



DESIGNING IN CONTEXT OF COMPLETE STREETS

MULTIMODAL
NETWORK –
LEVEL OF
SERVICE

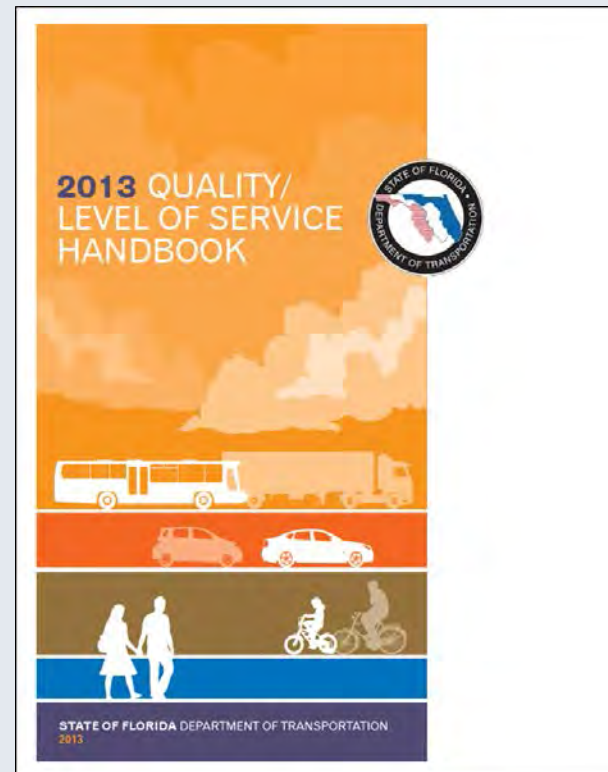
MODULE 7

MULTIMODAL LEVEL OF SERVICE

HCM 2010 / HCS 7



FDOT 2013 Q/LOS ARTPLAN



http://www.fdot.gov/planning/systems/programs/sm/los/los_sw2M2.shtm

Key Differences Between Other Tools



FDOT: QUALITY/LEVEL OF SERVICE HANDBOOK 2013

Figure 3-1
Examples of LOS By Mode for Urban Roadways

LOS	Automobile	Bicycle	Pedestrian	Bus
A/B				
C/D				
E/F				

Key Differences Between Other Tools

ARTPLAN

- Requires significantly fewer inputs than other tools such as HCS, TRANSYT-7F, and CORSIM
- Uses average travel speed rather than percent base free flow speed as the primary service measure

Number of inputs comparison:

Input	HCS Streets 2010	ARTPLAN
Turning Movements/Volume	12	3
Signal Timing Parameters	75+	5

ARTPLAN – Multimodal Analysis

Pedestrian/Bicycle/Transit Inputs

Input	HCS Streets 2010	ARTPLAN
Pedestrian Parameters	76	16
Bicycle Parameters	42	6
Transit Parameters	24	4

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Roadway Inputs

- **Roadway Class**
 - Class I: > 40 mph
 - Class II: < 35 mph
- **K Factor**
 - Urban – Rural Developed: 9.0
 - Rural Undeveloped: 9.5
- **% Heavy Vehicle**
 - Urbanized: 1.0
 - 2-lane to 6-lane: 2.0 – 3.0
 - Rural Developed: 3.0

Intersection Inputs

- Cycle Length
- Through g/G
- Left g/G
- Arrival Type
- On-Street Parking
- Parking Activity
- Number of Left/Right Turn Lanes
- Percent Left/Right Turns
- Total Left Turn Storage

