Bicycling and Walking
Performance Measures

Traditional, the new *Highway Capacity Manual*, and beyond…

Photo Credit: Sprinkle Consulting, Inc.

Bruce W. Landis, P.E., AICP

A New Game….

- "Balanced" transportation….
- Multi-modal
- Complete Streets
- Livability
- Sustainable "Whatever"
- Economically-Efficient Corridors
- Community Health Metrics….

Photo Credit: Sprinkle Consulting, Inc.

What gets “measured” gets “done”…

- Artifacts provide the evidence:
  - Federal Reporting by States (HPMS, etc.)
  - AASHTO (Roadway Geometric Design) Manuals
  - *Highway **Capacity** Manual*
  - Congestion Measures

Photo Credit: Sprinkle Consulting, Inc.

Livable, or Not Livable?

Photo Credit: Sprinkle Consulting, Inc.

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How Livable, or Complete?

Photo Credit: Sprinkle Consulting, Inc.

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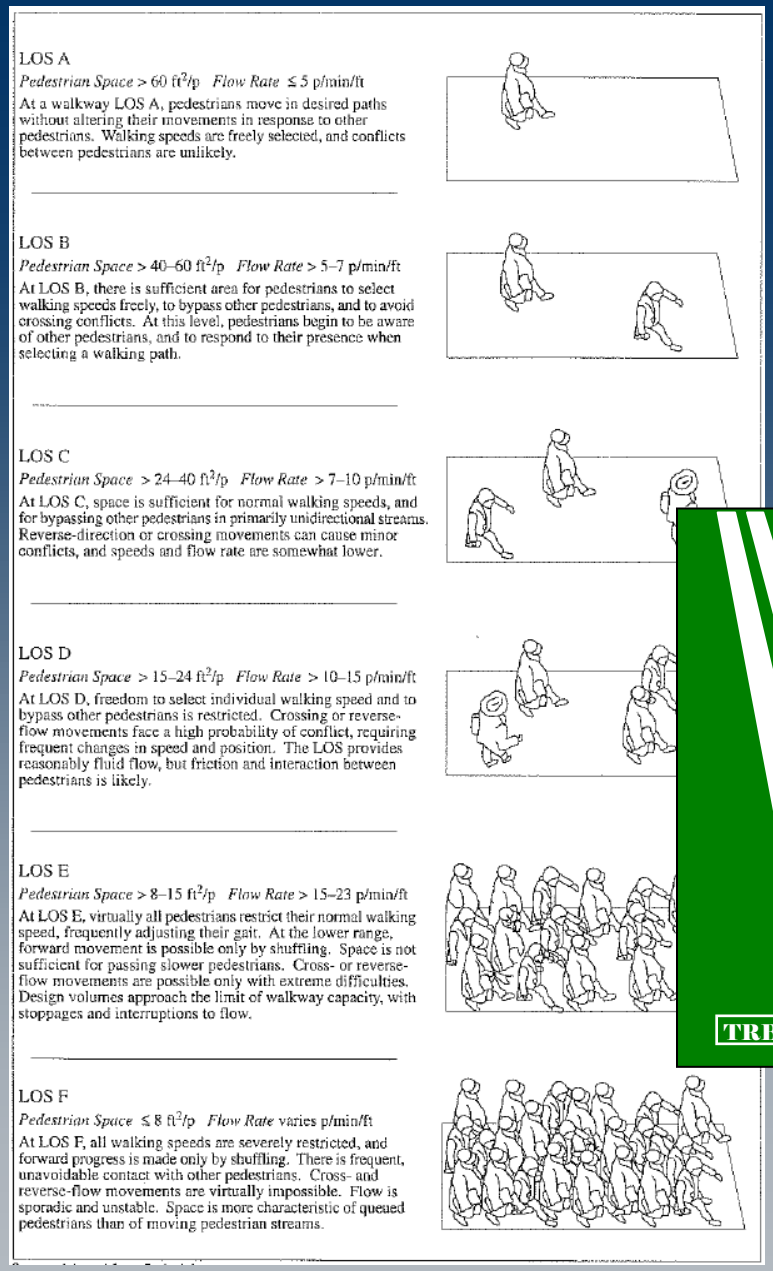

LOS A

Pedestrian Space > 60 ft²/p *Flow Rate* ≤ 5 p/min/ft

At a walkway LOS A, pedestrians move in desired paths without altering their movements in response to other pedestrians. Walking speeds are freely selected, and conflicts between pedestrians are unlikely.

LOS B

Pedestrian Space > 40–60 ft²/p *Flow Rate* > 5–7 p/min/ft

At LOS B, there is sufficient area for pedestrians to select walking speeds freely, to bypass other pedestrians, and to avoid crossing conflicts. At this level, pedestrians begin to be aware of other pedestrians, and to respond to their presence when selecting a walking path.

LOS C

Pedestrian Space > 24–40 ft²/p *Flow Rate* > 7–10 p/min/ft

At LOS C, space is sufficient for normal walking speeds, and for bypassing other pedestrians in primarily unidirectional streams. Reverse-direction or crossing movements can cause minor conflicts, and speeds and flow rate are somewhat lower.

LOS D

Pedestrian Space > 15–24 ft²/p *Flow Rate* > 10–15 p/min/ft

At LOS D, freedom to select individual walking speed and to bypass other pedestrians is restricted. Crossing or reverse-flow movements face a high probability of conflict, requiring frequent changes in speed and position. The LOS provides reasonably fluid flow, but friction and interaction between pedestrians is likely.

LOS E

Pedestrian Space > 8–15 ft²/p *Flow Rate* > 15–23 p/min/ft

At LOS E, virtually all pedestrians restrict their normal walking speed, frequently adjusting their gait. At the lower range, forward movement is possible only by shuffling. Space is not sufficient for passing slower pedestrians. Cross- or reverse-flow movements are possible only with extreme difficulties. Design volumes approach the limit of walkway capacity, with stoppages and interruptions to flow.

LOS F

Pedestrian Space ≤ 8 ft²/p *Flow Rate* varies p/min/ft

At LOS F, all walking speeds are severely restricted, and forward progress is made only by shuffling. There is frequent, unavoidable contact with other pedestrians. Cross- and reverse-flow movements are virtually impossible. Flow is sporadic and unstable. Space is more characteristic of queued pedestrians than of moving pedestrian streams.

