MEMORANDUM - CITY OF PASADENA
DEPARTMENT of TRANSPORTATION

DATE: May 28, 2014

TO: Planning Commission

FROM: Frederick C. Dock, Director of Transportation

RE: NEW TRANSPORTATION PERFORMANCE MEASURES FOR TRANSPORTATION IMPACT ANALYSIS

RECOMMENDATION:

It is recommended that the Planning Commission receive this report, provide comments to staff on the proposed new Transportation Performance Measures and continue the item to their June 11, 2014 meeting.

BACKGROUND:

Over the last three years Department of Transportation staff has presented and discussed the concept of developing new mobility performance measures with both the Transportation Advisory Commission (TAC), Planning Commission (PC), the community and the City Council.

As Pasadena updates its General Plan, the City is using this opportunity to redefine critical aspects of its transportation policy. In addition to sustainability, the City's transportation system is expected to support the goals of livability, neighborhood protection and mobility. The Mobility Element is focused on three main policy objectives, as refined from the 2004 General Plan and extensive community input:

- Enhance livability
- Encourage walking, biking, transit, and other alternatives to motor vehicles
- Create a supportive climate for economic viability

The Mobility Element places an emphasis on multi-modal mobility and livability, prompting the use of applicable transportation performance measures to judge progress towards these objectives, as well as providing the necessary input to the General Plan EIR and development review transportation impact analysis (TIA). A key challenge facing the City is the current set of Performance Measures and Metrics, used in the 2004 General Plan and the Transportation Impact Review Current Practice and Guidelines, which place a considerable emphasis on the automobile. If these measures continue to be used in their current form, it would present a conflict with the updated Mobility Element objectives. Recent case law related to project-level transportation analysis emphasizes the need for General Plan consistency, use of state of the practice methods, and explicit guidance for resolving conflicting mitigation actions. In order to address this, our recommend practice is to revise and adopt transportation performance measures and TIA procedures that ensure both legal defensibility and consistency with the General Plan.

Pasadena is currently using a conventional set of performance measures for evaluating system performance and in reviewing the impacts of new development. Intersection volume to capacity ratios and Level of Service are the primary measures. The city also uses a volume-based analysis of change in traffic on street segments to assess impact. When looked at in the above context, the current measures are silent with regard to system performance of non-auto modes and tend to generate mitigation solutions that encourage widening of intersections and streets, which may compromise the performance of non-auto modes and are increasingly contrary to community values. Consequently, a more robust set of measures has been developed that decreases the emphasis on additional vehicle capacity and on reducing individual intersection delay in favor of increasing the emphasis on network management and travel time reliability. To achieve this shift in emphasis, the metrics shift in scale, away from individual location specific measures to corridor or area wide measures.

While the same measures will be used to analyze the mobility impacts and changes of both the General Plan and individual development project, thethresholds for identifying significant impacts for each requires an understanding of how individual projects relate to the General Plan as measured by each of the metrics. For both the Transportation Advisory Commission and the Planning Commission staff will present the information over the course of two meetings with the first meeting focused on the new mobility measures and threshold for the General Plan analysis and the meeting focused on how the new measures and thresholds would be applied at the individual project review level.

New Transportation Performance Measures

This memo describes seven proposed transportation performance measures that collectively assess the quality of walking, biking, transit, and vehicular travel in the City of Pasadena. The proposed update of the City's performance metrics and thresholds addresses the new LOS policy in transportation studies, and defines how to analyze the quality of bicycle, pedestrian, and transit facilities and services. To better align transportation system and network analysis with community values as expressed in the general plan, the performance measures and methods presented in this memorandum are recommended for use in transportation analysis. Therefore, the performance measures and significant impact thresholds to be used seek to be internally consistent and legally defensible under the current state of the practice.

Each of the New Transportation Performance Measures corresponds to one of the following three key points:

1. Accessibility and environmental performance
2. Auto performance measures to reflect the state of the practice and tradeoffs between modes and other community values
3. Measures that promote pedestrian, bicycle, and transit mobility

The table below summarizes the metrics and the proposed thresholds for determining an impact. See Appendix A for detailed descriptions and existing values for each metric.

