewalks with a landscaped parkway next to on-street parking to separate people on the sidewalk from moving vehicles.
2A. EXISTING PERFORMANCE MEASUREMENT TOOLS

(LOS AND VMT)

In September 1999 the City Council adopted the Transportation Element of the General Plan with a number of policy references to Level-of-Service (LOS) and Vehicle Miles Traveled (VMT). These types of performance measures focus primarily on vehicular travel and performance measures related to delay and congestion and are consistent with the practice in many large California jurisdictions. They ensure that transportation facilities, typically intersections, operate at or better than a designated vehicle LOS threshold, which is measured using average vehicular delay. Table 2.1 shows the definition of LOS used by the City of Los Angeles.

LOS and VMT-related policies often result in mitigation requirements that increase vehicular capacity and are often inconsistent with other community values and General Plan policies that are supportive of non-auto travel modes and that minimize negative impacts on air quality, noise, and water quality, and reduces greenhouse gas (GHG) emissions.

<table>
<thead>
<tr>
<th>Level of Service</th>
<th>Volume/Capacity Ratio</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.000-0.600</td>
<td>EXCELLENT. No vehicle waits longer than one red light and no approach phase is fully used.</td>
</tr>
<tr>
<td>B</td>
<td>0.601-0.700</td>
<td>VERY GOOD. An occasion approach phase is fully utilized; many drivers begin to feel somewhat restricted within groups of vehicles.</td>
</tr>
<tr>
<td>C</td>
<td>0.701-0.800</td>
<td>GOOD. Occasionally, drivers may have to wait through more than one red light; backups may develop behind turning vehicles.</td>
</tr>
<tr>
<td>D</td>
<td>0.801-0.900</td>
<td>FAIR. Delays may be substantial during portions of the rush hours, but enough lower volume periods occur to permit clearing of developing lines, preventing excessive backups.</td>
</tr>
<tr>
<td>E</td>
<td>0.901-1.000</td>
<td>POOR. Represents the most vehicles that intersection approaches can accommodate; may be long lines of waiting vehicles through several signal cycles.</td>
</tr>
<tr>
<td>F</td>
<td>Greater than 1.000</td>
<td>FAILURE. Backups from nearby intersections or on cross street may restrict or prevent movement of vehicles out of the intersection approaches. Tremendous delays with continuously increasing queue lengths.</td>
</tr>
</tbody>
</table>

Minimum vehicle level of service (LOS) thresholds for roadways are used in environmental impact analysis. While capacity expansion aimed at moving more cars and trucks through an intersection may reduce the average vehicular delay at an intersection, it may have a negative impact on
other modes of transport such as pedestrians, bicycles, and transit. In particular the LOS measurement tool makes infill, pedestrian-oriented, or transit-oriented development difficult to approve due to congestion impacts (typically LOS D-F) in areas already subject to congested traffic circulation.

There is no specific LOS standard promulgated in the Transportation Element; however, the criteria for selecting functional class designations (CH VI, Section B) is based upon a criterion of LOS D or better for the year 2010 which, when coupled with the environmental review requirement, has far reaching effects on the design of the transportation network throughout the City. The City also has policy language that supports analysis of alternative measures such as accessibility, vehicle hours of travel, vehicle miles of travel, and transit mode split and ridership. However, the direct effect on design across the City in these areas has been more limited, due in part to unresolved conflicts with the vehicular LOS standards and a lack of legal definition for analysis methods and context sensitivity.

Box 2.1 contains key monitoring policies and programs referenced in the Transportation Element.

**CONGESTION MANAGEMENT PROGRAM STANDARDS**

The guidelines set forth in the 2004 Congestion Management Program for Los Angeles County indicate that if a proposed development project adds 50 or more peak hour trips in either the AM or PM peak hour (of adjacent street traffic) to a CMP arterial intersection, then a CMP arterial intersection analysis must be conducted.

For the purpose of a CMP Traffic Impact Analysis, a project impact is considered to be significant if a proposed project increases traffic demand, as determined by comparing cumulative with project to cumulative without project conditions, on a CMP facility by 2 percent of capacity (V/C ≥ 0.02), causing LOS F (V/C > 1.00).

The Transportation Element includes a policy to incorporate VMT and VHT into the CMP standard:

P7.5 - Work with LACMTA to amend the County Congestion Management Program (CMP) to incorporate vehicle miles traveled and vehicle hours traveled as measurable standards for CMP effectiveness in addition to the current level-of-service standard.

**COMMUNITY PLANS & SPECIFIC PLANS**

The City’s Community Plans are more specific as to a LOS objective. Of the 35 Community Plans, several suburban plan areas include policies that the LOS should be maintained at LOS D or better. The more developed urban areas include policies to maintain LOS E, or are silent on LOS goals as a policy.
Box 2.1 Key Monitoring and Benchmarking Policies of the Transportation Element

Policy 1.1 - Establish highway and transit accessibility measures to be used in evaluating the transportation needs of the City's communities.

Program 31 – The database should include at a minimum:

a. Measures of accessibility at the Community Plan Area level;
b. Measures of mobility (including levels of service and mode split as well as vehicle miles traveled/vehicle hours traveled);
c. Measures of plan implementation (such as TIMP adoption/LAP adoption).