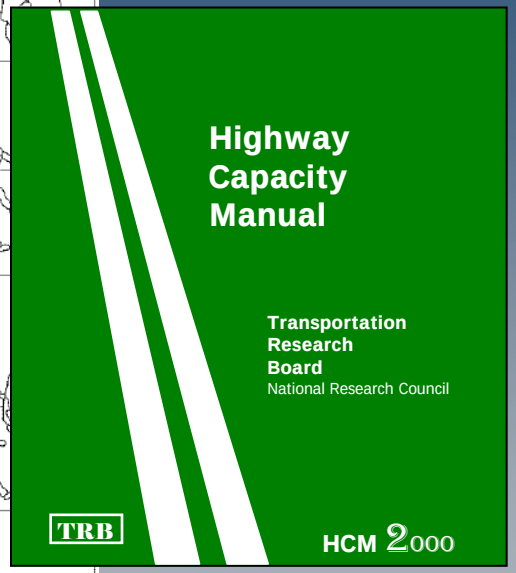

Photo by Dan Burden

Photo Credit: Sprinkle Consulting, Inc.

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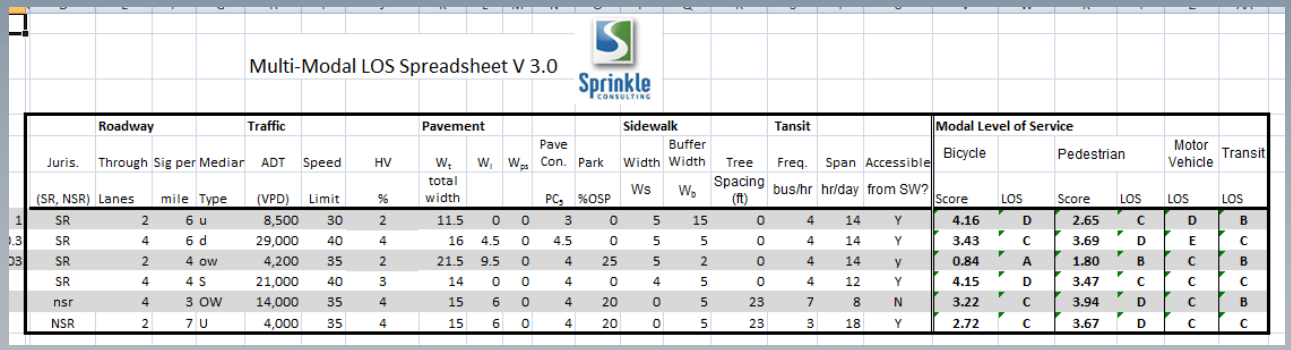
The Highway Capacity Manual

Insert Dowlings….



Multi-Modal LOS Spreadsheet V 3.0

	Roadway			Traffic			Pavement					Sidewalk			Tansit			Modal Level of Service					
	Juris.	Through	Sig per	Median	ADT	Speed	HV	W_t	W_l	W_{pt}	Pave Con.	Park	Width	Buffer Width	Tree	Freq.	Span	Accessible	Bicycle		Pedestrian		Motor Vehicle	Transit
	(SR, NSR)	Lanes	mile	Type	(VPD)	Limit	%	total width			PC_s	%OSP	Ws	W_b	Spacing (ft)	bus/hr	hr/day	from SW?	Score	LOS	Score	LOS	LOS	LOS
1	SR	2	6	u	8,500	30	2	11.5	0	0	3	0	5	15	0	4	14	Y	4.16	D	2.65	C	D	B
.3	SR	4	6	d	29,000	40	4	16	4.5	0	4.5	0	5	5	0	4	14	Y	3.43	C	3.69	D	E	C
03	SR	2	4	ow	4,200	35	2	21.5	9.5	0	4	25	5	2	0	4	14	y	0.84	A	1.80	B	C	B
	SR	4	4	S	21,000	40	3	14	0	0	4	0	4	5	0	4	12	Y	4.15	D	3.47	C	C	C
	nsr	4	3	OW	14,000	35	4	15	6	0	4	20	0	5	23	7	8	N	3.22	C	3.94	D	C	B
	NSR	2	7	U	4,000	35	4	15	6	0	4	20	0	5	23	3	18	Y	2.72	C	3.67	D	C	C

Photo Credit: Sprinkle Consulting, Inc.

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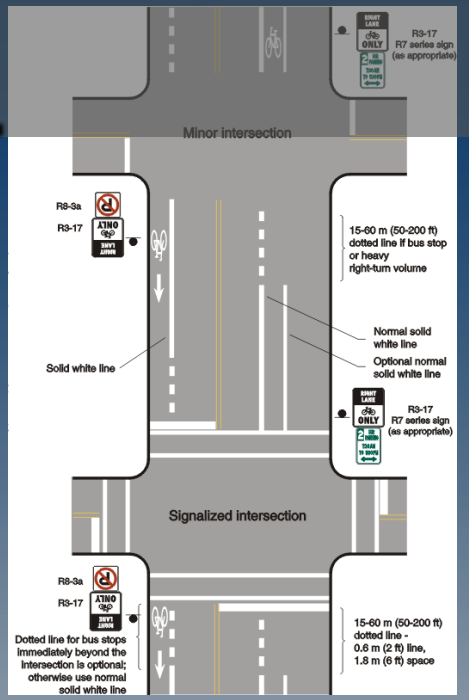
Planning, Design, Investment Decisions…



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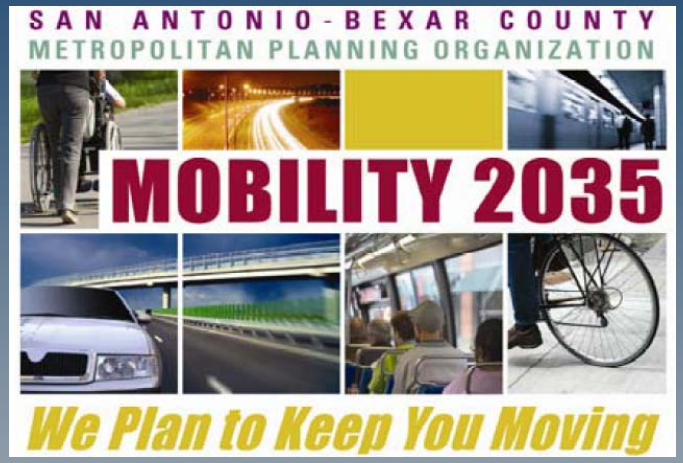
Reliable Measures

- Motor Vehicle LOS
- Bicycling LOS
- Pedestrian LOS
- Transit LOS
- Fuel Savings
- Emissions / GHG
- Health Savings
- Economic Effects

Photo Credit: Sprinkle Consulting, Inc.

San Antonio - Bexar Co. MPO



SAN ANTONIO BIKES
Office of Environmental Policy

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Photo Credit: Sprinkle Consulting, Inc.

