Amp
Bus Rapid Transit Project

Citizen Advisory Committee

September 30, 2014

Transit Alliance of Middle Tennessee

amp moving forward.

Nashville MTA

Nashville Area Metropolitan Planning Organization

Agenda

1. Traffic Update
2. Midtown Review
3. West Nashville Review

Traffic Update

Among fastest growing cities in U.S.

Businesses & residents moving here

Source: U.S. Census Bureau

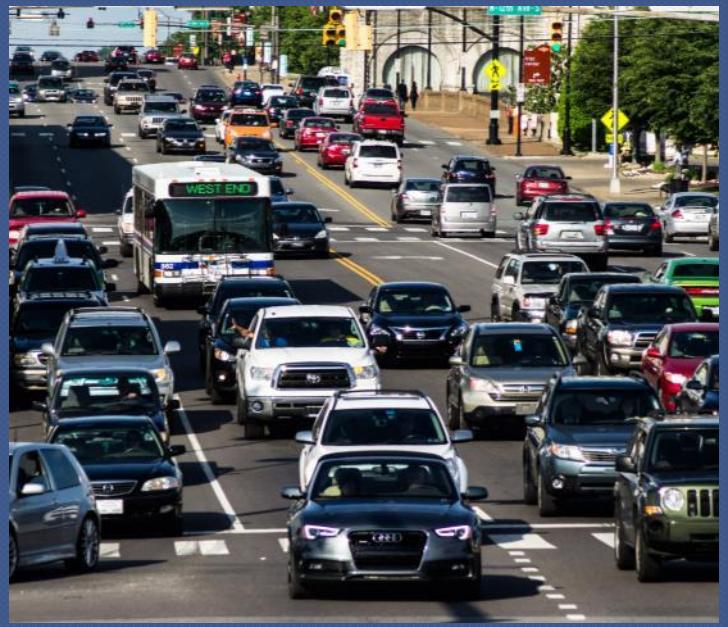
Traffic Update

- Nashville's success results in
  - ✓More jobs
  - ✓More people
  - ✓More traffic
- How to
  - ✓Continue success
  - ✓Get more people where they want to go
- Solutions complex & controversial

We want to move more people

Traffic Update

Traffic vs. Congestion



Traffic Update

Traffic Growth

Analysis includes traffic from 32 new developments located 1/2 mile each way off corridor

Example: So Bo & Music Row planning over 1million SF office plus 200 K retails, 3K apartments and 3 K hotel beds.

Source: METRO Public Works

Traffic Update

Modelling Inputs & Assumptions:

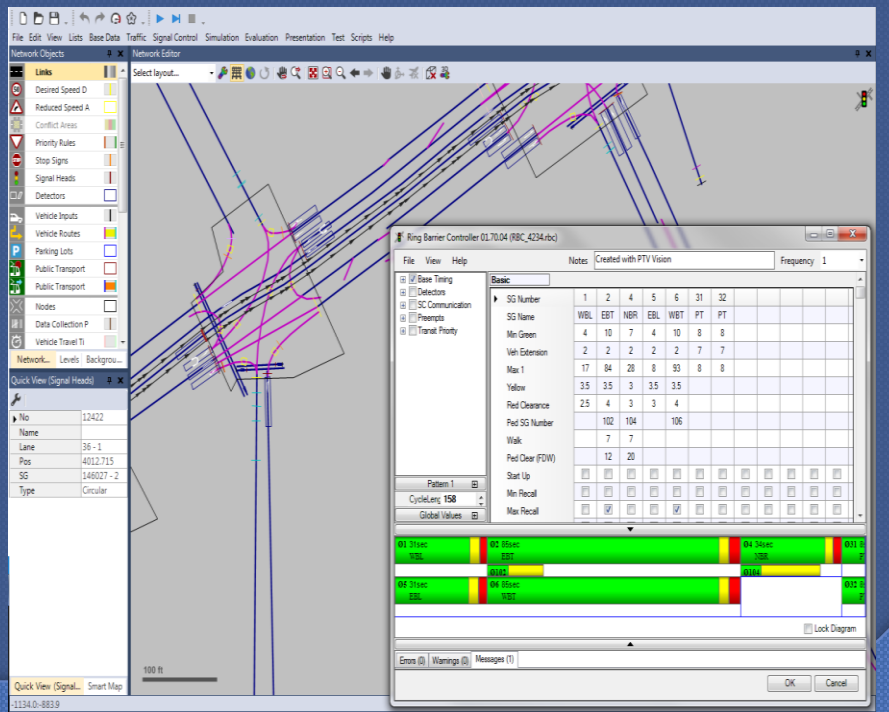
- Current traffic counts (2014)
- Updated forecast (reviewed with TDOT)
  - ✓Updated development projects
  - ✓No mode shift for existing traffic
    (existing drivers stay in cars)
  - ✓No diversion
    (drivers stay on West End)