P3 - Develop local accessibility plans (LAPs) for selected centers and districts which will expedite approvals of new development applications and streamline project review for traffic mitigation procedures. Each LAP should consider inclusion of each of the following components:

a. Transit access component: to determine the appropriate minimum level of transit service/accessibility based on assessment of current and future conditions, and to identify actions to achieve that level of service/accessibility.
b. Pedestrian facilities component: to identify pedestrian circulation/amenity needs and direct pedestrian access from transit facilities to adjacent commercial development.
c. Shared-parking component: to identify locations and sizes of shared-use parking facilities to be utilized within the targeted growth area.
d. Bicycle access component: to provide for safe and efficient bicycle access within the targeted growth area.
e. Vehicular circulation component: to identify a menu of mitigation measures and provides for adequate internal circulation of vehicles, including delivery trucks.

Policy 7.1 – Monitor Progress toward the Citywide General Plan Framework and Transportation Element goals and objectives and determine whether they should be revised by maintaining biannual statistics on the following:

a. Accessibility;
b. Vehicle miles traveled/vehicle hours traveled;
c. Transit mode split and ridership;
d. Congestion Management Program (CMP) network levels of service; and
e. Congested Corridor arterial street levels of service.

Vehicle Miles Traveled (VMT)/Vehicle Hours Traveled (VHT) - These evaluation measures calculate the total vehicle miles traveled and the total vehicle hours traveled. VMT is a measurement of the total miles traveled by all vehicles in the specified area for a specified time. VHT is the total vehicle hours expended traveling on the network in the area for a specified time period. These measures calculate the total auto travel distances and auto travel hours by adding all individual trips, from each origin to each destination, and are used as measures of system use. A shorter average commute distance with longer average commute time may indicate closer origin and destination but higher levels of congestion. These statistics shall be calculated using PM Peak period data from the evaluation year model run. This will be prepared jointly by the Departments of City Planning and Transportation. These statistics shall also be aggregated to Community Plan Area level.

The Transportation Element includes a policy in support of VMT charges as a future funding mechanism:

P6.6 - Study possible new funding sources for feasibility and effectiveness, including:

a. fuel taxes, vehicle miles traveled charges, or other user fees;
b. sales taxes, bond measures, or other general public financing mechanisms;
c. developer fees, assessment districts, or other private sector financing programs;
d. Citywide infrastructure fee; and
e. public-private partnerships.
ENVIRONMENTAL REVIEW

The environmental review of potential impacts from public and private projects is generally governed by the guidelines established by the now-defunct Department of Environmental Affairs. The procedures established by EAD regarding Traffic Impacts are consistent with those adopted by the Department of Transportation in its Traffic Study Guidelines (latest version May 2009).

Significant Impact – The Traffic Study Guidelines utilize LOS in its very specific definition of significant impact, which is measured in terms of the expected change in volume to capacity (V/C) ratio (see following Tables 2.1 and 2.2). The procedures in the Traffic Study Guidelines specify intersection capacity analysis according to the Critical Movement Analysis (CMA) methods of TRB Circular 212 (1980) for project level review. For long range studies of transportation impacts (such as in Community Plan updates, Highway Designation Proposal, or Transportation Corridor Alternative analyses), link level of service of analysis is generally used. This approach compares the forecast volume of traffic on a specific roadway segment to the estimated capacity of that segment during the peak hour.

It is noted that all assessments of LOS and impact are evaluated in terms of peak hour vehicle trips. Extensive efforts are made in the procedures to evaluate vehicle trip reductions in terms of the project considered. Discounts in trip generation are facilitated for TOD and other transit-friendly proposals. These discounts can be significant: for example, mixed-use projects located over or adjacent to a subway or light rail station can receive up to a 25% trip reduction credit if they provide convenient pedestrian access to the station. In certain instances, developers have been required to submit and adhere to trip reduction plans and programs as a traffic mitigation measure to keep below the expected vehicle trip thresholds.

In its latest bi-annual local funding program ("Call for Projects"), Metro amended its award procedures to give priority to transportation improvement projects according to, among other criteria, the reduction in greenhouse gas (GHG) emissions. A simple spreadsheet is utilized to estimate annual GHG emissions (with and without the project) based upon vehicle trips and VMT (according to average trip lengths) utilizing average emission factors.
### TABLE 2.2 – CITY OF LOS ANGELES DEFINITION OF SIGNIFICANT IMPACT

<table>
<thead>
<tr>
<th>Level of Service</th>
<th>Final V/C Ratio</th>
<th>Project-Related Increase in V/C</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>&gt;0.701-0.800</td>
<td>Equal to or greater than 0.040</td>
</tr>
<tr>
<td>D</td>
<td>&gt;0.801-0.900</td>
<td>Equal to or greater than 0.020</td>
</tr>
<tr>
<td>E</td>
<td>&gt;0.901-1.000</td>
<td>Equal to or greater than 0.010</td>
</tr>
<tr>
<td>F</td>
<td>Greater than 1.000</td>
<td>Equal to or greater than 0.010</td>
</tr>
</tbody>
</table>
2B. TRENDS IN PERFORMANCE MEASUREMENT TOOLS

The goal of most local planning agencies with respect to transportation is primarily focused on the movement of people during commute hours, rather than the movement of vehicles. However, current practices treat all types of vehicles nearly equal such that delay imparted to a fully-occupied transit vehicle is weighted the same as delay to two single-occupant vehicles. In recognition of this bias, some agencies are exploring the use of a multimodal LOS or other performance measures aimed at improving “person-capacity” of transportation facilities that account for how well a facility moves people, not just vehicles and/or balances these against other important community objectives. In addition, attempts are underway to better define bicycle and pedestrian service levels and to account for land use considerations by examining the contextual appropriateness of capacity expansion.