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DOT Research Initiatives

Photo Credit: Sprinkle Consulting, Inc.

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

Bruce W. Landis, P.E., AICP

National Cooperative Highway Research Program **NCHRP 3-70**

- Multi-modal LOS for Arterials
- Evaluated Bicycling & Walking Conditions Methods
- Established the Best Measures / Models
- Acknowledged Superiority of Bike/Ped Measures' Approach to the Traditional MV LOS
- Tested then Intertwined all Modes' Methods
- Created First Inter-translation QOS/LOS
- Established Simultaneous Reporting

Photo Credit: Sprinkle Consulting, Inc.

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Nationwide Testing & Surveying

✓Oregon ✓Virginia ✓Florida

✓Texas ✓California

✓Illinois ✓Georgia

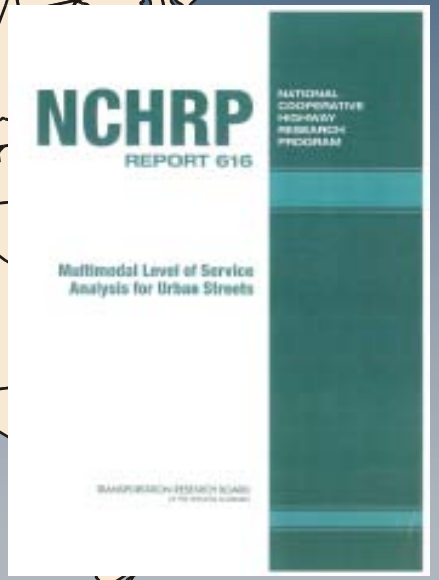

Photo Credit: Sprinkle Consulting, Inc.

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Austin's NCHRP 3-70 Test Corridors

- Guadalupe (MLK to Dean Keeton)
- Manchaca (Berkeley to SH 71)
- Manor (Chestnut to Rogge)

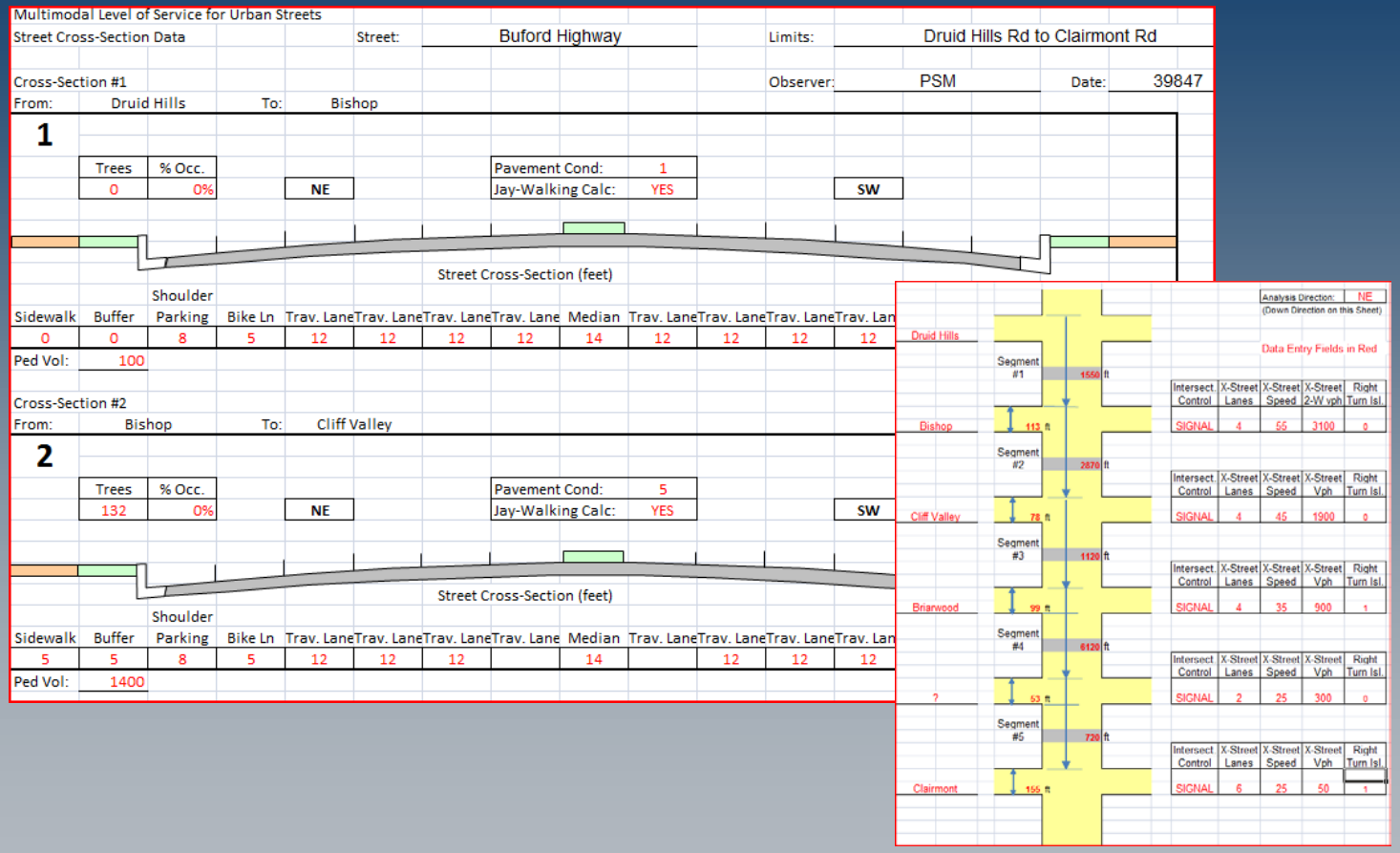
Photo Credit: Sprinkle Consulting, Inc.

National Cooperative Highway Research Program NCHRP 3-92

- Update of the ***HCM***
- Incorporated NCHRP reports, reliable peer- and agency-reviewed methods
- Places Bike, Ped, Transit QOS/LOS measures on par with MV measures
- Acknowledges the “new” approach of asking “customers” for performance measures

Photo Credit: Sprinkle Consulting, Inc.