METRIC		DESCRIPTION	IMPACT THRESHOLD (GENERAL PLAN)
1.	VMT Per Capita	Vehicle Miles Traveled (VMT) in the City of Pasadena per service population (population + jobs).	Any increase in Citywide VMT per Capita
2.	VT Per Capita	Vehicle Trips (VT) in the City of Pasadena per service population (population + jobs).	Any increase in Citywide VT per Capita
3.	Corridor Travel Times	Auto Travel Times for significant arterials in the City will be determined and forecasted using the Dynamic Traffic Assignment (DTA) Model.	Disclosure Only
4.	Auto Level of Service	Level of Service (LOS) as defined by the Transportation Research Board's *Highway Capacity Manual (HCM) 2010*. Uses intersection control delay to evaluate auto congestion	Any decrease beyond the established Minimum LOS D Threshold outside designated High Pedestrian Activity Areas.
5.	Proximity and Quality of Bicycle Network	Percent of dwelling units and jobs within a quarter mile of each of three bicycle facility types	Disclosure Only
6.	Proximity and Quality of Transit Network	Percent of jobs located within a quarter mile of each of three transit facility types. The Pedestrian Accessibility Score within each Traffic Analysis Zone (TAZ).	Disclosure Only
7.	Pedestrian Accessibility	The Pedestrian Accessibility Score uses the mix of destinations, and a network-based walk shed to evaluate walkability	Disclosure Only.

NEXT STEPS:

The Planning Commission will be presented the New Mobility Performance Measures and Thresholds information over the course of two meetings with the first meeting focused on the new mobility measures and threshold for the General Plan analysis and the meeting focused on how the new measures and thresholds would be applied at the project review level.

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Approved by:

Frederick C. Dock, PE AICP
Director of Transportation

APPENDIX

A. Descriptions of the Proposed Transportation Performance Metrics

ATTACHMENTS:

1. Proposed Transportation Performance Metrics and Thresholds for General Plan Review

APPENDIX A - DESCRIPTIONS OF NEWTRANSPORTATION PERFORMANCE METRICS

1. VMT PER CAPITA

The Vehicle Miles Traveled (VMT) per Capita measure sums the miles traveled for trips within the City of Pasadena citywide model. The Citywide VMT is calculated by adding: 1) 100% of VMT associated with trips traveling within the City of Pasadena boundaries that are generated or attracted by the City, and 2) 50% of VMT associated with trips with an end or origin outside of the City. The City's VMT is then divided by the City's total service population, defined as the population plus the number of jobs, per Capita.

Although VMT itself will likely increase with the addition of new residents, the City can reduce VMT on a per-capita basis with land use policies that help Pasadena residents meet their daily needs within a short distance of home, reducing trip lengths, and by encouraging development in areas with access to various modes of transportation other than auto.

2. VT PER CAPITA

Vehicle Trips (VT) per Capita is a measure of motor vehicle trips associated with the City. The measure sums the trips with origins and destinations within the City of Pasadena, as generated by the Trip-Based citywide model. The regional VT is calculated by adding the VT associated with trips generated and attracted within the City of Pasadena boundaries, and 50 percent of the VT associated with trips that either begin or end in the City, but have one trip end outside of the City. The City's VT is then divided by the City's total service population, defined as the population plus the number of jobs, to calculate VT per Capita.

As with VMT, VT itself will likely increase with the addition of new residents, but the City can reduce VT on a per-capita basis with land use policies that help Pasadena residents meet their daily needs within a short distance of home, reducing trip lengths, and by encouraging development in areas with access to various modes of transportation other than auto.

3. CORRIDOR TRAVEL TIME

Auto Travel Time for significant corridors in the City was determined and forecasted using the City's Dynamic Traffic Assignment (DTA) model which can estimate future travel times along corridors in the City. The City has collected travel time runs for 16 significant arterials, and this travel time information was used to evaluate auto operation in the General Plan context. Travel Times along a set of 16 origin-destination pairs were determined, and forecast travel times were prepared using the City's DTA model.