At the state level in California, Caltrans is working to develop new “smart mobility” performance measures. These measures are intended to balance multiple objectives for operating the California transportation system and relate the direct impacts of land use and transportation system changes to five overarching goals: safety, mobility, economy, environmental quality, and customer satisfaction. Table 2.3 summarizes these performance measures and the intended outcome of their use. These measures are not yet a part of standard practice but should be considered for agencies concerned about the related goals.

A wide range of performance measures were examined to understand how other large cities are evaluating the performance of their streets. Commonly used performance measures can be classified into three main approaches. The three approaches are Mode Specific, Multimodal, and System. Each of these approaches and the example performance measures that fall into the three categories are described below.
### TABLE 2.3 - SMART MOBILITY PERFORMANCE MEASURES AND THE INTENDED OUTCOMES

<table>
<thead>
<tr>
<th>PERFORMANCE MEASURE</th>
<th>SMART MOBILITY METRIC</th>
<th>SMART MOBILITY OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety</td>
<td>Modal Accident Rates, Severity</td>
<td>Minimize accident rates and severity for all users</td>
</tr>
<tr>
<td></td>
<td>Target speed, speed management</td>
<td>Minimize accident severity, Maximize context sensitivity quality of life, customer satisfaction</td>
</tr>
<tr>
<td>Mobility</td>
<td>Modal Travel-Time Mobility</td>
<td>Minimize travel time to necessary destinations while minimizing discretionary VMT per capita</td>
</tr>
<tr>
<td></td>
<td>Modal Travel-Time Consistency</td>
<td>Minimize travel time to necessary destinations while minimizing discretionary VMT per capita</td>
</tr>
<tr>
<td></td>
<td>Activity Connectedness</td>
<td>Minimize travel time to necessary destinations while minimizing unnecessary VMT per capita</td>
</tr>
<tr>
<td></td>
<td>Universal Accessibility (ADA)</td>
<td>Minimize number of inaccessible places</td>
</tr>
<tr>
<td></td>
<td>Ped &amp; Bike Mode Share</td>
<td>Minimize travel time to necessary destinations while minimizing unnecessary VMT per capita</td>
</tr>
<tr>
<td></td>
<td>Transit Mode Share</td>
<td>Minimize travel time to necessary destinations while minimizing unnecessary VMT per capita</td>
</tr>
<tr>
<td>Economy</td>
<td>Productivity Lost to Congestion</td>
<td>Maximize Gross State Domestic Product</td>
</tr>
<tr>
<td></td>
<td>Network Capacity, Operations Management</td>
<td>Minimize travel time to necessary destinations while minimizing discretionary VMT per capita</td>
</tr>
<tr>
<td></td>
<td>Return on Investment (ROI) Nexus</td>
<td>Maximize State domestic product and minimize user cost per dollar of transport investment.</td>
</tr>
<tr>
<td>Environmental Quality</td>
<td>VMT per capita relative to AB32 Target</td>
<td>Maintain climate stability by maintaining VMT and GHG below AB32 Target</td>
</tr>
<tr>
<td></td>
<td>Energy Consumption</td>
<td>Reduce dependence on fossil fuels, minimize GHG emissions and criteria pollutant emissions</td>
</tr>
<tr>
<td></td>
<td>Emissions, including CO2</td>
<td>Protect air quality and climate by minimizing GHG emissions, criteria pollutant emissions</td>
</tr>
<tr>
<td></td>
<td>Noise Impacts</td>
<td>Minimize % of population and # of sensitive receptors impacted</td>
</tr>
<tr>
<td></td>
<td>System Condition</td>
<td>Optimize Net Current Asset Value by Mode</td>
</tr>
<tr>
<td></td>
<td>Wetland, Ecological Impacts</td>
<td>Maximize Area of Functional Wetlands, Sensitive and Priority Habitats Remaining</td>
</tr>
<tr>
<td></td>
<td>Land Use Efficiency</td>
<td>Maximize Area of Agricultural Lands and Habitats Remaining</td>
</tr>
<tr>
<td></td>
<td>% of Materials Reuse, Recycling</td>
<td>Minimize Net Consumption of Construction and Maintenance Inputs</td>
</tr>
<tr>
<td>Customer Satisfaction</td>
<td>Multi-Modal LOS</td>
<td>Maximize customer satisfaction, perception of travel experience in terms of comfort and convenience.</td>
</tr>
</tbody>
</table>

(see also speed management above)

Source: Smart Mobility: A Caltrans Handbook Using Performance Measures to Advance Smart Mobility, Draft for review by SMF Technical Advisory Committee, May 2009
**Mode Specific Approaches**

Mode Specific approaches evaluate the performance of a street or intersection for a single mode. Evaluation and mitigation recommendations are made for the mode being evaluated with minimal consideration given to other modes.