Practical & conservative assumptions

Microsimulation Software

- Traffic Microsimulation VISSIM
  - Can model all modes including autos, trucks, bus rapid transit, bikes and pedestrian
  - Detailed analysis of Vehicle Network Performance
    - Delay
    - Queue Length
    - Travel Time

Used by many DOT's



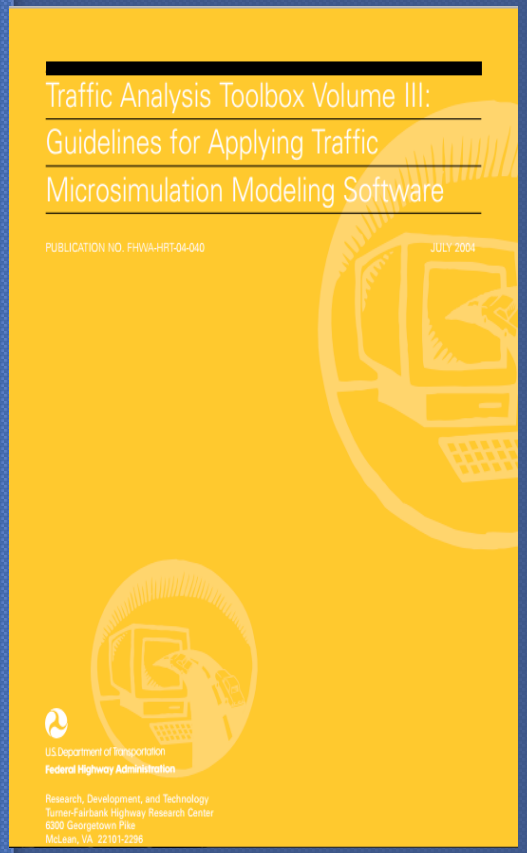
Microsimulation Overview

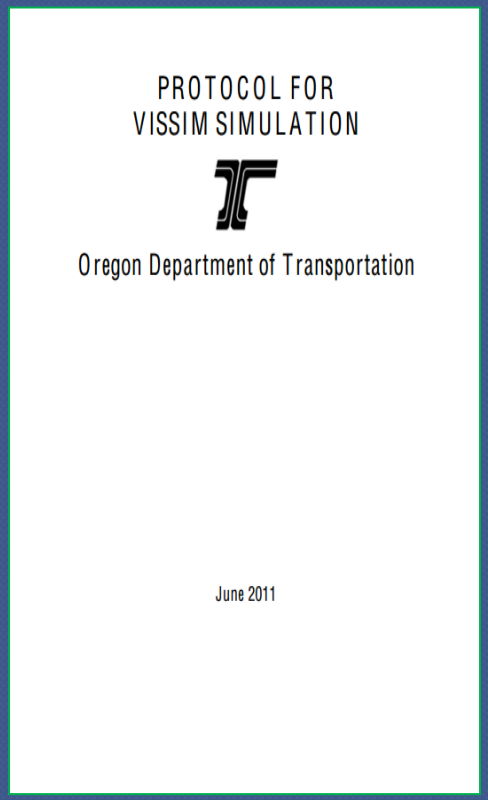
- Scope
  - 2 models
    - West
    - East
- Time of Day
  - AM Peak Hour
  - PM Peak Hour

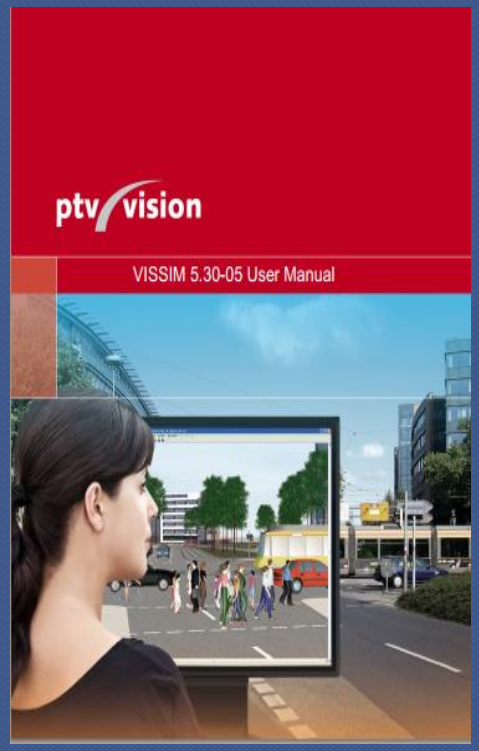
Microsimulation Overview

Scenario	Geometry	Volumes	Signal Timing
Existing	Existing Lane Configurations	2014	Existing timing provided by MPW
No Build	Existing Lane Configurations	2018 (Forecast)	Existing timing provided by MPW
Build	Current Design Lane Configurations	2018 (Forecast)	Optimized signal timing & Access management