Chapters 16 & 17 Urban Arterials
a.k.a. "Multi-modal LOS"



Multimodal Level of Service for Urban Streets

Street Cross-Section Data — Street: Buford Highway — Limits: Druid Hills Rd to Clairmont Rd

Cross-Section #1 — Observer: PSM — Date: 39847

From: Druid Hills To: Bishop

1

Trees	% Occ.		Pavement Cond:	1	
0	0%	NE	Jay-Walking Calc:	YES	SW

Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Trav. Lan
0	0	8	5	12	12	12	12	14	12	12	12	12

Ped Vol: 100

Cross-Section #2

From: Bishop To: Cliff Valley

2

Trees	% Occ.		Pavement Cond:	5	
132	0%	NE	Jay-Walking Calc:	YES	SW

Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Trav. Lan
5	5	8	5	12	12	12		14		12	12	12

Ped Vol: 1400

Analysis Direction: NE (Down Direction on this Sheet)

Data Entry Fields in Red

		Intersect. Control	X-Street Lanes	X-Street Speed	X-Street 2-W vph	Right Turn Isl.
Druid Hills	Segment #1 1550 ft					
Bishop	113 ft	SIGNAL	4	55	3100	0
	Segment #2 2870 ft					
Cliff Valley	78 ft	SIGNAL	4	45	1900	0
	Segment #3 1120 ft					
Briarwood	99 ft	SIGNAL	4	35	900	1
	Segment #4 6120 ft					
?	63 ft	SIGNAL	2	25	300	0
	Segment #5 720 ft					
Clairmont	155 ft	SIGNAL	6	25	50	1

Photo Credit: Sprinkle Consulting, Inc.

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Highway System Structure

- Points
- Segments
- Facilities
- Corridors
- Areas

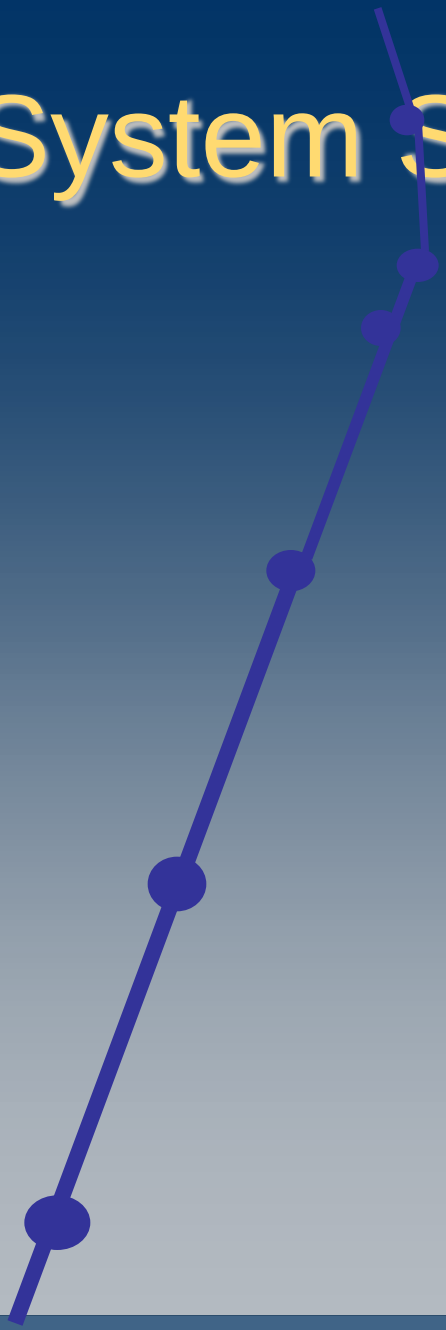

Photo Credit: Sprinkle Consulting, Inc.

Arterial Bicycle LOS Model

$$\text{Bicycle LOS} = a_1(\textbf{\textit{Seg}}) + a_2(\exp(\textbf{\textit{Int}})) + a_3(\textbf{Cflt})$$

Where

Seg = length weighted avg. *Segment Bicycle LOS Model*

exp = exponential function

Int = average *Intersection Bicycle LOS Model*

Cflt = number of conflicts per mile (e.g., driveways, unsig. Int.)

a_1, a_2, a_3 = coefficients

Photo Credit: Sprinkle Consulting, Inc.

Segment *Bicycle LOS Model*

$$Seg = 0.507 \ln\left(V/(4*PHF*L)\right) + 0.199SP_t*(1+10.38HV)^2 + 7.066(1/PC)^2 - 0.005(W_e)^2 + 0.760$$

Photo Credit: Sprinkle Consulting, Inc.

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Effective Pavement **Width** Effects….

Photo Credit: Sprinkle Consulting, Inc.

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MV **Volume** Effects….

Photo Credit: Sprinkle Consulting, Inc.

Pavement Condition Effects….

Photo Credit: Sprinkle Consulting, Inc.

Arterial Bicycle LOS Model

$$\text{Bicycle LOS} = a_1(\textbf{\textit{Seg}}) + a_2(\exp(\textbf{\textit{Int}})) + a_3(\textbf{Cflt})$$

Where

Seg	= length weighted avg. *Segment Bicycle LOS Model*
exp	= exponential function
Int	= average ***Intersection Bicycle LOS Model***
Cflt	= number of conflicts per mile (e.g., driveways, unsig. Int.)
a_1, a_2, a_3	= coefficients

Photo Credit: Sprinkle Consulting, Inc.

Intersection *Bicycle LOS*

$$IntBLOS = -\ 0.2144\ W_t + 0.0153\ CD + 0.0066\ (Vol_{15} / L) + 4.1324$$

W_t	= total width of outside through lane and shoulder / bike lane (if present)
CD	= crossing distance, the width of the side street (including auxiliary lanes and median)
Vol15	= volume of directional traffic during a 15-minute time period
L	= total number of through lanes on the approach to the intersection

Photo Credit: Sprinkle Consulting, Inc.

Establishing Target Level(s) of Service

Photo Credit: Sprinkle Consulting, Inc.

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Multi-Modal LOS Spreadsheet V 3.0

Sprinkle CONSULTING

	Roadway			Traffic			Pavement					Sidewalk			Tansit			Modal Level of Service					
	Juris.	Through	Sig per	Median	ADT	Speed	HV	W_t	W_l	W_{ps}	Pave Con.	Park	Width	Buffer Width	Tree	Freq.	Span	Accessible	Bicycle		Pedestrian		Motor Vehicle	Transit
	(SR, NSR)	Lanes	mile	Type	(VPD)	Limit	%	total width			PC_s	%OSP	Ws	W_b	Spacing (ft)	bus/hr	hr/day	from SW?	Score	LOS	Score	LOS	LOS	LOS
1	SR	2	6	u	8,500	30	2	11.5	0	0	3	0	5	15	0	4	14	Y	**4.16**	**D**	**2.65**	**C**	**D**	**B**
.3	SR	4	6	d	29,000	40	4	16	4.5	0	4.5	0	5	5	0	4	14	Y	**3.43**	**C**	**3.69**	**D**	**E**	**C**
03	SR	2	4	ow	4,200	35	2	21.5	9.5	0	4	25	5	2	0	4	14	y	**0.84**	**A**	**1.80**	**B**	**C**	**B**
	SR	4	4	S	21,000	40	3	14	0	0	4	0	4	5	0	4	12	Y	**4.15**	**D**	**3.47**	**C**	**C**	**C**
	nsr	4	3	OW	14,000	35	4	15	6	0	4	20	0	5	23	7	8	N	**3.22**	**C**	**3.94**	**D**	**C**	**B**
	NSR	2	7	U	4,000	35	4	15	6	0	4	20	0	5	23	3	18	Y	**2.72**	**C**	**3.67**	**D**	**C**	**C**

Photo Credit: Sprinkle Consulting, Inc.