The metric seeks to evaluate whether future condition auto travel times for significant arterials can be maintained within +/- 20% of existing travel times. Travel time reliability, and the ability for the auto network to absorb new vehicle demand was evaluated with the DTA model.

4. AUTO LEVEL OF SERVICE (LOS)

Auto LOS is a qualitative description of traffic flow from a vehicle driver's perspective based on factors such as speed, travel time, delay, and freedom to maneuver. Six levels of service are defined, ranging from LOS A (best operating conditions) to LOS F (worst operating conditions). LOS E corresponds to operations "at capacity." When volumes exceed capacity, stop-and-go conditions result and operations are designated to LOS F.

Signalized Intersections

Traffic conditions at signalized intersections are evaluated using methodologies proposed by the Transportation Research Board (TRB), as documented in the 2010 Highway Capacity Manual (HCM 2010). The 2010 HCM method calculates control delay at an intersection based on inputs

such as traffic volumes, lane geometry, signal phasing and timing, pedestrian crossing times, and peak hour factors and is currently state of the practice for analyzing LOS. Control delay is defined as the delay directly associated with the traffic control device (i.e., a stop sign or a traffic signal) and specifically includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. These delay estimates are considered meaningful indicators of driver discomfort and frustration, fuel consumption, and lost travel time.

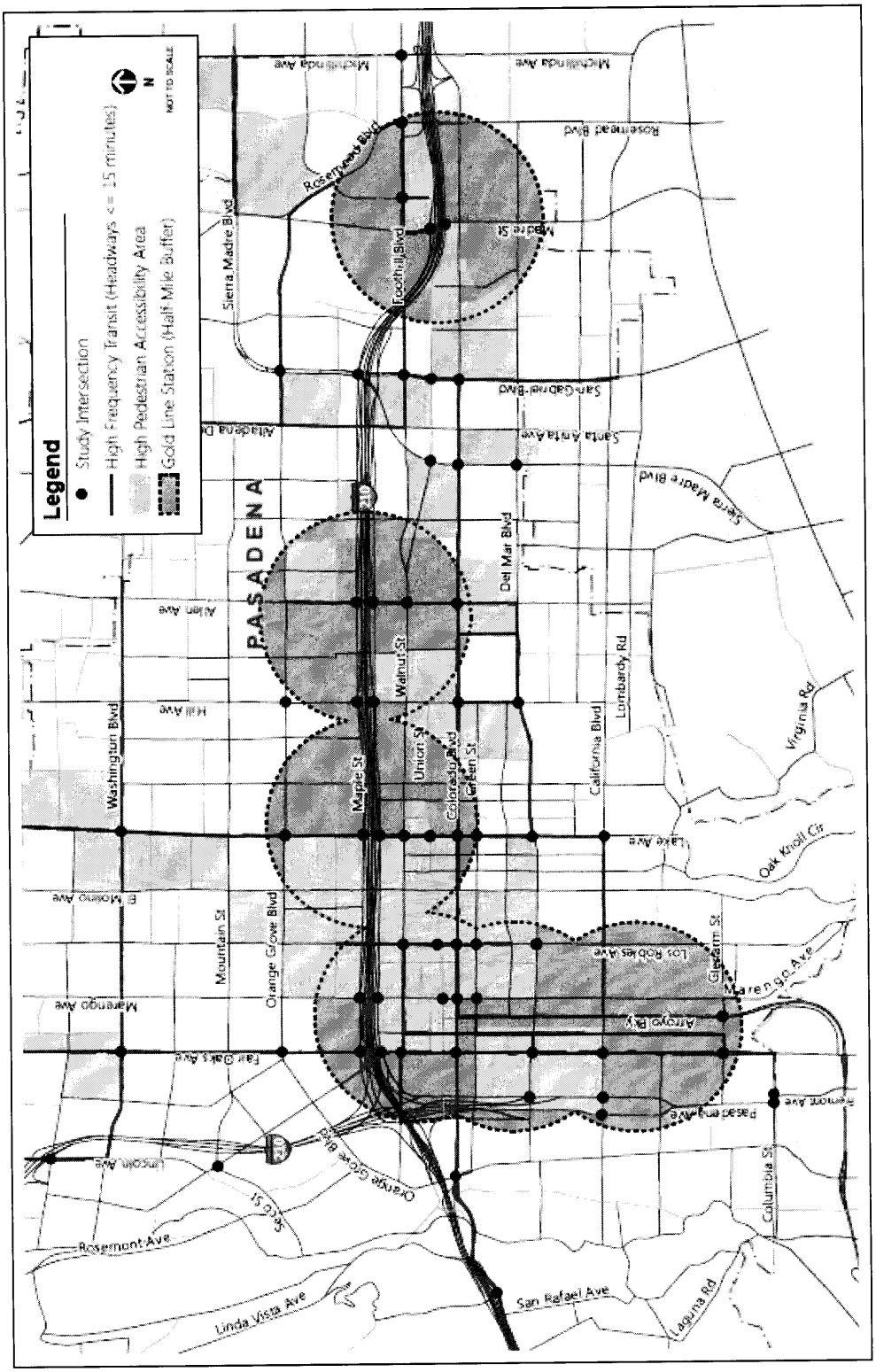
TABLE A1 – SIGNALIZED INTERSECTION LOS CRITERIA