**Vehicle Level of Service** – The Highway Capacity Manual (HCM) established the concept of level of service (LOS) to translate the numerical results of traffic operations analysis into letter grades more readily understandable by the general public. LOS provides a qualitative description of transportation operating conditions related to speed, travel time, maneuverability, traffic interruptions, and driver comfort and convenience. It is most often used to describe delay to vehicles at intersections. Acceptable LOS thresholds are set locally and usually for the peak hour. LOS is a nationally accepted and widely used performance measure for the evaluation of vehicle user comfort and convenience.

**Bicycle Compatibility Index** – The Bicycle Compatibility Index (BCI) was developed for the Federal Highway Administration. It was created for urban and suburban roadway segments and incorporated variables that bicyclists typically use to assess the "bicycle friendliness" of a roadway including: the presence of a bicycle lane or paved shoulder; the width of the bicycle lane or paved shoulder; curb lane width, curb lane traffic volume; traffic volume in other lanes; vehicle speeds; parking lane and occupancy; and the type of roadside development. The BCI model and the related LOS designations provide practitioners the capability to assess their roadways with respect to compatibility for shared-use operations by motorists and bicyclists and to plan for and design roadways that are bicycle compatible. The BCI model can be used for operational evaluation, design, and planning. The Bicycle Compatibility Index is a nationally accepted performance measure for evaluating bicycle compatibility of roadway segments.

**Transit Capacity and Quality of Service** – The Transit Capacity and Quality of Service Manual (TCQSM) provides a set of techniques for evaluating the quality of service and capacity of transit services, facilities, and systems. Quality of service is defined as the overall measured or perceived performance of transit service from the passenger’s point of view. Performance criteria for a variety of dimensions of transit quality have been developed. These include service coverage, pedestrian environment, frequency, amenities, transit information and system legibility, transfers, total trip time, cost, safety and security, passenger load, appearance and comfort, and reliability. The TCQSM uses the concept of LOS to quantify transit service quality for fixed route service. LOS A designates the highest quality while LOS F designates the lowest quality. For demand-responsive transit, LOS ranges from 1 to 8, where 1 represents the best quality of service and 8 represents the worst. TCQSM is a nationally accepted performance measure for evaluating transit.
**Pedestrian Friendliness** – The City of Redmond, WA developed a methodology for evaluating pedestrian link travel that moved away from LOS and instead created four categories of pedestrian friendliness. The four categories, listed from best pedestrian accommodation to worst, are Pedestrian Place, Pedestrian Supportive, Pedestrian Tolerant, and Pedestrian Intolerant. This approach evaluates the roadway corridor, pedestrian realm, and adjacent land uses for the presence of a sidewalk, sidewalk buffer, setback zone, and through walkway. Using these features, the segment of roadway being evaluated is categorized based on its pedestrian friendliness. This methodology has not been accepted nationally as a standard performance measure.

**Multimodal Approaches**

Multimodal approaches evaluate the performance of a street or intersection for multiple modes. Evaluation and mitigation recommendations are made with consideration for all of the modes being evaluated. Included below are six examples of various multimodal approaches that are being explored or utilized by various jurisdictions nationwide.

**HCM Multimodal LOS** – Recent federal research of multimodal LOS (NCHRP 3-70) has resulted in the publication of a proposed set of methodologies to analyze LOS for auto, transit, bicycle, and pedestrian modes. The method is under review for inclusion in the proposed 2010 Highway Capacity Manual (HCM). The study conducted video laboratories and field surveys involving the general public from four urban areas and then developed a LOS model for each of the four modes (auto, transit, bicycle, and pedestrian). The models were calibrated and validated to observed data and were found to match the public’s perception better than the 2000 HCM. The models are intended to weigh tradeoffs of improvements.

For the auto model, the traditional Vehicle LOS calculation methodologies that are widely used by most jurisdictions remain the recommended approach, focusing on the measurement of intersection delay.

The transit model is a function of accessibility by pedestrians, bus stop amenities, waiting time for the bus, and mean speed of the bus. Key inputs include headway, pedestrian LOS, average bus speed, travel time, on-time rating, and presence of a shelter or bench. The LOS is computed by segment, but a facility LOS can also be calculated.

The bicycle model is a function of the intersection score, segment score, and number of unsignalized conflicts per mile. Key intersection LOS inputs include width of outside through lane and bike lane, width of street to be crossed, directional traffic volume, and number of lanes approaching the intersection. Key segment LOS inputs include vehicle lanes, volumes, and speed, heavy vehicle percentage, pavement condition, percentage of segment with occupied on-street parking, and width of outside lane, shoulder, and bike lane.

