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Multimodal Level of Service: Choosing the Right Tool for the Job

Toolbox Tuesdays
Southern California Association of Governments
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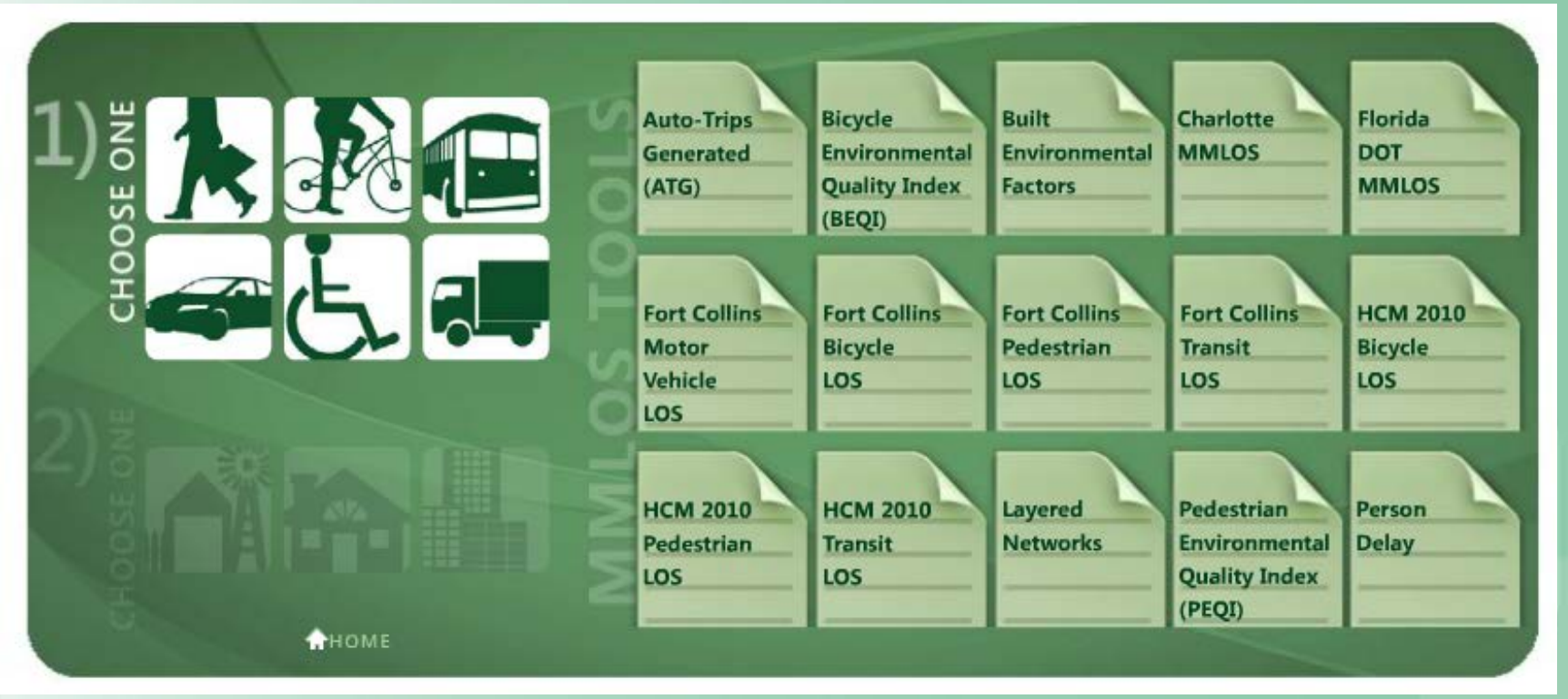
Themes

- There are many ways to evaluate multimodal performance
- Sensitivity matters
- Know what you want from the tool(s) you choose

A Menagerie of MMLOS Options



http://www.fehrandpeers.com/mmlos-toolkit/

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Variation by Type, Facility, and Mode

