Introduction to Transportation Level of Service & Highway Capacity Manual 2010

August 2011

SANTA CLARA Valley Transportation Authority

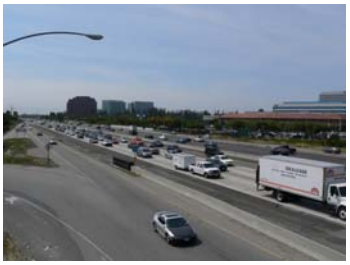
Presentation Outline

1. Review: Overview of VTA CMP
2. Transportation Level of Service concepts
3. Highway Capacity Manual 2010 and Multimodal Level of Service
4. Looking ahead – potential application in Santa Clara County

1. Overview of the VTA Congestion Management Program

What is the Congestion Management Program?

- A comprehensive transportation improvement program among local jurisdictions to **reduce traffic congestion** and **improve land use decision-making and air quality**
- Maintained by the Congestion Management Agency (CMA) in each urbanized county in California
- VTA is the CMA and maintains the Congestion Management Program for Santa Clara County



Legislative Basis for the CMP

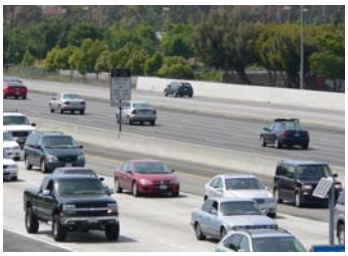
- **Proposition 111**, the Traffic Congestion Relief and Spending Limit Act, approved in June 1990
- **CMA Legislation** - California Statute, Government Code 65088, 1991
- Incentive-based approach
  - Increased transportation funding through gas tax
  - ***With funding, counties required to maintain a CMP***
  - ***Local agencies need to be in conformance with CMP to receive Prop. 111 gas tax subventions***
- Other benefits to local agencies
  - Consistent guidelines for transportation impact analysis
  - Along with changes in State and Federal legislation, more flexibility & decision-making at local and regional level

Elements of the VTA CMP

1. System Definition
2. ***Traffic Level of Service Standard***
3. ***Multimodal Performance Measures***
4. Trip Reduction and Transportation Demand Management
5. Countywide Transportation Model and Database
6. Community Form and Impact Analysis Program
7. Capital Improvement Program
8. Monitoring and Conformance
9. Deficiency Plan

Traffic Level of Service Standard

- CMP must include a traffic Level of Service (LOS) standard; **for Santa Clara County, the CMP LOS is E.**
- If facilities on the CMP network fall below the adopted LOS standard, the Member Agency responsible for the facility must prepare a **Deficiency Plan** for that facility.
- Member Agencies must **monitor LOS** using adopted methodologies; VTA has adopted Traffic LOS Analysis Guidelines



Recent and Upcoming VTA CMP Activities

- **Update of VTA TIA Guidelines** – adopted March 2009
- **Update of VTA Deficiency Plan Requirements** – adopted August 2010
- **Potential future updates of VTA CMP technical standards** and guidelines to reflect:
  - ***Revisions in CEQA transportation analysis guidelines in spring 2010***
  - ***Release of 2010 version of Highway Capacity Manual (HCM) in December 2010***
  - Recent research on trip generation rates for Transit-Oriented Developments and mixed-use developments
  - Passage of SB 375 and efforts to reduce GHG and VMT, and integrate transportation & land use planning

2. Transportation Level of Service Concepts

Level of Service Overview

- Level of Service (LOS) is a way of characterizing the performance of portions of the transportation system – e.g., freeways, signalized intersections, rural highways
- Traditionally, LOS has only been evaluated for automobiles
- Automobile LOS generally emphasizes vehicular throughput and minimizing delay
- Different ways of calculating LOS exist, but the Highway Capacity Manual (HCM) is most commonly accepted
- Until recently, little emphasis has been placed on other modes (peds, bikes, transit)

Automobile LOS - Freeway

- LOS can be based on either density or speed
- The HCM method for freeway segment LOS is density; VTA CMP uses density as well

Table 1: Freeway LOS Criteria

Level of Service	Density (passenger cars/mile/lane)	Speed (miles/hour)
A	density ≤ 11.0	67.0 ≤ speed
B	11.0 < density ≤ 18.0	66.5 ≤ speed < 67.0
C	18.0 < density ≤ 26.0	66.0 ≤ speed < 66.5
D	26.0 < density ≤ 46.0	46.0 ≤ speed < 66.0
E	46.0 < density ≤ 58.0	35.0 ≤ speed < 46.0
F	58.0 < density	speed < 35.0

Automobile LOS – Signalized Intersection

- LOS typically based on 'average control delay'
- Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay

Table 2: Signalized Intersection LOS Criteria

Level of Service	Average Control Delay (seconds/vehicle)
A	delay ≤ 10.0
B+	10.0 < delay ≤ 12.0
B	12.0 < delay ≤ 18.0
B-	18.0 < delay ≤ 20.0
C+	20.0 < delay ≤ 23.0
C	23.0 < delay ≤ 32.0
C-	32.0 < delay ≤ 35.0
D+	35.0 < delay ≤ 39.0
D	39.0 < delay ≤ 51.0
D-	51.0 < delay ≤ 55.0
E+	55.0 < delay ≤ 60.0
E	60.0 < delay ≤ 75.0
E-	75.0 < delay ≤ 80.0
F	delay > 80.0