The pedestrian model uses either the density-based LOS from the 2000 HCM (measures the number of pedestrians in a given space) or a new non-density
Trends in Performance Tools

The non-density LOS considers segment LOS, intersection LOS, and a roadway crossing difficulty factor. Key inputs for calculating segment LOS include buffer width (outside vehicle lane, shoulder, bike lane, parking, and planters), sidewalk presence and width, and directional vehicle volume, speed, and number of lanes. Intersection LOS can only be calculated for signalized intersections. Inputs include right turn on red (RTOR) and permitted left turn volumes, traffic volume and speed, crossing distance, delay before crossing the intersection, and the presence of right turn channelization islands.

The pedestrian LOS model purposefully excludes factors outside of the right-of-way such as adjacent or surrounding land uses, presumably to simplify and standardize application of the model. Notable features not included are other built environment factors that could enhance pedestrian comfort such as lighting, benches, shade, or tree cover.

The individual modal levels of service are not combined into a single comprehensive LOS to allow for tradeoff and weighting if needed. However, the method provides an integrated LOS modeling system where changes to a single variable can be quickly evaluated for their effect on each modal LOS.


The Bicycle LOS model evaluates roadway segments and requires a variety of data including average daily traffic, percent heavy vehicles, number of lanes of traffic, posted speed limit, total width of pavement, on-street parking presence and occupancy, outside lane width, pavement condition, and presence of a designated bike lane.

The Pedestrian LOS model evaluates the width of the outside lane, the width of the shoulder, presence of on-street parking, presence and type of buffer between the walk and a roadway, buffer width, presence of a sidewalk, sidewalk width, traffic volumes, peak hour factor, number of travel lanes, and average speed.

The FDOT has been struggling with the different LOS meaning for different modes. Although each of the methodologies makes use of the LOS A-F scales, the meaning of A-F is not consistent across the modes. The FDOT and its research team evaluated and considered various methods to make the LOS thresholds more consistent across modes, but found no scientific basis to adjust individual mode’s LOS scales. Caution is recommended when comparing the same LOS letter grade across the modes.

**Multimodal Intersection Delay** – This type of benchmarking analyzes the delay experienced by each person traveling through an intersection. The analysis uses simulation to separately evaluate the person delay for each mode of travel at an intersection. The person delay for each mode can then be averaged to create an overall person delay for the intersection. This method provides a better
decision-making tool for developing improvements to facilitate more efficient movement of people, rather than a single mode, through an intersection. It also facilitates development of mitigation measures that benefit more people. It is useful for analyzing higher occupancy travel modes such as BRT or the influence of a grade separated crossing. This method has been used to evaluate Van Ness Street BRT in San Francisco as well as a campus gateway intersection to the University of California at Davis.

**CHARLOTTE, NC DOT MMLOS METHODOLOGY**

Charlotte, NC has developed a methodology in 2007 to assess the important design features that impact pedestrians and bicyclists crossing signalized intersections. This methodology can be used as a diagnostic tool to assess and improve pedestrian and bicyclist levels of comfort and safety through intersection design features. The results can be compared with those for traffic levels of service of an intersection and weighed according to user priorities. Pedestrian LOS factors considered include the number of cross street lanes, signal phasing, as well as crosswalk treatment, median, right turn on red (RTOR), right turn channelization, and pedestrian signal head type. Bicycle LOS factors include automobile speed, width of outside lane or presence of a bike lane, as well as cross street width, RTOR, and right turn channelization.

**GAINESVILLE, FL MMLOS METHODOLOGY**

Gainesville, FL has created LOS performance measures for bicycle and pedestrian facilities. The LOS evaluations describe the degree of bicycle and pedestrian accommodation in a transportation corridor. The bicycle LOS variables include designated basic facility provided, the rate and number of conflicts, speed differential between the motor vehicle and bicycle, motor vehicle LOS, maintenance, provision of transportation demand management programs, and intermodal links. The formula for Pedestrian LOS evaluation includes variables such the provision of basic facilities, conflicts, amenities, motor vehicle LOS, maintenance, and TDM and multimodal provisions. The Gainesville bicycle and pedestrian LOS performance measures evaluate roadway corridors using a point system of 1 to 21 that results in LOS ratings from A to F. The methodology hypothesizes that there is a critical mass of variables that must be present to attract non-motorized travel. The methodology is applicable for corridor evaluations of arterial and collector roadways in urban and suburban areas.

**FORT COLLINS, CO MMLOS METHODOLOGY**

The City of Fort Collins' MMLOS Manual outlines goals, policies, and the specific methodology used to analyze MMLOS in the city. Minimum LOS standards are provided for each mode in the form of a matrix with a combination of quantitative calculations and checklists. Different area types have standards for various factors related to each mode's LOS. Public Transit LOS is based on the hours of weekday service, frequency of weekday service, travel time factor, and a peak load factor. Pedestrian LOS is based on directness, continuity, quality and frequency of street crossings, visual interest, the number and quality of local amenities, and security with level of service thresholds defined for different area types, such as: pedestrian districts,
routes to schools, activity corridors and centers, and routes to transit. Bicycle LOS standards are based on the connectivity of on-street bike lanes, off-street paths, or on-street bike routes to various bicycle facilities. Motor vehicle LOS for future forecasts relies on predicted volume to capacity ratios, access, connectivity, and continuity. LOS thresholds are established for arterials, collectors, connectors, and local streets within activity centers, commercial corridors, and mixed use districts.