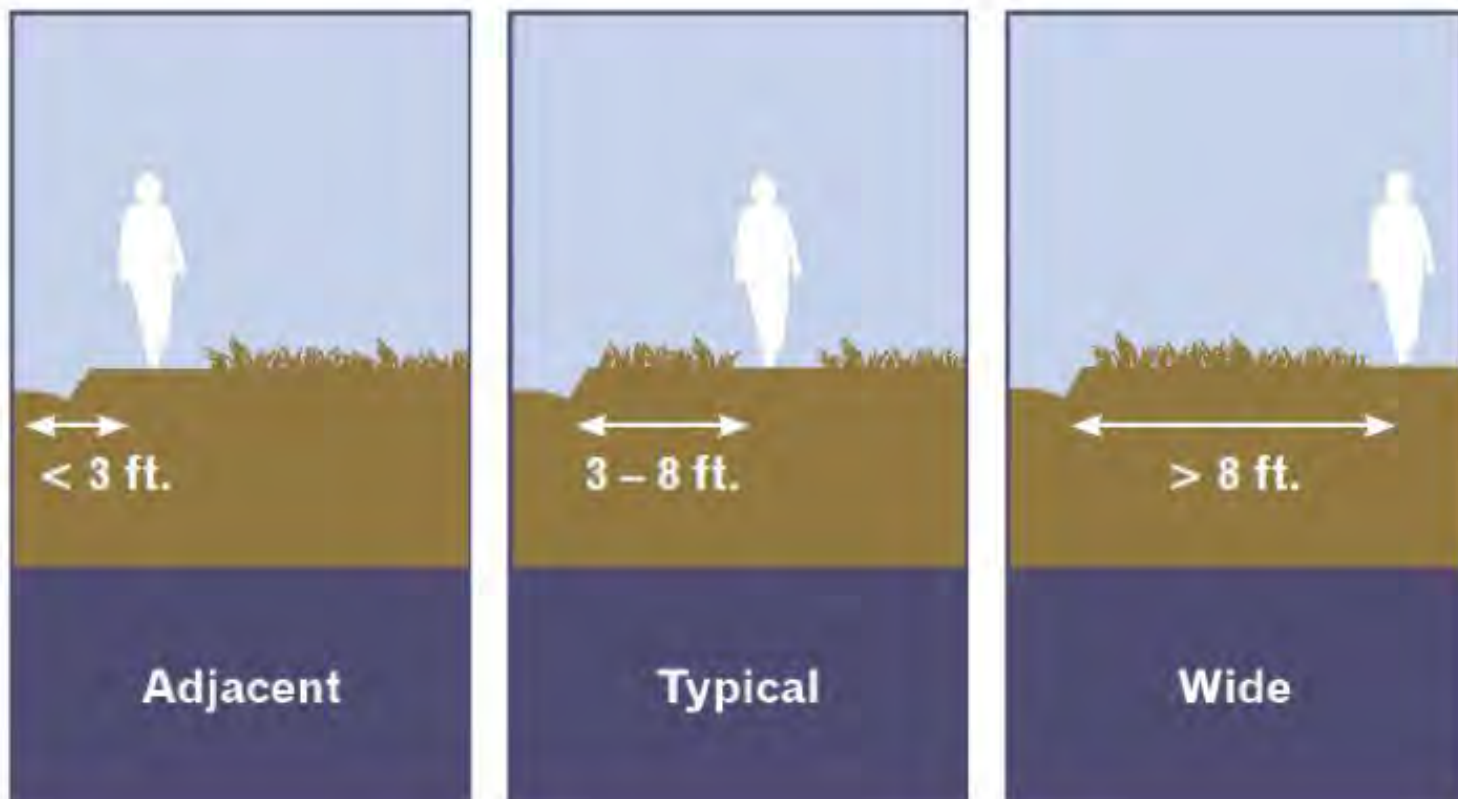
Pedestrian Mode Variables

- **Sidewalk** - paved walkway at the side of a roadway, typically 5 feet in width (on the directional side of the arterial being analyzed)
- **Sidewalk Protective Barrier** - Physical barriers of at least 3' high and spacing of 20' or less that separate pedestrians from vehicles, such as planted trees and on-street parking.



Pedestrian Mode Variables

- **Sidewalk/Roadway Separation** - lateral distance in feet from the outside edge of pavement to the inside edge of the sidewalk