VTA CMP Level of Service Standard

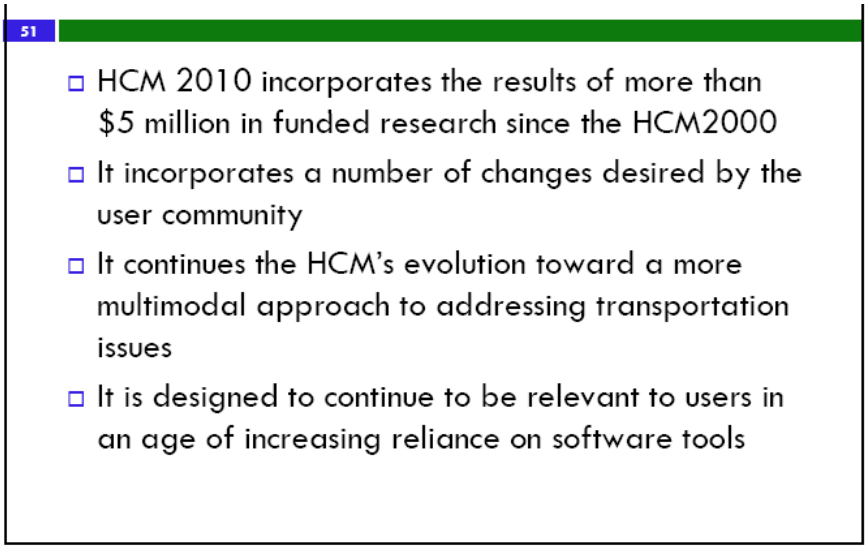
- The CMP automobile LOS standard is LOS E.
- If analysis shows that a development project will cause LOS on a CMP facility to fall from E or better to F, project is said to impact facility
- For facilities at LOS F under existing or background conditions:
  - **Intersections at LOS F**: Project said to cause impact if: project increases average control delay for critical movements by 4 seconds or more, and project increases critical V/C value by 0.01 or more
  - **Freeway segments at LOS F**: A project is said to cause impact if new trips added are more than 1% of freeway capacity
- Only qualitative analysis of peds/bikes/transit required, except in unusual cases (e.g., stadium, major TOD)

3. Highway Capacity Manual 2010 and Multimodal Level of Service Measures

Highway Capacity Manual - Overview

- The HCM is published by the Transportation Research Board.
- HCM contains concepts, guidelines, and procedures for computing the capacity and quality of service for transportation facilities.
- There have been five editions from 1950 to 2010.
- HCM 2010 was released in December 2010; training/webinars conducted late spring 2011.
- HCM 2010 beginning to be accepted and adopted, but software to implement manual still evolving.

HCM 2010 – Summary of Changes



(Source: TRB webinar on HCM 2010)

1950 – 1985 Manuals

- 1950 HCM
  - Streetcars and buses impact vehicle capacity at traffic signals
  - Pedestrian impacts on vehicle capacity addressed indirectly
- 1965 HCM
  - LOS concept introduced
  - Short (11-page) chapter on bus transit
- 1985 HCM
  - Pedestrian and bicycle chapters introduced

17 (Source: TRB webinar on HCM 2010) *VTA Congestion Management Program*

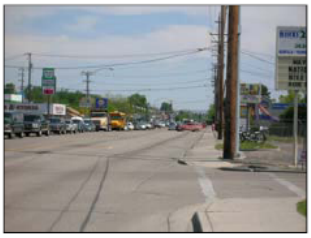
2000 Manual

- Expanded pedestrian chapter
  - Service measures: space per pedestrian, average delay, average travel speed
- Expanded bicycle chapter
  - Service measures: average travel speed, average delay, hindrance
- Revised transit chapter
  - Four passenger-oriented service measures: frequency, hours of service, passenger load, reliability

18 (Source: TRB webinar on HCM 2010) *VTA Congestion Management Program*

HCM 2000 Measures Issues

- HCM 2000 focuses on capacity and delay
  - Research suggests these aren't the key factors
    - Auto volumes and other factors are important to service quality



HCM2000: Ped LOS A

HCM2000: Ped LOS D

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(Source: TRB webinar on HCM 2010)

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HCM 2010 Approach

- Multimodal evaluation for urban streets
  - *Emphasizes combined evaluation of auto, ped, bike, and transit modes*

FDOT Quality/LOS Handbook 2002

Interactions

Bicycle LOS | Automobile LOS | Pedestrian LOS | Transit LOS

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(Source: TRB webinar on HCM 2010)

VTA Congestion Management Program

Quality of Service

- QOS is the perception of how well a facility operates from the traveler's perspective
- Research has quantified traveler perception and developed QOS scores
  - Scores incorporate multiple factors (e.g., traffic volumes, lane widths, etc.)
- Models set LOS thresholds based on survey responses to actual conditions