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Pedestrian LOS Model

= Worse of (Density LOS, Roadway Environ. LOS)

Density LOS = letter grade of LOS for “crowding” density of sidewalks, walkways and street corners

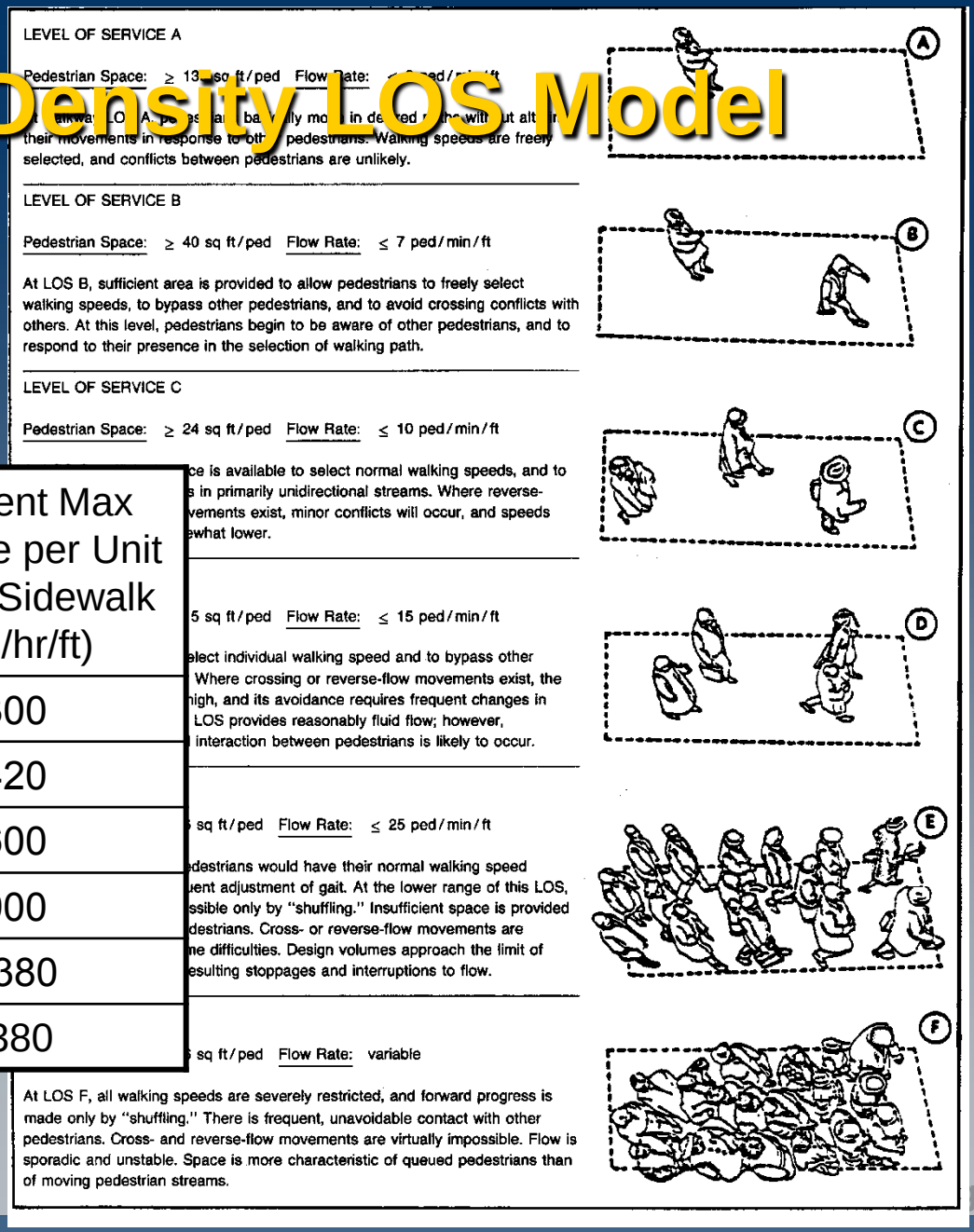
Roadway-Ped LOS = letter grade of LOS for urban street based on ped. safety / comfort factors reflecting interaction with motor vehicles

Photo Credit: Sprinkle Consulting, Inc.

Pedestrian Density LOS Model

From Chapter 18 of the 2000 *HCM*

LOS	Min. Ped Space per Person (SF)	Equivalent Max Flow Rate per Unit Width of Sidewalk (peds/hr/ft)
A	> 60	≤ 300
B	>40	≤ 420
C	>24	≤ 600
D	>15	≤ 900
E	>8	≤ 1380
F	≤ 8	>1380



LEVEL OF SERVICE A

Pedestrian Space: ≥ 13 sq ft/ped Flow Rate: ≤ ped/min/ft

their movements in response to other pedestrians. Walking speeds are freely selected, and conflicts between pedestrians are unlikely.

LEVEL OF SERVICE B

Pedestrian Space: ≥ 40 sq ft/ped Flow Rate: ≤ 7 ped/min/ft

At LOS B, sufficient area is provided to allow pedestrians to freely select walking speeds, to bypass other pedestrians, and to avoid crossing conflicts with others. At this level, pedestrians begin to be aware of other pedestrians, and to respond to their presence in the selection of walking path.

LEVEL OF SERVICE C

Pedestrian Space: ≥ 24 sq ft/ped Flow Rate: ≤ 10 ped/min/ft

ce is available to select normal walking speeds, and to
s in primarily unidirectional streams. Where reverse-
vements exist, minor conflicts will occur, and speeds
ewhat lower.