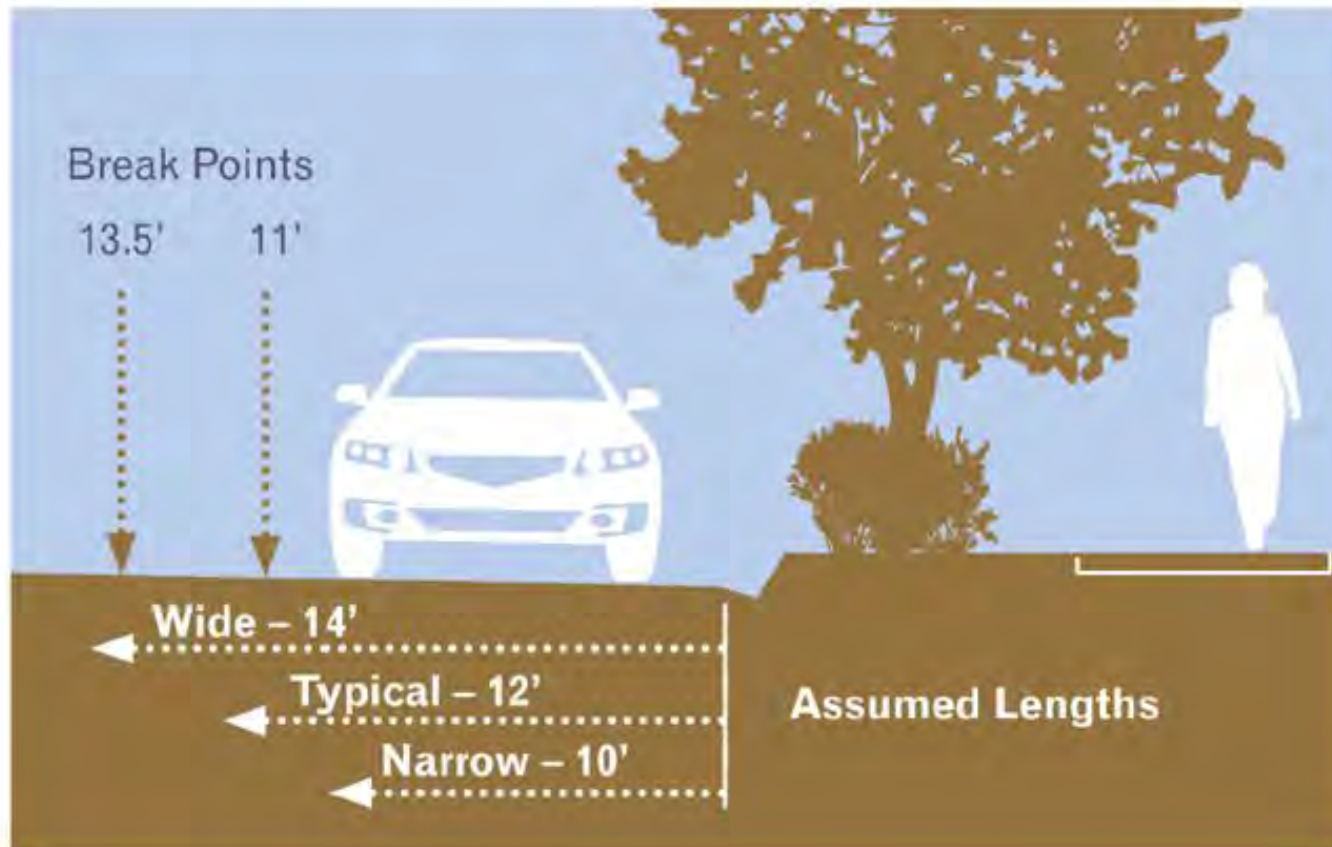
Bicycle Mode Variables

- **Side Path** - Off-street dedicated bicycle and pedestrian path (ARTPLAN analyzes bicycles only)
- **Side Path Separation** - distance between the side path and the outside edge of the roadway



Bicycle Mode Variables

- **Outside Lane Width** - Width, in feet, of a roadway's outside motorized vehicle through lane, not including the gutter



Bicycle Mode Variables

- **Pavement Condition** - classification of the roadway surface where bicycling usually occurs
 - **Desirable** - new or recently resurfaced
 - **Typical** - light gray color, the surface appears worn, and may have some cracks; however, the ride for the bicyclist is fairly smooth
 - **Undesirable** - noticeable cracks, broken pavement, or ruts



Bus Mode Variables

- Bus Stop Amenities

- **Excellent** – Shelter and bench
- **Good** – Shelter, no bench
- **Fair** – Bench, no shelter
- **Poor** – No bench or shelter



- Bus Stop Type

- **Typical** – Dwell time approximately 15 s
- **Major** – Dwell time approximately 35 s



- Passenger Load Factor





- Passengers divided by seats (0 - 300%)



**Table 3-1
Service Frequency LOS Thresholds**

Level of Service	Adjusted Service Frequency (Vehicles/hour)	Headway (minutes)	Comments
A	>6	<10	Passengers don't need schedules
B	>4	<15	Frequent service, passengers consult schedules
C	≥3	≤20	Maximum desirable time to wait if transit vehicle missed
D	≥2	≤30	Service unattractive to choice riders
E	≥1	≤60	Service available during hour
F	<1	>60	Service unattractive to all riders

Figure 2-4
Relationship of Inputs to Quality of Service Measures

Mode	Automobile	Bicycle	Pedestrian	Bus
Major Inputs	Volume and Lanes	Bicycle Lane	Sidewalk	Bus Frequency
	Volume and Lanes			
	Other Traffic and Roadway Characteristics			
	Arterial Running Speed			
	Arterial Running Time		Sidewalk	
	Control Characteristics			
	Control Delay			
Service Measure	Average Travel Speed	Bicycle LOS Score	Pedestrian LOS Score	Adjusted Bus Frequency
LOS Determinator	HCM LOS Criteria	HCM LOS Criteria	HCM LOS Criteria	TCQSM LOS Criteria
				

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ARTPLAN 2012: Rural Developed Area - [Service Volumes]

File View Help

K:\TWC_Civil\State\FDOT\SYSTEMS\QLOS\LOSPLAN\ARTPLAN\SCENARIOS\Bike.ru

Mode: Automobile Bike Pedestrian Bus

Notes:

- * Service volumes for the specific facility being analyzed, based on the number of thru lanes appearing in the intersection and segment data screens.
- ** Cannot be achieved based on input data provided.
- *** Not applicable for that level of service letter grade. See generalized tables notes for more details.