	HCM 2010	PEQI	BEQI	Fort Collins	Charlotte
SEGMENT					
Pedestrian LOS					
Bicycle LOS					
Transit LOS					
Automobile LOS					
INTERSECTION					
Pedestrian LOS					
Bicycle LOS					
Automobile LOS					

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Pedestrian Environmental Quality Index (PEQI)

INTERSECTION - Intersection Safety
Crosswalks (21 – 8)
Ladder Crosswalk (24 - 8)
Countdown in Signal 4 Directions/w countdown (21 - 5)
Crossing Speed (20 - 9)
Crosswalk Scramble (19 - 5)
No Turn on Red (19 - 5)
Traffic Calming Features (20 - 9)
Additional Signs for Pedestrians (17 - 7)
STREET SEGMENT - Traffic
Number of Lanes (24 - 4)
Two Way Traffic (10 - 7)
Vehicle Speed (27 - 2)
Traffic Volume (22 - 7)
Traffic Calming Features (20 - 7)

STREET SEGMENT - Street Design
Width of Sidewalk (22 - 1)
Sidewalk Impediments (24 -2)
Large Sidewalk Obstructions (15 - 5)
Presence of Curb (17 - 7)
Driveway Cuts (15 - 5)
Trees (16 - 7)
Planters/Gardens (9 - 4)
Public Seating (13 - 7)
Presence of a Buffer (21 - 4)
STREET SEGMENT - Land Use
Public Art/ Historic Sites (14 - 6)
Restaurant and Retail Use (19 - 9)
STREET SEGMENT - Perceived Safety
Illegal Graffiti (9 – 5)
Litter (10 - 5)
Lighting (25 - 7)
Construction Sites (13 - 7)
Abandoned Buildings (15 - 5)

Score	Interpretation
100 – 81	Highest Quality
80 – 61	High Quality
60 – 41	Average Quality
40 – 21	Low Quality
<=20	Poor Quality

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Fort Collins Pedestrian LOS

Quality Indicators	A	B	C	D	E	F
Directness (Actual/Minimum)	< 1.2	1.2 - 1.4	1.4 - 1.6	1.6 - 1.8	1.8 - 2.0	> 2.0
Continuity	Pedestrian sidewalk appears as a single entity within a majority of activity area or public open space	Continuous stretches of sidewalks which are physically separated with landscaped parkways	Continuous stretches of sidewalks which may have variable widths, with and without landscaped parkways	Pedestrian corridors are not well connected with several breaches in pedestrian network	Significant breaks in continuity	Complete breakdown in the pedestrian traffic flow; all people select different routes; no network exists
Signalized Street Crossings	- 3 or fewer lanes to cross - Signal has clear vehicular pedestrian indicators - Well marked crosswalks - Good lighting levels - Standard curb ramps - Automatic pedestrian signal phase - Amenities, signing, and sidewalk and roadway character strongly suggest the presence of a pedestrian crossing - Drivers and pedestrians have unobstructed views	4 or 5 lanes to cross and/or missing 2 elements of A	6 or more lanes to cross and/or missing 4 elements of A	Missing 5 elements of A	Missing 6 elements of A	Missing 7 elements of A
Visual Interest and Amenity	Visually appealing and compatible with local architecture; generous sidewalk width, active building frontages, pedestrian lighting, street trees, and quality street furniture	Generous sidewalks, visual clarity, some street furniture and landscaping, no blank street walls	Functionality operational with less importance to visual interest or amenity	Design ignores pedestrian with negative mental image	Comfort and convenience nonexistent, design has overlooked needs of users	Total discomfort and intimidation
Security	Sense of security enhanced by presence of other people using sidewalks and overlooking them from adjacent buildings; good lighting and clear sight lines	Good lighting levels and unobstructed lines of sight	Unobstructed lines of sight	Sidewalk configuration and parked cars may inhibit vigilance from the street	Major breaches in pedestrian visibility from street, adjacent land uses, and activities	Streetscape is pedestrian intolerant