21 (Source: TRB webinar on HCM 2010) *VTA Congestion Management Program*

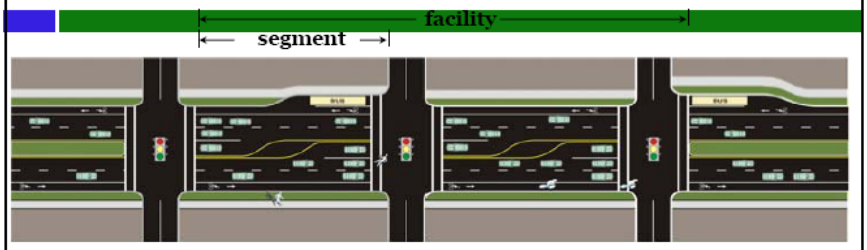
MMLOS Defined

- MMLOS measures the degree to which the urban street design and operations meets the needs of each major mode's users
- Four level of service results for the street:
  - Auto, Transit, Bicycle, Pedestrian
- A combined LOS is not calculated

Main Street Level of Service		
User Type	AM Pk Hr	PM Pk Hr
Auto	C	E
Transit	B	C
Bicycle	D	C
Pedestrian	C	D

22 (Source: TRB webinar on HCM 2010) *VTA Congestion Management Program*

MMLOS Applications



- Segments
  - All four modes
- Signalized Intersections
  - Auto, pedestrian, and bicycle modes
- Facility
  - All four modes

23 (Source: TRB webinar on HCM 2010) VTA Congestion Management Program

Pedestrian LOS Findings

- Score was improved by:
  - Adding facilities:
    - Sidewalks
    - Bike lanes
    - On-street parking
  - Signal changes:
    - RTOR restriction
    - Protected left-turn phasing
- Mid-block crossing difficulty has a significant influence
  - Cross-section additions improved Segment LOS, but increased RCDF

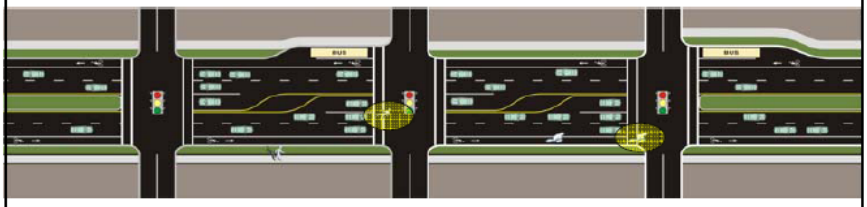
24 (Source: TRB webinar on HCM 2010) VTA Congestion Management Program

Bicycle LOS Findings

- Score was changed by:
  - Adding facilities:
    - Bike lanes
    - On-street parking (+/-)
- Less factors to change to influence score than Pedestrian LOS
- Access management has a significant influence
  - Important to examine Facility LOS

25 (Source: TRB webinar on HCM 2010) *VTA Congestion Management Program*

Transit LOS: Segments



- Factors include:
  - Service frequency (+)
  - Average bus speed (+)
  - Bus reliability (+)
  - Average passenger load (-)
  - Shelter, bench presence (+)
  - Pedestrian LOS score for segment (+)

26 (Source: TRB webinar on HCM 2010) *VTA Congestion Management Program*

Data Collection

- Much of it is standard for a traffic study
- Additional data:
  - Transit stop amenities
  - RTOR & permitted left-turn volumes
  - Transit performance and occupancy
  - Travel time and # of stops
- Sources:
  - Field measurements
  - Scaled aerials
  - Photos
  - Software outputs
  - Concept plan drawings

27 (Source: TRB webinar on HCM 2010) *VTA Congestion Management Program*

4. Looking ahead – Potential application to Santa Clara County

28 *VTA Congestion Management Program*

Need and Opportunities

Is the status quo acceptable?

- Currently, analysis of non-auto modes in TIAs is minimal and subjective; meaningful analysis rarely seen
- Evaluation of projects is skewed towards the auto; leads to auto-focused mitigation measures
- VTA's multimodal goals and the CMP are often in conflict; LOS standard can discourage good dev't

What are the opportunities?

- Highway Capacity Manual (HCM) 2010 provides new, accepted Multimodal LOS measures
- Adopting these measures now positions our county ahead of the curve, addressing multimodal goals
- Adopting new measures can encourage a balanced evaluation of development & transportation projects

Stakeholder Involvement

Partners in this effort:

- VTA and local agency staff
- SOM WG and LUTI WG (possible joint sub-committee)
- VTA TAC – Periodic updates and direction
- Other VTA Committees, e.g., BPAC – Periodic updates and direction
- City BPACs – Additional resource
- Transportation consultants – help review technical approach

Questions to Consider

1. Should our immediate goal be simply disclosure of Multimodal LOS, or creating a standard?
2. How will cities approach incorporating Multimodal LOS in their policies & procedures?
3. Who might be the best people/groups to involve, both in the VTA process and the city/county processes?
4. How can we highlight the benefits of this approach, and re-assure people about cost concerns?

Questions or Comments?

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