5 sq ft/ped Flow Rate: ≤ 15 ped/min/ft

elect individual walking speed and to bypass other
Where crossing or reverse-flow movements exist, the
high, and its avoidance requires frequent changes in
LOS provides reasonably fluid flow; however,
interaction between pedestrians is likely to occur.

sq ft/ped Flow Rate: ≤ 25 ped/min/ft

destrians would have their normal walking speed
ent adjustment of gait. At the lower range of this LOS,
ssible only by "shuffling." Insufficient space is provided
destrians. Cross- or reverse-flow movements are
ne difficulties. Design volumes approach the limit of
esulting stoppages and interruptions to flow.

sq ft/ped Flow Rate: variable

At LOS F, all walking speeds are severely restricted, and forward progress is made only by "shuffling." There is frequent, unavoidable contact with other pedestrians. Cross- and reverse-flow movements are virtually impossible. Flow is sporadic and unstable. Space is more characteristic of queued pedestrians than of moving pedestrian streams.

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Pedestrian LOS Model

Two Roadway Environment models…modified by…

$$PedLOS = (a_1 P\mathbf{Segment} + a_2 P\mathbf{Int} + c)\ (\mathbf{RCDF})$$

PSeg	= *Segment Pedestrian LOS* value
PInt	= *Intersection Pedestrian LOS* value
RCDF	= Roadway Crossing Difficulty Factor
a_1, a_2	= coefficients
c	= constant

Photo Credit: Sprinkle Consulting, Inc.

Segment Pedestrian LOS

$$\text{Seg LOS} = -1.2276 \ln (W_t + f_p \times \%OSP + f_b \times W_b + f_{sw} \times W_s) + 0.0091(Vol_{15}/L) + 0.0004\, SPD^2 + 6.0468$$

Where:

Ped Seg LOS = Pedestrian level of service score for a segment
ln = Natural log
W_t = Width of outside lane plus shoulder / bike lane
f_p = On-street parking effect coefficient (= 0.20)
%OSP = Percent of segment with on-street parking
f_b = Buffer area coefficient (= 5.37 for trees spaced 20 feet on center)
W_b = Buffer width (distance between edge of pavement and sidewalk, in feet)
fsw = Sidewalk presence coefficient (= 6 - 0.3Ws)
Ws = Width of sidewalk
Vol15 = Volume of motorized vehicles in the peak 15 minute period
L = Total number of directional through lanes
SPD = Average running speed of motorized vehicle traffic (mi/h)

Photo Credit: Sprinkle Consulting, Inc.

Intersection Pedestrian LOS

Ped Int LOS (Signal) = 0.00569 (RTOR+PermLefts) + 0.00013 (crossingTrafVol x TrafSpeed) + 0.0681 (# LanesCrossed $^{0.514}$) + 0.0401In(PedDelay) – RTCI (0.0027PerpTrafVol – 0.1946) + 1.7806

Where
RTOR+PermLefts = right-turn-on-red vehicles plus number of motorists making a permitted left turn in a 15 minute period

PerpTrafVol*PerpTrafSpeed = Product of the traffic in the outside through lane of the street being crossed and the midblock 85th percentile speed of traffic on the street being crossed in a 15 minute period

LanesCrossed = The number of lanes being crossed by the pedestrian
PedDelay = Average number of seconds the pedestrian is delayed before being able to cross the intersection

RTCI = Number of right turn channelization islands on the approach

Photo Credit: Sprinkle Consulting, Inc.

Roadway Crossing Difficulty Factor

RCDF = Max[0.80, Min{[(XLOS#-NXLOS#)/7.5 + 1.00],1.20}]

Where

RCDF = Roadway crossing difficulty factor

XLOS# = Roadway crossing difficulty LOS Number

NXLOS# = Non-crossing Pedestrian LOS number

= (0.318 PSeg + 0.220 PInt + 1.606)

Pseg = Ped. Segment LOS number (computed per equation #20)

Pint = Ped. Intersection LOS number (computed per equation #21)

Photo Credit: Sprinkle Consulting, Inc.

Pedestrian Level of Service

Level of Service	Score
A	≤ 1.5
B	> 1.5 and ≤ 2.5
C	> 2.5 and ≤ 3.5
D	> 3.5 and ≤ 4.5
E	> 4.5 and ≤ 5.5
F	> 5.5

Photo Credit: Sprinkle Consulting, Inc.

Chapters 16 & 17 Urban Arterials
a.k.a. Multi-modal or **Complete Streets** LOS

Multimodal Level of Service for Urban Streets

Street Cross-Section Data — Street: Buford Highway — Limits: Druid Hills Rd to Clairmont Rd

Cross-Section #1 — Observer: PSM — Date: 39847

From: Druid Hills To: Bishop

1

Trees	% Occ.			Pavement Cond:	1	
0	0%	NE		Jay-Walking Calc:	YES	SW

Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Trav. Lan
0	0	8	5	12	12	12	12	14	12	12	12	12

Ped Vol: 100

Cross-Section #2

From: Bishop To: Cliff Valley

2

Trees	% Occ.			Pavement Cond:	5	
132	0%	NE		Jay-Walking Calc:	YES	SW

Street Cross-Section (feet)

Sidewalk	Buffer	Shoulder Parking	Bike Ln	Trav. Lane	Trav. Lane	Trav. Lane	Trav. Lane	Median	Trav. Lane	Trav. Lane	Trav. Lane	Trav. Lan
5	5	8	5	12	12	12		14		12	12	12

Ped Vol: 1400

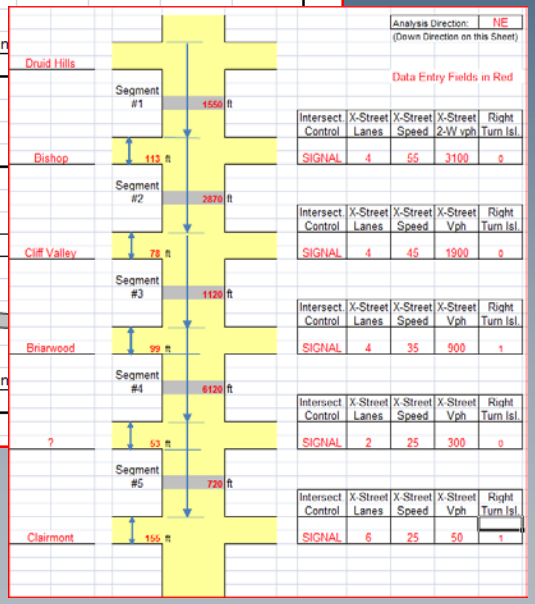

Photo Credit: Sprinkle Consulting, Inc.

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Reliable Measures

- Motor Vehicle LOS
- Bicycling LOS
- Pedestrian LOS
- Transit LOS
- Fuel Savings
- Emissions / GHG
- Health Savings
- Economic Effects

Photo Credit: Sprinkle Consulting, Inc.