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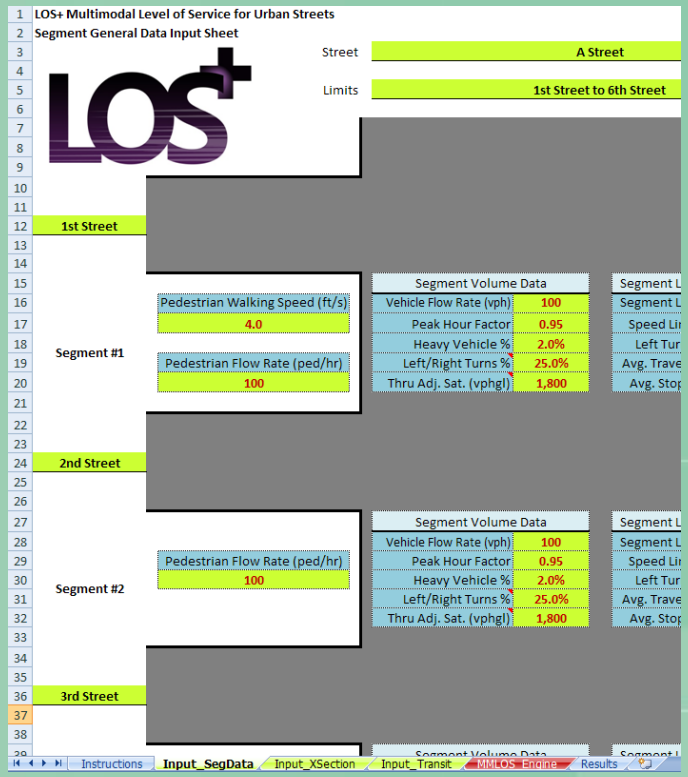
HCM 2010 Pedestrian LOS

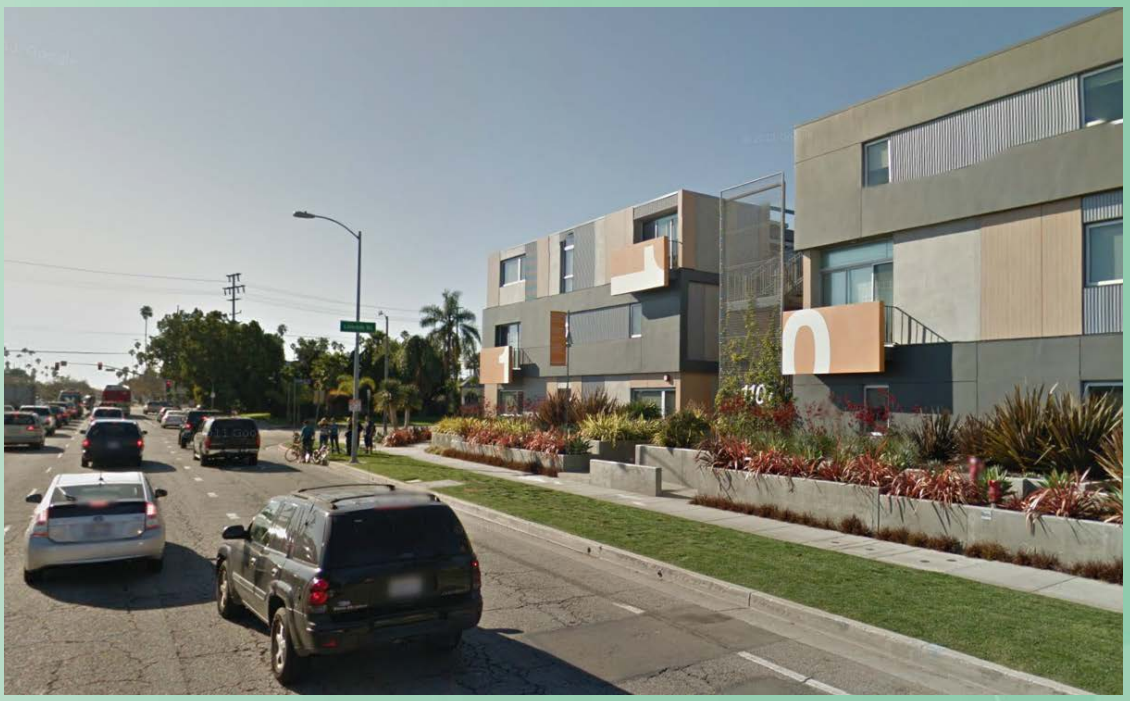
Required Data Inputs
Intersection control type
Coordinated signal control
Link length
Traffic calming measures
Number of traffic lanes at cross-section
ADT 2-way (vpd) or Pk Hr 2-way (vph)
Cycle length (secs)
Speed limit
Through lanes at intersection
Left/Right turns percentage
Progression arrival type
On-Street parking occupancy
Striped [Parking]
Travel lane widths
Shoulder Parking width
Downstream cross street width
Lane widths