**System Approaches**

There are three primary system approaches in use today: vehicle miles traveled per capita, automobile trips generated, and travel time. System approaches evaluate the performance of a street system based upon characteristics of key performance metrics. Evaluation and mitigation recommendations are made with consideration for outcomes on the street system.

**Vehicle Miles Traveled (VMT) Per Capita**

This approach measures the miles traveled by vehicles within a specified time divided by the area’s population. It can help decision makers understand how travel patterns may change from current conditions in response to growth and planned transportation investments.

VMT calculations are derived from a travel demand model. The results allow cities to then measure the VMT effects caused by additional development and transportation investment. The City can then evaluate the changes in vehicle miles traveled and travel patterns.

This approach allows for the evaluation of network utilization based on VMT and estimate the fluctuations in greenhouse gas (GHG) emissions associated with the changes to VMT. GHG emissions can be calculated using the California Air Resources emissions factors (EMFAC) that correlates VMT to levels of GHG emissions. EMFACs provide regional values that are based on the percent of truck traffic in the region.

Necessary data inputs for the vehicle miles traveled per capita approach, such as vehicle trip generation rates, land use and built environment variables, and trip lengths, are based on available regional and local data.

**Automobile Trips Generated (ATG)** – This approach, under study by the County of San Francisco, uses auto trips generated (vehicle trips per day) by development rather than using congestion (delay) as the basis for determining environmental impacts. It requires development to pay a per-trip impact fee. This fee goes into a fund that pays for actions that help reduce new automobile trip-making.

The ATG method can be used as an alternative to vehicle LOS, especially in locations where vehicle LOS alone does not reflect a city’s policies and priorities. In many cases, negative vehicle LOS impacts are a predictable and unavoidable consequence of policies that prioritize transit, bicycle, and pedestrian travel as prioritizing these modes often requires reallocating infrastructure to those modes and away from automobiles.
The ATG approach assumes that every vehicle trip generated by a new development exerts a significant and negative impact upon non-auto modes and the environment (e.g., increasing air pollutant and GHG emissions). Because of this impact, each new trip needs to be mitigated through the provision of new pedestrian, bicycle and transit facilities. By providing these facilities, a city can become a more walkable and bikeable city, transit riders will increase and it will be less necessary for people to drive.

**TRAVEL TIME** – Travel time can be used to evaluate the impact of new development on the transportation networks or changes to multimodal transportation networks. Travel time can be measured between select origins and destinations (O-Ds), as vehicle hours of travel (VHT), or vehicle hours of delay (VHD). These measures are calculated using a travel demand model. O-D based travel times simply calculate the congested travel time between activity locations that are important for the community to measure and monitor. VHT is a measurement of the total hours traveled by all vehicles on the network in the area for a specified time period. The measure calculates the total auto travel hours by adding all individual trips, from each origin to each destination. VHD measures the total number of hours traveled by vehicles at speeds less than free-flow within a specified area over a specified time. These tools can help decision makers understand how travel time and delay may change from current conditions in response to growth and planned transportation investments. Santa Monica, CA, and Fort Collins, CO both track and report on travel time annually as part of larger performance measurement and community scorecard efforts.

If a proposed development would increase travel times along a major corridor above a certain percentage (e.g. one percent), a project’s impact would be considered significant and a developer would be required to find a way to reduce travel times. Mitigation options could include providing additional multimodal capacity and/or improving transit or bicycle travel times for the selected origins and destinations.

**SUMMARY**

All of the preceding approaches were discussed with the technical advisory committee (TAC). In order to assist the TAC in determining the most viable options for the City to explore further the project team developed a series of criteria for evaluating the multiple approaches. Criteria related to land use context and the influence on design were added to address the need for a more direct link to land use as called for in SB375. Criteria related to ease of implementation were also included to assess the degree of change needed in the City’s various development review processes.

The criteria below were applied to the three major approaches (mode specific, multimodal and system) and qualitatively rated using a high, medium, and low scoring format. The results are summarized in Table 2.4, with high performing options shown with a filled circle, medium performing options with a half-filled circle, and low performing options shown with an open circle.
**EVALUATION CRITERIA**

**Readily Available Data:** How much data is needed to measure performance? How available is the data, and will it need to be collected?

**Technical Simplicity:** Is regression analysis required? How involved is the assessment process?

**Ease of use:** Do staff need extensive training to implement the methodology?

**Consistent and Repeatable:** Will the same results be produced with different reviewers or analysts?

**Context Scale:** Does the methodology apply at intersection, link, or broader land-use context?

**Influence on Design:** Does the methodology influence design and quality of facilities?

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**TABLE 2.4 EVALUATION OF PERFORMANCE MEASUREMENT APPROACHES** (high performing options shown with a filled circle, medium with a half-filled circle, and low performing options shown with an open circle)