Calibration Resources







Calibration

- Volume

  The best universal measure to compare simulation inputs and outputs is the GEH formula.

$$GEH = \sqrt{\frac{2(m-c)^2}{m+c}}$$

m = output traffic volume from the simulation model (vph)

c = input traffic volume (vph)

GEH < 5.0	Acceptable fit
5.0 <= GEH <= 10.0	Caution: possible model error or bad data
GEH > 10.0	Unacceptable

Source: ODOT VISSIM PROTOCOL

Existing Models Volume Calibration

Movement	Direction	OUTPUT	INPUT	GEH
1: West End Ave/Bosley Springs Rd - 65: West End Ave@152.2 - 10396@84.3	SW-NW	153	*155*	0.161
1: West End Ave/Bosley Springs Rd - 322: Bosley Springs Rd@458.2 - 323: Woodlawn Dr@2.6	NW-SE	3	*3*	0.000
1: West End Ave/Bosley Springs Rd - 322: Bosley Springs Rd@458.2 - 326: West End Ave@26.0	NW-SW	85	*79*	0.663
1: West End Ave/Bosley Springs Rd - 322: Bosley Springs Rd@458.2 - 331: West End Ave@9.5	NW-NE	26	*25*	0.198
1: West End Ave/Bosley Springs Rd - 325: Woodlawn Dr@258.5 - 326: West End Ave@26.0	SE-SW	83	*79*	0.444
1: West End Ave/Bosley Springs Rd - 325: Woodlawn Dr@258.5 - 331: West End Ave@9.5	SE-NE	97	*100*	0.302
1: West End Ave/Bosley Springs Rd - 325: Woodlawn Dr@258.5 - 10395@102.9	SE-NW	37	*39*	0.324
1: West End Ave/Bosley Springs Rd - 328: West End Ave@112.9 - 323: Woodlawn Dr@2.6	SW-SE	25	*26*	0.198
1: West End Ave/Bosley Springs Rd - 328: West End Ave@112.9 - 331: West End Ave@9.5	SW-NE	1586	*1565*	0.529
1: West End Ave/Bosley Springs Rd - 330: West End Ave@222.3 - 323: Woodlawn Dr@2.6	NE-SE	37	*38*	0.163
1: West End Ave/Bosley Springs Rd - 330: West End Ave@222.3 - 326: West End Ave@26.0	NE-SW	1004	*989*	0.475
1: West End Ave/Bosley Springs Rd - 330: West End Ave@222.3 - 10397@56.5	NE-NW	135	*134*	0.086
2: West End Ave/Hospital Driveway - 66: West End Ave@247.0 - 315: Hospital Driveway@21.7	SW-NW	236	*242*	0.388
2: West End Ave/Hospital Driveway - 311: Hospital Driveway@276.0 - 313: West End Ave@23.6	NW-NE	118	*116*	0.185
2: West End Ave/Hospital Driveway - 312: West End Ave@625.4 - 310: Hospital Driveway@24.4	NE-W	280	*298*	1.059
2: West End Ave/Hospital Driveway - 312: West End Ave@625.4 - 10185@3.0	NE-SW	1200	*1185*	0.434
2: West End Ave/Hospital Driveway - 316: Hospital Driveway@128.0 - 10393: West End Ave@0.2	N-SW	26	*24*	0.400
2: West End Ave/Hospital Driveway - 332: West End Ave@236.1 - 313: West End Ave@23.6	SW-NE	1484	*1463*	0.547

- 55 intersections with total of 518 movements were analyzed under existing scenarios.
- 4 movements have 5.0 <= GEH <= 10.0 under existing AM and PM scenarios.

The model is reliable & accurate

Calibration

- Travel Time

Criteria	Acceptance Targets
Modeled travel time within ±1 minutes for routes with observed travel times less than 7 minutes.	All routes identified in the Data Collection Plan
Modeled travel time within ±15% for routes with observed travel times greater than 7 minutes.	All routes identified in the Data Collection Plan

Source: FHWA Traffic Analysis Toolbox Volume III

Existing Models Travel Time Calibration

Scenario		Travel Time			
		Field	Calibration Range		Model
			Min	Max	
West End Ave from St. Thomas Hospital to 12th Ave South	AM Peak Hour	14:22	12:13	16:31	15:12
	PM Peak Hour	13:30	11:28	15:31	13:24
West End Ave from 12th Ave South to St. Thomas Hospital	AM Peak Hour	13:51	11:46	15:56	12:33
	PM Peak Hour	18:31	15:44	21:18	16:34
From Main Street and 10th Street to Woodland St. and 1st Street	AM Peak Hour	05:42	04:42	06:42	05:57
	PM Peak Hour	04:18	03:18	05:18	04:57
From Woodland St. and 1st Street to Main Street and 10th Street	AM Peak Hour	06:16	05:16	07:16	05:24
	PM Peak Hour	07:28	06:20	08:35	08:00