LEVEL OF SERVICE	DESCRIPTION	DELAY IN SECONDS
A	Progression is extremely favorable and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.	< 10.0
B	Progression is good, cycle lengths are short, or both. More vehicles stop than with LOS A, causing higher levels of average delay.	> 10.0 to 20.0
C	Higher congestion may result from fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level, though many still pass through the intersection without stopping.	> 20.0 to 35.0
D	The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high V/C ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.	> 35.0 to 55.0
E	This level is considered by many agencies to be the limit of acceptable delay. These high delay values generally indicate poor (vehicle) progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences.	> 55.0 to 80.0
F	This level is considered oversaturation, which is when arrival flow rates exceed the capacity of the intersection. This level may also occur at high V/C ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also be contributing factors to such delay levels.	> 80.0

Source: 2010 *Highway Capacity Manual.*

As proposed, or intersections outside of the designated High Pedestrian Activity (HPA) areas the default minimum Level of Service to maintain in the City is LOS D. For intersections within the HPA areas there would be no minimum LOS.

Figure 1 illustrates the High Activity Areas (HAAs) and high-frequency transit segments used for determining the LOS threshold applicable to each intersection.



HIGH PEDESTRIAN ACCESSIBILITY AREAS, GOLD LINE STATIONS, HIGH FREQUENCY TRANSIT, AND STUDY INTERSECTIONS

FEHR & PEERS

5. PROXIMITY AND QUALITY OF BICYCLE NETWORK

The Proximity and Quality of Bicycle Network provides a measure of the percent of the City's dwelling units and work places within a quarter mile of each of three bicycle facility types. The facility types are aggregated into three hierarchy levels, obtained from the City's 2012 (Draft) Bicycle Transportation Plan categories as shown in Table A4.

TABLE A4 – BIKE FACILITIES HIERARCHY

LEVEL	DESCRIPTION	FACILITIES INCLUDED
1 (A)	Advanced Facilities	Bike Paths (P1) Multipurpose Paths (PP) Cycle Tracks/Protected Bike Lanes
2 (B)	Dedicated Facilities	Buffered Bike Lanes Bike Lanes (2, P2)
3 (C)	Basic Facilities	Bike Routes (3, P3) Enhanced Bike Routes (E3, PE3) Bike Boulevards (BB) Emphasized Bikeways (PEB)

Source: City of Pasadena Bicycle Transportation Plan, 2012.

For each bike facility level, a quarter-mile network distance buffer is calculated and the total dwelling units and work places within the buffer are added.

The City can improve measures of Bike Facility Access by improving and expanding existing bike facilities and by encouraging residential and commercial development in areas with high-quality bike facilities.

6. PROXIMITY AND QUALITY OF TRANSIT NETWORK

The Proximity and Quality of Transit Network provides a measure of the percent of the City's dwelling units and work places within a quarter mile of each of each of three transit facility types, as defined in the *Draft Streets Types Plan* and in Table A5.