<table>
<thead>
<tr>
<th>Methodology</th>
<th>Readily Available Data</th>
<th>Technical Simplicity</th>
<th>Ease of Use</th>
<th>Consistent &amp; Repeatable</th>
<th>Application Scale</th>
<th>Influence on Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle LOS</td>
<td></td>
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<tr>
<td>BCI</td>
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<td>TCQSM</td>
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<td>Charlotte, NC</td>
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<td>Gainesville, FL</td>
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<tr>
<td>VMT per Capita</td>
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<td>ATG</td>
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<td>Travel Time</td>
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Further research on several of these new measurement tools is necessary to determine the best option for the City of Los Angeles. Software requirements to implement the measurement tools are typically available in the form of Microsoft Excel based models or low cost (less than $500) software programs that run on standard desktop personal computers. For multimodal level of service analyses where forecast travel time or delay specific to pedestrians, bicyclists, or transit must be calculated, microsimulation software such as VISSIM or Paramics is recommended. Regional modeling hardware requirements and recommended specifications are available from SCAG modeling staff. Additional information is needed to better understand the effectiveness, ease of implementation and financial efficiency of each new strategy. In particular, applying these tools to real world situations and performing case studies will help aid the understanding of the pros and cons of these new measurement strategies.
3. NEXT STEPS

STREET CLASSIFICATION SYSTEM

Of the three classification systems studied, further research was conducted and potential cross-sections developed for a citywide layered network approach. This aided a staff-level discussion about the benefits and drawbacks of using such an approach. While the City is in need of a system-wide street classification that emphasizes the importance of accommodating every mode (not just automobiles), there was an acknowledgement that there must be an additional tool that allows for focused solutions to be applied in a specific neighborhood or region of the city.

In order to fully benefit from a layered-network approach, street design guidelines should be developed that define the engineering and design details for each street type. These guidelines would define “essential” and “supporting” elements for each street type, desired travel speeds for each classification, and a multimodal mitigation toolbox that would allow the City to utilize transportation development fees for pedestrian, bicycle, and transit improvements in locations with either limited opportunities for vehicular capacity expansion or in locations with multimodal priorities.

In addition to the geometric and other design elements that would be addressed by any effort to expand the current street standards, the concept of speed suitability should be addressed. This is a crosscutting objective that links roadway design elements to the desired speed of motorists traveling in that facility. Context sensitive speeds link design to the adjacent land use, modal safety priorities, and congestion and air quality outcomes.

Prominent examples of this comprehensive design approach include New York’s Street Design Manual, San Francisco’s Better Streets Plan, and Seattle’s Right of Way Improvements Manual. These efforts reflect substantial investment by multiple departments and agencies with extensive stakeholder input. Benefits of this approach would be similar to the positive changes that the Los Angeles Downtown Street Standards and Design Guidelines has achieved, including improved function and operations for all modes as well as coordinated urban design. Challenges to this approach include the length of time and the amount of resources needed to comprehensively address the many utility, engineering, land use, economic, and environmental considerations for each street.

BENCHMARKING TOOLS

The research into three new street performance measurement approaches provides the City with multiple options to consider as an alternative to the current Vehicle LOS that focuses exclusively on measuring the performance of a street for vehicular mobility. Regardless of the approach selected, both mode-specific measurement and system-wide monitoring tools will need to be utilized in order to ensure that both modal and system-wide needs are balanced.
**SYSTEM-WIDE APPROACH**

System-level monitoring and evaluation discussions focused on options to expand the analysis of the system’s performance beyond the current traffic congestion measures. Concepts identified for further development included:

- Developing **desired travel speeds** for existing classifications and emphasis street designations
- Improving regional modeling capabilities for reporting on the full range of Caltrans Smart Mobility Metrics to comply with AB32 and SB375
- Utilizing regional modeling tools to **identify centers and districts** with lower than average vehicle trip lengths and high potential for transit, bicycle, and pedestrian travel to support GHG funding priorities
- Defining and adopting the **Layered Network** in the City’s Transportation Element and apply a **context-based overlay** along specific corridors.

Since changes in these areas would impact a wide range of development review issues as well as legal requirements under CEQA, it would require involvement from the Department of City Planning, Department of Transportation, the Department of Public Works – Engineering, and the City Attorney’s Office.

**PROJECT-LEVEL BENCHMARKING**

Applying system-wide benchmarks at the project level is essential to improving street performance across a variety of modes. Implementation of the MMLOS concept would require a joint effort between DCP and LADOT to revise the City’s Traffic Impact Study Guidelines (Guidelines). The amended Guidelines could include:

- Augmenting the current vehicular LOS procedures with **multimodal LOS procedures and significance criteria** for transit, bicycle, and pedestrian modes
- Establishing transportation demand management (TDM) **Best Management Practices (BMPs)** to quantify vehicle trip reduction measures
- Developing a **mitigation toolbox** for transit, bicycle, and pedestrian improvements in the right of way
- Incorporating **pedestrian and bicycle counts** and data collection guidance for traffic studies

The revised Traffic Study Guidelines would guide project review and project-level mitigation, ensure consistency with system-wide goals and utilize performance measures other than trip generation and intersection impacts to determine success.

**BENCHMARKING CASE STUDIES**

Successful benchmarking depends on the availability and accuracy of data. While data exists for vehicular modes, a more comprehensive
pedestrian and bicycle data collection effort is necessary to support future analysis that would measure multimodal goals.