ActiveTransportation Corridors

Advanced Tools for Livability Benefits…

Photo by Dan Burden

Bruce W. Landis, P.E., AICP

Photo Credit: Sprinkle Consulting, Inc.

Bruce W. Landis, P.E., AICP

Conserve by Bicycle and Pedestrian Study Benefits Calculator

Roadway Information

Roadway Name	new road name
Jurisdiction	Miami
SR Designation	
US Designation	
Functional Class	Arterial
Number of Lanes	4
AADT	36000
Signals	4
Divided or Undivided	Undivided
One- or two-way	Two-way
Area Type	Other
Speed Limit	30
Percent Heavy Vehicles	2 %
Motor Vehicle LOS*	E
Pavement Condition	3.5

*(from ARTPLAN or Generalized Tables)

Corridor Characteristics

Average Traveler Trip Length (n	4.0
Aesthetics (1-5)	3
Points of Interest (1-3)	2
Auto Occupancy (ppmv)	1.43
Bike/Ped Facility Length (mi.)	9
Independent Alignment Trail?	Yes
Corridor Study Length	24 miles

Transit Service

Buses Per Hour	2
Bus Occupancy (ppb)	35
Trains Per hour	7
Span of Service (hours per day)	13
Bus LOS*	3

Analysis Zone

Ellipse Length (mi.)	2.00
Ellipse Width (mi.)	0.40

Analyst	
Date	
Agency/Company	
Scenario	

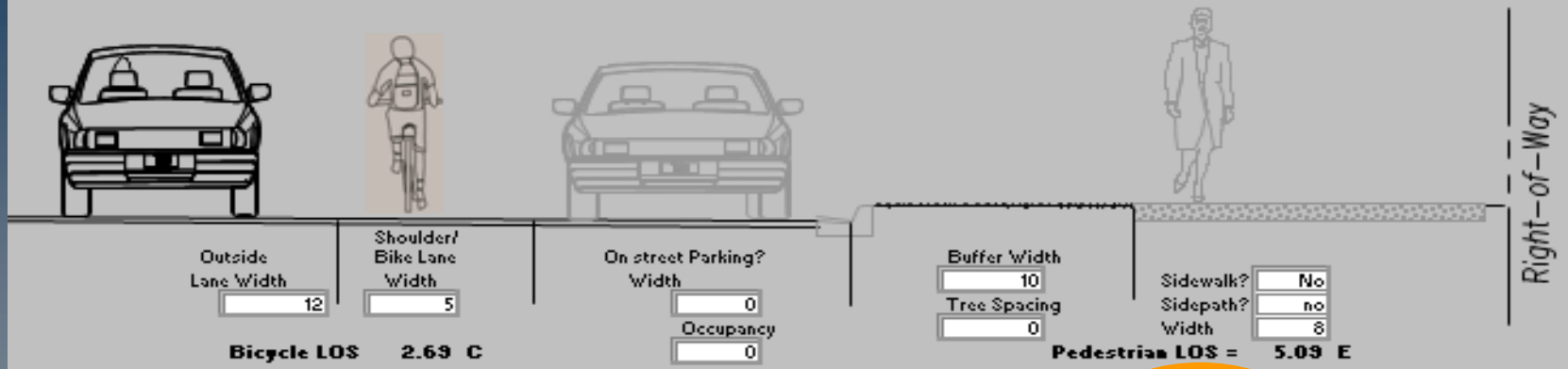
Influence Area Demographics

Population within 10 miles (people)	1000
Population within 0.5 miles (people	11000
Population Density (pop/sq. mi.)	7954
Employment Density (jobs/sq mi)	3683
Household Income ($/household)	100000

Connectivity Measures

Pedestrian	0.95
Bicycle	3.28

Enter Ped and Bike LOS Data



Bicycle LOS 2.69 C

Pedestrian LOS = 5.09 E

Mode Splits	Person Trips	Volume	Facility Users Hourly	Facility Users Daily
Motor Vehicles	3,682	2,575		
Transit	1,375	39		
Bicycle	4	4	13	167
Pedestrian	1	1	13	267

Induced Recreational	
Midpoint	Facility
78	141
278	2,502

Total Daily
2,575
39
308
2,768

Benefits of Facility		
Fuel Savings	3	Gal
CO2 Reduction	64	lbs
Health Benefits	$1,357	

Revised - 10/29/09

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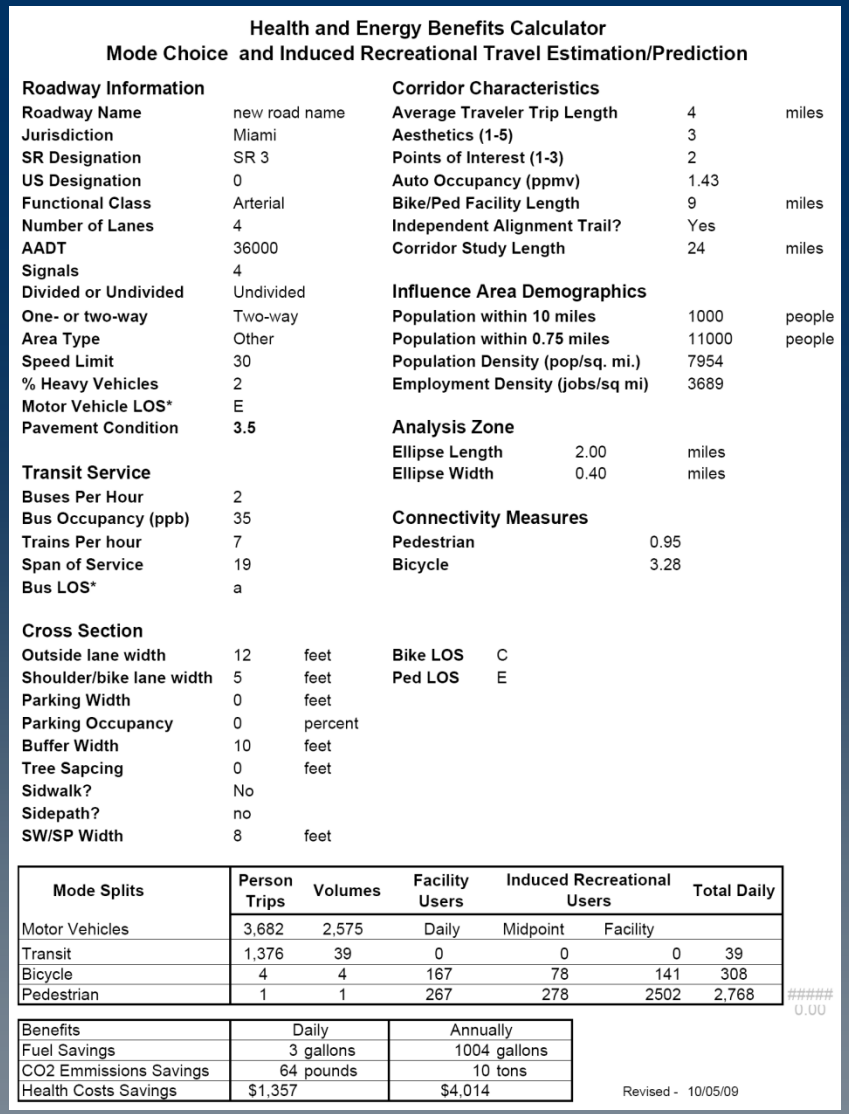
Report Output for Corridor Investments