TABLE A5 – TRANSIT FACILITIES HIERARCHY

LEVEL	FACILITIES INCLUDED
1 (A)	Includes all Gold Line stops as well as corridors with transit service, whether it be a single route or multiple routes combined, with headways of five minutes or less during the peak periods.
2 (B)	Includes corridors with transit headways of between six and 15 minutes in peak periods.
3 (C)	Includes corridors with transit headways of 16 minutes or more at peak periods.

Source: *Draft Streets Types Plan,* Pasadena Department of Transportation, March 2013.

For each facility level, a quarter-mile network distance buffer is calculated and the total dwelling units and work places within the buffer are added.

The City can improve the measures of Transit Proximity and Quality by reducing headways on existing transit routes, by expanding transit routes to cover new areas, and by encouraging residential and commercial development to occur in areas with an already high-quality transit service.

7. PEDESTRIAN ACCESIBILITY

The Proximity and Quality of Pedestrian Environment provides a measure of the average walkability in the TAZ surrounding Pasadena residents, based on a Pedestrian Accessibility metric. The Pedestrian proximity metric is a simple count of the number of land use types accessible to a Pasadena resident or employee in a given TAZ within a 5-minute walk. The ten categories of land uses are:

- Retail
- Personal Services
- Restaurant
- Entertainment
- Office (including private sector and government offices)
- Medical (including medical office and hospital uses)
- Culture (including churches, religious and other cultural uses)
- Park and Open Space
- School (including elementary and high schools)
- College

The resulting count of land use types is then assigned a letter grade from A to D based on the following structure:

- **A** – greater than or equal to 0 land use types and less than 2 land use types
- **B** – greater than or equal to 2 land use types and less than 5 land use types
- **C** – greater than or equal to 5 land use types and less than 8 land use types
- **D** – greater than or equal to 8 land use types

The City can improve the Resident and Employment Pedestrian Accessibility Scores by:

- Encouraging residential development in areas with high existing Pedestrian Accessibility Scores;
- Encouraging commercial development in areas with high existing Pedestrian Accessibility Scores; and
- Attracting mixed development and new land use types to increase the Pedestrian Accessibility metric values of other areas.

Attachment 1

Pasadena – Proposed New Mobility Metrics and Thresholds

General Plan / Specific Plan Level

Metric	Replacement for	Policy Being Addressed	Threshold	Disclosure	Threshold Value	Notes
VMT Per Capita	Auto Level of Service	Sustainability				
Citywide Average			X		Target citywide average with range	Reduce from existing – basis for impact fee update
VT Per Capita	Segment Volume	Economic Vitality; Livability				New/old metrics measure vehicle trips, but in different ways
Citywide Average			X		Target citywide average with range	Reduce from existing – basis for impact fee update
Corridor Travel Times	Auto Level of Service	Economic Vitality; Livability		X	(Reliability at or below speed limit; MAP-21 metric for Principal Arterials)	Impact occurs at too fast or too slow; metric applicable at GP and Specific Plan level, but not fine-grained enough for project level
Auto Level of Service		Economic Vitality; Livability	X		Threshold set by geographic area: No minimum in HPAs; LOS D elsewhere	Methodology for calculating changes to current standard (HCM 2010) Will be replaced by OPR SB 743 rulemaking in TPAs May be replaced by OPR SB 743 rulemaking outside TPAs
Proximity and Quality of Bicycle Facilities		Encourage alternatives to motor vehicles				Metric evaluates extent and connectivity of bicycle network
Citywide				X	Target proximity for tiers	improve over existing - basis for enhanced impact fee
Proximity and Quality of Transit Facilities		Encourage alternatives to motor vehicles				Metric evaluates extent and connectivity of transit network
Citywide				X	Target proximity for tiers	improve over existing - basis for enhanced impact fee
Pedestrian Accessibility		Enhance livability; Encourage alternatives to motor vehicles				Metric evaluates proximity and variety of land uses for pedestrian access
Citywide				X	Target proximity for tiers	improve over existing - basis for enhanced impact fee