The application of new MMLOS procedures and criteria has the potential to substantially change project level studies and mitigation outcomes that would direct mitigation away from traditional street widening towards solutions that promote a variety of transportation modes. More research and testing are necessary to determine the differentiation and efficacy of the various MMLOS alternatives. A series of case studies to test application of the recommended measures should be conducted. Forensic analysis of recently completed projects is recommended to compare the existing procedures and outcomes to those proposed. These case studies could be accomplished through a joint effort between the Departments of City Planning and Transportation.

**ACTION PLAN**

As a result of this study, the Technical Advisory Committee and the consultant team identified a series of implementation steps for both legislative and operational changes. The following table identifies major action items, agency responsibility, and approval responsibility.
Next Steps for Development, Adoption and Application of New Street Classifications and Benchmarking Measures

<table>
<thead>
<tr>
<th>IMPLEMENTATION STEP</th>
<th>AGENCY INVOLVEMENT</th>
<th>STAKEHOLDER INVOLVEMENT</th>
<th>DIRECTIVE SOURCE/APPROVAL BODY</th>
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<tr>
<td>Develop definitions of essential and supporting elements of each network type.</td>
<td>DCP, LADOT</td>
<td></td>
<td>CPC</td>
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<tr>
<td>Conduct benchmarking case studies to aid in selecting and adopting most appropriate set of performance standards for the city’s streets.</td>
<td>DCP, LADOT</td>
<td>PAC, BAC</td>
<td>CPC, City Council</td>
</tr>
<tr>
<td>Amend the Transportation Element to establish a layered network, new street cross-sections and performance standards that emphasize pedestrian, bicycle and/or transit mobility.</td>
<td>DCP, LADOT</td>
<td>PAC, BAC, General Public</td>
<td>CPC, City Council</td>
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<tr>
<td>Amend Street Standards Plan S-470-0 to include expanded list of Standard Cross Sections.</td>
<td>DCP, LADOT, DPW-Engineering</td>
<td>PAC, BAC</td>
<td>CPC, Street Standards Committee, DCP, LADOT &amp; DPW-Engineering Department General Managers</td>
</tr>
<tr>
<td>Assign new street designations and adopt context-sensitive overlays through the New Community Plan Program’s Community Plan Implementation Overlays (CPIOs).</td>
<td>DCP</td>
<td>PAC, BAC, General Public</td>
<td>CPC, City Council</td>
</tr>
<tr>
<td>Amend Citywide CEQA Guidelines Manual to include analysis based on new performance measures.</td>
<td>DCP, LADOT, DPW, City Attorney</td>
<td>PAC, BAC, General Public</td>
<td>Motion: CF 10-0667 Precedent: City Council approval by resolution (CF 02-1507)</td>
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<tr>
<td>Amend LADOT’s Manual of Policies and Procedures to reflect new street typologies.</td>
<td>LADOT</td>
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<tr>
<td>Collect traffic data to prepare periodic benchmarking reports.</td>
<td>LADOT</td>
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<tr>
<td>Add new typologies and new street designations to NAVIGATE LA.</td>
<td>DPW-Engineering</td>
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<tr>
<td>Update ZIMAS to reflect changes in street designations.</td>
<td>DCP</td>
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DCP – Department of City Planning
LADOT – Department of Transportation
DPW-Engineering – Department of Public Works-Engineering
CPC – City Planning Commission
APPENDIX A – SUPPORTING REFERENCE MATERIALS
APPENDIX A – SUPPORTING REFERENCE MATERIALS

The following materials were referenced in this study:

**CALTRANS SMART MOBILITY**

Smart Mobility Framework Fact Sheet, Caltrans and USEPA, January 21, 2009
Smart Mobility 2010: A Call to Action for the Next Decade, Powerpoint presentation, Nov. 19, 2009
Smart Mobility Performance Measures, Powerpoint presentation, January 2010
Smart Mobility Framework Phase 1 Report, Caltrans, January 9, 2009

**MULTI-MODAL APPROACHES TO LOS**

NCHRP 3-70 Multimodal Level of Service Analysis for Urban Streets, Final Report, February 2008
2009 Quality/Level of Service Handbook, Florida Department of Transportation, 2009
Fort Collins, CO Multimodal Level of Service Manual, March 1997
Charlotte, NC Planning and Designing Intersections Using Multi-Modal LOS Standards, April 2005

**MODE SPECIFIC APPROACHES TO LOS**

Bicycle Level of Service Model, Sprinkle Consulting, April 2007
Urban Street Standards Study for TOD and Urban Centers, City of Aurora - Phase 2, 2009
Los Angeles, CA Walkability Checklist, Department of City Planning, November 2008
Walkability Checklist, Pedestrian and Bicycle Information Center, downloaded January 2010
San Diego, CA Walkability Checklist, downloaded January 2010
Bikeability Checklist, Pedestrian and Bicycle Information Center, downloaded January 2010
Metropolitan Transportation Commission Resource Guide, Regional Pedestrian Committee, November 2004

**SYSTEMS APPROACHES**

Auto Trips Generated Method Final Report, San Francisco County Transportation Authority, 2008

**GENERAL INFO**

Customer Based Level of Service, Powerpoint presentation, APA National Conference, 2005
Multimodal Level of Service Overview, Powerpoint presentation, January 2010
APPENDIX B – TAC PRESENTATIONS