Required Data Inputs
Median type
Median width
Percent with restrictive median
Bike lane width
Number of cross street lanes
Buffer width
Curb present
Street tree numbers/spacing
Mid-segment ped. crossing
Pk hr auto volumes: cross street
Ped. Volumes
Ped. cycle walk time (analysis)
Ped. cycle walk time (cross street)
RT islands
RTOR + permissive left (vph)
Sidewalk width
X-Street speed limit



What is the LOS for pedestrians on this street segment?

Peak hour two-way auto volume:	**1,987**
Auto lanes:	
EB	**3 x 11'**
WB	**3 x 11'**
Speed limit:	**40 mph**
Sidewalk width:	**5'**
Buffer between parking and sidewalk:	**4'**
Average percent of parking utilized:	**26%**
No street furniture	
Intermittent trees	



Venice Blvd, WB, east of Lincoln Blvd

PEQI:	**High Quality**
Fort Collins:	**A/C/C/C/C**
HCM 2010	**B**

Sensitivity Matters: HCM 2010 LOS

- How would the following affect transit LOS:
  New shelter; stop; lane?

- *Good, bad, and nearly indifferent. Adding a shelter to an existing stop improves LOS, but adding a new stop to a segment degrades LOS. Adding a bus-only lane shows very little benefit; on Venice Blvd, EB, east of Lincoln, adding an exclusive lane for buses would improve LOS by 1.6%*

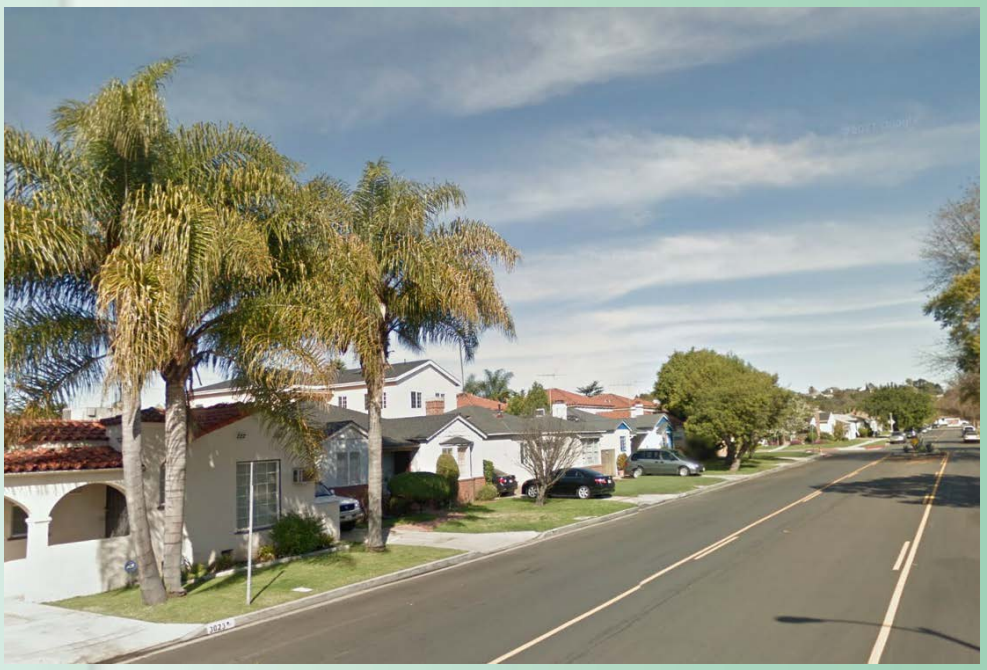
Sensitivity Matters: HCM 2010 LOS

- Putting a bike lane inside a parking lane improves bicycle LOS by about what percent?