Lanes **Hourly Volume in Peak Direction**

	A	B	C	D	E
1	--	430	700	---	---
2	--	1030	1590	---	---
3	--	1610	2300	---	---
4	--	2190	3100	---	---
*	--	1030	1590	---	---


Lanes **Hourly Volume in Both Directions**

	A	B	C	D	E
2	--	760	1370	---	---
4	--	1810	2770	---	---
6	--	2830	4170	---	---
8	--	3850	5590	---	---
*	--	1810	2770	---	---

Lanes **Annual Average Daily Traffic**

	A	B	C	D	E
2	--	8000	14400	---	---
4	--	19100	29200	---	---
6	--	29800	43900	---	---
8	--	40500	58700	---	---
*	--	19100	29200	---	---

SubLink | LOS Results (Auto) | LOS Results (MM)



ARTPLAN 2012: Rural Developed Area - [Service Volumes]

File View Help

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Mode: Automobile Bike Pedestrian Bus

Notes:

- * Service volumes for the specific facility being analyzed, based on the number of thru lanes appearing in the intersection and segment data screens.
- ** Cannot be achieved based on input data provided.
- *** Not applicable for that level of service letter grade. See generalized tables notes for more details.

Buses Per Hour in Peak Direction

	A	B	C	D	E
1	--	107	175	284	452


Notes:

- Utilize service volume tables for other modes. All numbers shown are in terms of buses per hour only for the study hour in the single direction of highest traffic flow, and the daily resulting table includes the planning analysis factor (K) and the directional distribution factor (D).

Buses in Study Hour in Peak Dir. (Daily)

	A	B	C	D	E
2	--	9.04	14.64	23.47	37.25

Properties | Interaction | Link (Auto) | Link (MM) | Ped SubLink | LOS Results (Auto) | LOS Results (MM)



ARTPLAN 2012: Rural Developed Area - [Service Volumes]

File View Help

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Mode: Automobile Bike Pedestrian Bus

Notes:

- * Service volumes for the specific facility being analyzed, based on the number of thru lanes appearing in the intersection and segment data screens.
- ** Cannot be achieved based on input data provided.

Lanes **Hourly Volume in Peak Direction**

	A	B	C	D	E
1	--	250	570	1000	> 1000
2	--	590	1220	2000	> 2000
3	--	760	1800	2820	3000
4	--	1010	2400	3700	4000
*	--	590	1220	2000	> 2000


Lanes **Hourly Volume in Both Directions**

	A	B	C	D	E
2	--	490	1100	1760	> 1760
4	--	880	2140	3510	> 3510
6	--	1320	3190	4940	5270
8	--	1770	4200	6420	7020
*	--	880	2140	3510	> 3510

Lanes **Annual Average Daily Traffic**

	A	B	C	D	E
2	--	4900	12400	19200	> 19200
4	--	9300	22500	37000	> 37000
6	--	13900	33100	52000	55500
8	--	18600	44200	68700	73800
*	--	9300	22500	37000	> 37000

Properties | Interaction | Link (Auto) | Link (MM) | Ped SubLink | LOS Results (Auto) | LOS Results (MM)



ARTPLAN 2012: Rural Developed Area - [Service Volumes]

File View Help

K:\TWC_Civil\State\FDOT\SYSTEMS\QLOS\LOSPLAN\ARTPLAN\SCENARIOS\Bike.ru

Mode: Automobile Bike Pedestrian Bus

Notes:

- * Service volumes for the specific facility being analyzed, based on the number of thru lanes appearing in the intersection and segment data screens.
- ** Cannot be achieved based on input data provided.
- *** Combination of % RV's and Outside Lane Volume is outside the validated range of the Bicycle LOS model.

Lanes **Hourly Volume in Peak Direction**

	A	B	C	D	E
1	--	---	---	430	> 430
2	--	---	---	380	> 820
3	--	---	---	570	> 1250
4	--	---	---	280	> 1660
*	--	---	---	380	> 820


Lanes **Hourly Volume in Both Directions**

	A	B	C	D	E
2	--	---	---	760	> 760
4	--	---	---	660	> 1440
6	--	---	---	380	> 2190
8	--	---	---	490	> 2910
*	--	---	---	660	> 1440

Lanes **Annual Average Daily Traffic**

	A	B	C	D	E
2	--	---	---	9000	> 9000
4	--	---	---	7000	> 15100
6	--	---	---	3800	> 23100
8	--	---	---	5100	> 30600
*	--	---	---	7000	> 15100

Properties | Interaction | Link (Auto) | Link (MM) | Ped SubLink | LOS Results (Auto) | LOS Results (MM)



MULTIMODAL LEVEL OF SERVICE

QUESTIONS?