Societal benefits:

- Fuel Savings
- CO^2 Emissions Savings
- Health Cost Savings



Health and Energy Benefits Calculator
Mode Choice and Induced Recreational Travel Estimation/Prediction

Roadway Information	
Roadway Name	new road name
Jurisdiction	Miami
SR Designation	SR 3
US Designation	0
Functional Class	Arterial
Number of Lanes	4
AADT	36000
Signals	4
Divided or Undivided	Undivided
One- or two-way	Two-way
Area Type	Other
Speed Limit	30
% Heavy Vehicles	2
Motor Vehicle LOS*	E
Pavement Condition	3.5

Transit Service	
Buses Per Hour	2
Bus Occupancy (ppb)	35
Trains Per hour	7
Span of Service	19
Bus LOS*	a

Cross Section		
Outside lane width	12	feet
Shoulder/bike lane width	5	feet
Parking Width	0	feet
Parking Occupancy	0	percent
Buffer Width	10	feet
Tree Sapcing	0	feet
Sidwalk?	No	
Sidepath?	no	
SW/SP Width	8	feet

Corridor Characteristics		
Average Traveler Trip Length	4	miles
Aesthetics (1-5)	3	
Points of Interest (1-3)	2	
Auto Occupancy (ppmv)	1.43	
Bike/Ped Facility Length	9	miles
Independent Alignment Trail?	Yes	
Corridor Study Length	24	miles

Influence Area Demographics		
Population within 10 miles	1000	people
Population within 0.75 miles	11000	people
Population Density (pop/sq. mi.)	7954	
Employment Density (jobs/sq mi)	3689	

Analysis Zone		
Ellipse Length	2.00	miles
Ellipse Width	0.40	miles

Connectivity Measures	
Pedestrian	0.95
Bicycle	3.28

Bike LOS	C
Ped LOS	E

Mode Splits	Person Trips	Volumes	Facility Users	Induced Recreational Users		Total Daily
Motor Vehicles	3,682	2,575	Daily	Midpoint	Facility	
Transit	1,376	39	0	0	0	39
Bicycle	4	4	167	78	141	308
Pedestrian	1	1	267	278	2502	2,768

Benefits	Daily	Annually
Fuel Savings	3 gallons	1004 gallons
CO2 Emmissions Savings	64 pounds	10 tons
Health Costs Savings	$1,357	$4,014

Revised - 10/05/09

Photo Credit: Sprinkle Consulting, Inc.

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Performance Metrics

Effective Mid-block Crossings

- Make motorists and pedestrians aware of the crossing
- Communicate the obligations
- Enable the motorists and the pedestrians to fulfill their obligations

Photo Credit: Sprinkle Consulting, Inc.

Performance Metrics "Buffered" Bike, or Comfort Lanes

Photo Credit: Sprinkle Consulting, Inc.

Your Resources…

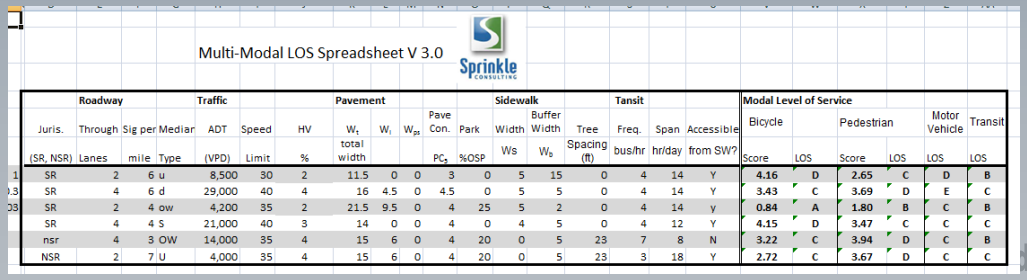
- *Highway Capacity Manual*
- *NCHRP Report 616*

  http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_616.pdf

- FDOT's *Q/LOS Handbook*

  http://www.dot.state.fl.us/planning/systems/sm/los/pdfs

- www.sprinkleconsulting.com
- 888 - 462 - 3514 Peyton McLeod or Bruce Landis



Multi-Modal LOS Spreadsheet V 3.0

	Roadway			Traffic			Pavement					Sidewalk			Tansit			Modal Level of Service					
	Juris.	Through	Sig per	Median	ADT	Speed	HV	W_t	W_l	W_{ps}	Pave Con.	Park	Width	Buffer Width	Tree	Freq.	Span	Accessible	Bicycle		Pedestrian		Motor Vehicle	Transit
	(SR, NSR)	Lanes	mile	Type	(VPD)	Limit	%	total width			PC_3	%OSP	Ws	W_b	Spacing (ft)	bus/hr	hr/day	from SW?	Score	LOS	Score	LOS	LOS	LOS
1	SR	2	6	u	8,500	30	2	11.5	0	0	3	0	5	15	0	4	14	Y	4.16	D	2.65	C	D	B
0.3	SR	4	6	d	29,000	40	4	16	4.5	0	4.5	0	5	5	0	4	14	Y	3.43	C	3.69	D	E	C
03	SR	2	4	ow	4,200	35	2	21.5	9.5	0	4	25	5	2	0	4	14	y	0.84	A	1.80	B	C	B
	SR	4	4	S	21,000	40	3	14	0	0	4	0	4	5	0	4	12	Y	4.15	D	3.47	C	C	C
	nsr	4	3	OW	14,000	35	4	15	6	0	4	20	0	5	23	7	8	N	3.22	C	3.94	D	C	B
	NSR	2	7	U	4,000	35	4	15	6	0	4	20	0	5	23	3	18	Y	2.72	C	3.67	D	C	C

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Bicycling and Walking
Performance Measures

Traditional, the new *Highway Capacity Manual*, and beyond…

Photo Credit: Sprinkle Consulting, Inc.

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