- *0%. It's not sensitive to the benefits of buffers or the perils of dooring.*

Sensitivity Matters: HCM 2010 LOS

- What is pedestrian LOS on a segment without sidewalks?



- *Not F. For example, on Venice Blvd, EB, east of Lincoln, decreasing sidewalk width from 5' to 0' would lower LOS from 2.58 (LOS B) to 2.67 (LOS B).*

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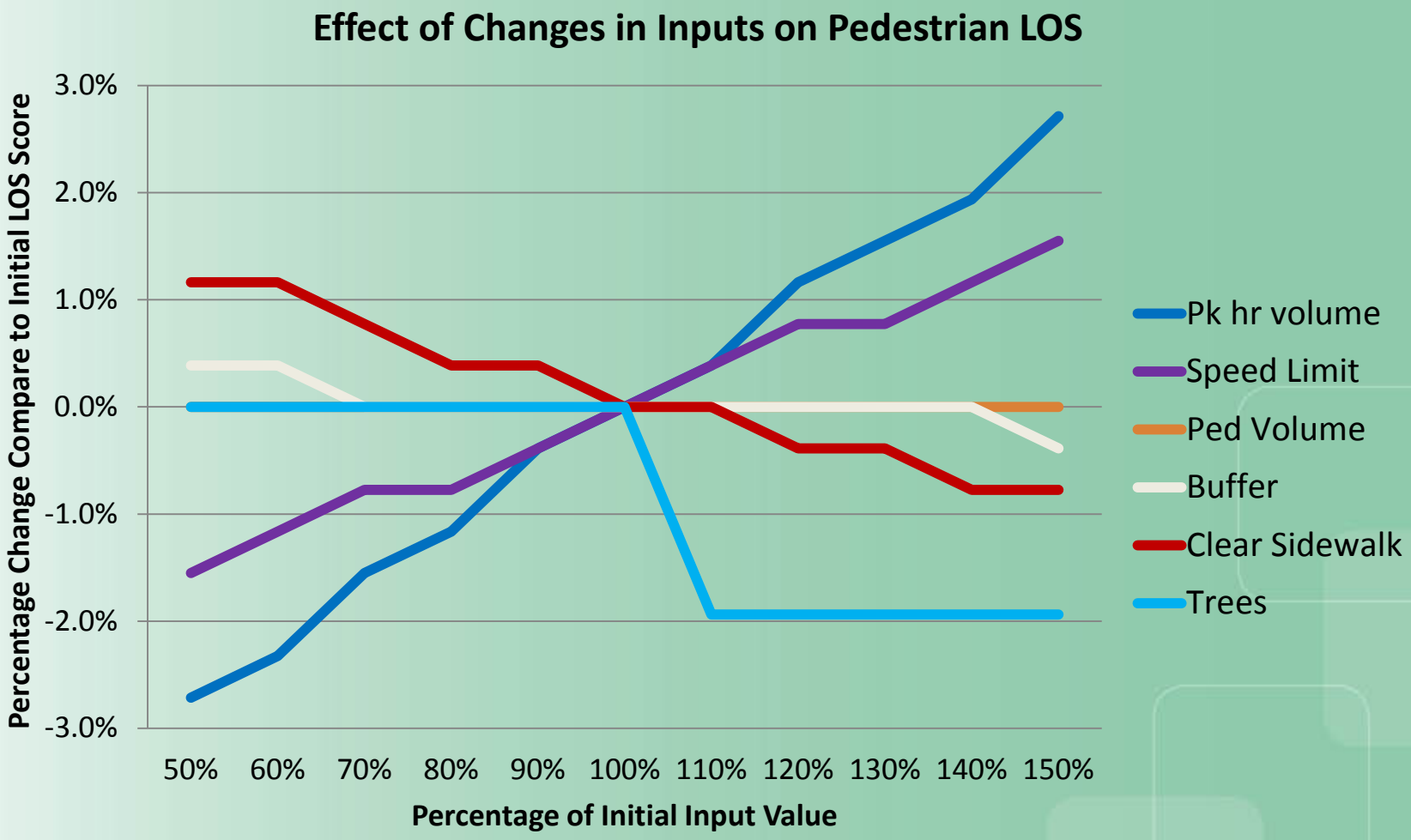
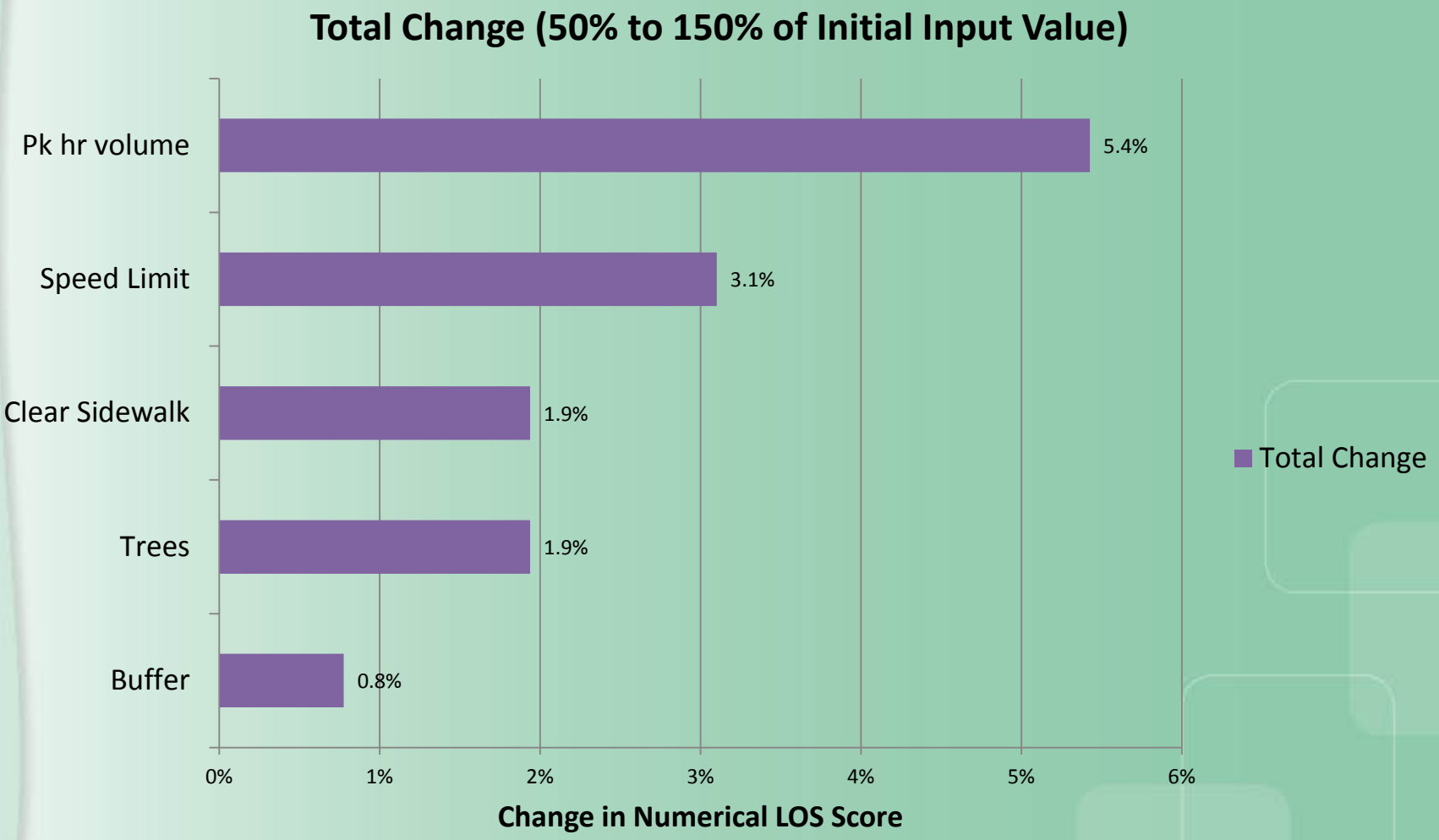
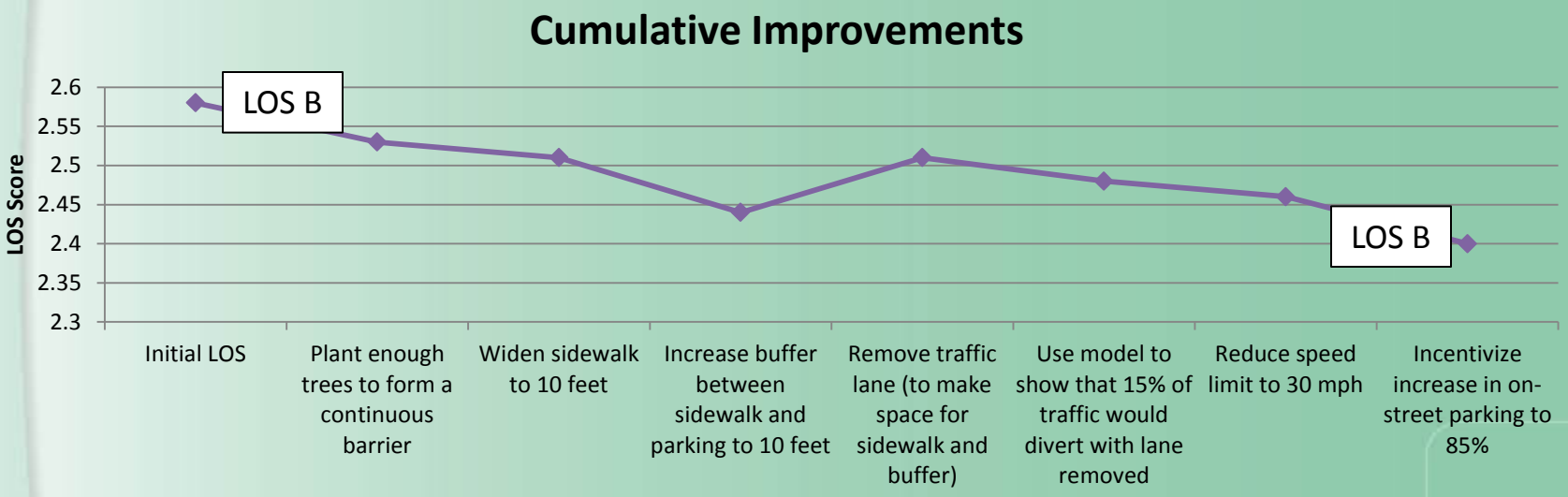
HCM 2010 Ped LOS Sensitivity



HCM 2010 Ped LOS Total Change



Ped LOS Cumulative Improvements



Initial LOS	2.58
Plant enough trees to form a continuous barrier	2.53
Widen sidewalk to 10 feet	2.51
Increase buffer between sidewalk and parking to 10 feet	2.44
Remove traffic lane (to make space for sidewalk and buffer)	2.51
Use model to show that 15% of traffic would divert with lane removed	2.48
Reduce speed limit to 30 mph	2.46
Incentivize increase in on-street parking to 85%	2.40
TOTAL CHANGE	0.18 (7%)

LOS Score	LOS
x <= 2.00	A
2.00 < x <= 2.75	B
2.75 < x <= 3.50	C
3.50 < x <= 4.25	D
4.25 < x <= 5.00	E
x > 5.00	F

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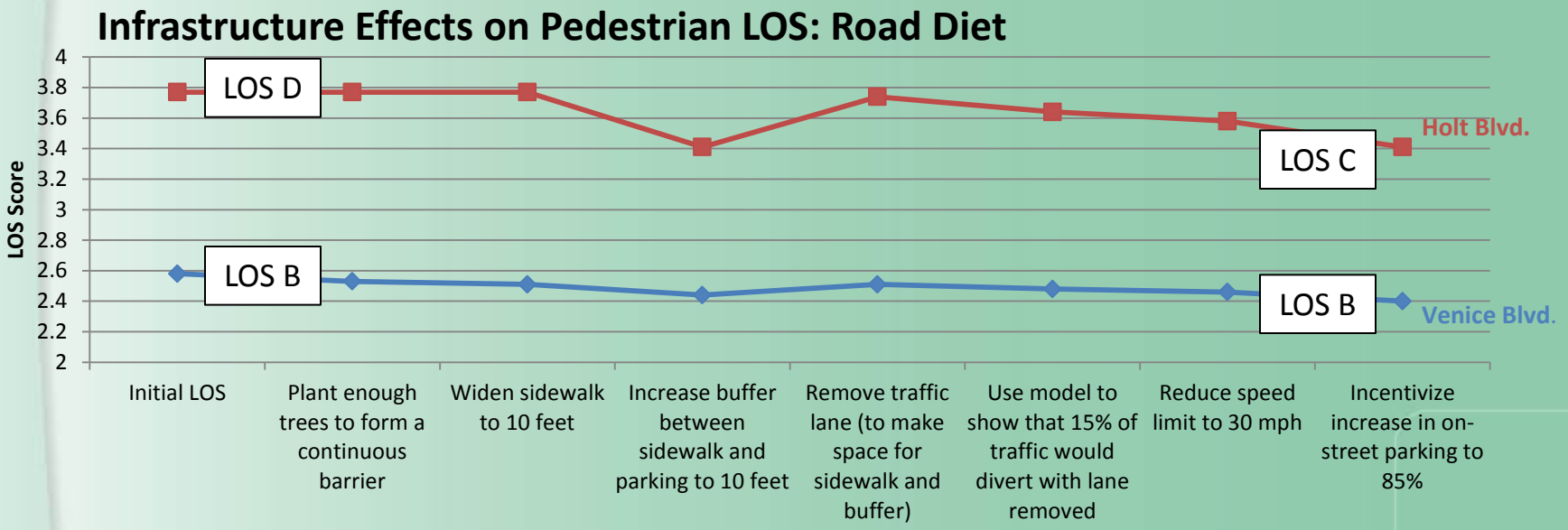
Ped LOS Cumulative Improvements

Los Angeles vs. Ontario



	Venice Blvd.	Holt Blvd.
Initial LOS	**2.58**	**3.77**
Plant enough trees to form a continuous barrier	2.53	3.77
Widen sidewalk to 10 feet	2.51	3.77
Increase buffer between sidewalk and parking to 10 feet	2.44	3.41
Remove traffic lane (to make space for sidewalk and buffer)	2.51	3.74
Use model to show that 15% traffic diversion	2.48	3.64
Reduce speed limit to 30 mph	2.46	3.58
Incentivize increase in on-street parking to 85%	**2.40**	**3.41**
TOTAL CHANGE	0.18 (7%)	0.36 (10%)
Letter Grade Change	B → B	D → C

LOS Score	LOS
x <= 2.00	A
2.00 < x <= 2.75	B
2.75 < x <= 3.50	C
3.50 < x <= 4.25	D
4.25 < x <= 5.00	E
x > 5.00	F

Know what you want

- Questions to consider going forward:
  - How useful is the tool for measuring mitigation benefits?
  - How legally defensible is the tool?
  - What about time and cost of data collection?
  - Repeatability – do we get the same results each time?
  - Tradeoffs – are the results comparable between modes? Are we measuring different things?
  - Do the results support our local values, policies, and investment priorities?
  - Who is asking for new methods and why?