Travel Time Results - Peak Directions (West Model)

Travel Time-West End/Midtown (St. Thomas to 12th Avenue)		
Scenario	Inbound (Eastbound) During AM Peak Hour	Outbound (Westbound) During PM Peak Hour
Existing - How long does it take to drive today?	14:56	15:30
Future, Without Amp - In four years (once all known development is complete), how long will it take to drive if corridor is unchanged?	19:33 (30.9 % slower than Existing)	18:45 (21.0 % slower than Existing)
Future, With Amp - In four years, how long will it take to drive if the Amp is built?	16:05 (17.7 % quicker than Future, Without Amp)	16:10 (13.8 % quicker than Future, Without Amp)
Future, On Amp - In four years, how long will it take to travel on the Amp?	13:41-15:00*	12:53-14:50*

**Model output varies based on type/extent of Transit Signal Priority.*

Travel Time Results - Peak Directions (East Model)

Travel Time-East Nashville (10th Street to S.1st Street)		
Scenario	Inbound (Westbound) During AM Peak Hour	Outbound (Eastbound) During PM Peak Hour
Existing - How long does it take to drive today?	05:57	08:00
Future, Without Amp - In four years (once all known development is complete), how long will it take to drive if corridor is unchanged?	07:02 (18.2 % slower than Existing)	09:29 (18.5 % slower than Existing)
Future, With Amp - In four years, how long will it take to drive if the Amp is built?	07:01 (0.2 % quicker than Future, Without Amp)	08:10 13.9 % quicker than Future, Without Amp
Future, On Amp - In four years, how long will it take to travel on the Amp?	06:48-07:56*	09:09-09:56*

**Model output varies based on type/extent of Transit Signal Priority.*

Traffic Terminology

LOS	Average Control Delay per Vehicle (seconds)	Description
A	≤ 10.0	Very low delay with extremely favorable progression. Most vehicles don't stop.
B	> 10.0 and ≤ 20.0	Generally good progression. Increase number of stops from that described for LOS "A" resulting in higher delays
C	> 20.0 and ≤ 35.0	Fair progression with increased delay. Number of stopping vehicles become significant; however, many still pass through the intersection without stopping. Stable flow.
D	> 35.0 and ≤ 55.0	The influence of congestion becomes more noticeable. Longer delays resulting from unfavorable progression, longer cycles, or high V/C ratios. Approaching unstable flow.
E	> 55.0 and ≤ 80.0	Limit of acceptable delay. Long delays associated with poor progression, long cycles, or high V/C ratios.
F	> 80.0	Unacceptable operation resulting from oversaturation (flow rates exceed capacity). Poor progression, long cycles, and high V/C ratios.

SOURCE: Highway Capacity Manual, TRB Special Report 209

Abbreviations:
LOS = Level of service
V/C = Volume to capacity ratio

Delay and LOS Results (Critical Intersections)

Intersection	AM PEAK HOUR						PM PEAK HOUR					
	Existing (2013)		No Build (2018)		Build (2018)		Existing (2013)		No Build (2018)		Build (2018)	
	Delay	*LOS*	*Delay*	*LOS*	*Delay*	*LOS*	*Delay*	*LOS*	*Delay*	*LOS*	*Delay*	*LOS*
West End Ave/Bowling Ave	30.75	C	43.98	D	30.63	D	30.77	C	31.65	C	26.33	C
West End Ave/I-440 EB Off Ramp	23.46	C	29.83	C	23.50	C	13.45	B	13.37	B	11.42	B
West End Ave/I-440 WB Off Ramp	53.57	D	74.22	E	70.15	E	18.92	B	36.29	D	17.59	B
West End Ave/I-440 Off Ramp-New	NA	NA	NA	NA	20.60	C	NA	NA	NA	NA	19.06	B
West End Ave/Murphy Rd	41.87	D	44.39	D	58.45	E	46.81	D	54.86	D	44.46	D
West End Ave/31st Ave	40.12	D	42.87	D	44.26	D	67.82	E	81.31	F	55.04	E
West End Ave/25th Ave	20.98	C	22.74	C	28.37	C	20.02	C	41.51	D	31.00	C
West End Ave/16th Ave	28.93	C	33.66	C	37.42	D	40.29	D	52.45	D	47.93	D
Broadway/14th Ave	22.66	C	27.00	C	18.51	B	24.0	C	28.46	C	32.35	C
Broadway/13th Ave	33.06	C	35.67	D	26.66	C	15.59	B	16.47	B	36.19	D

Summary

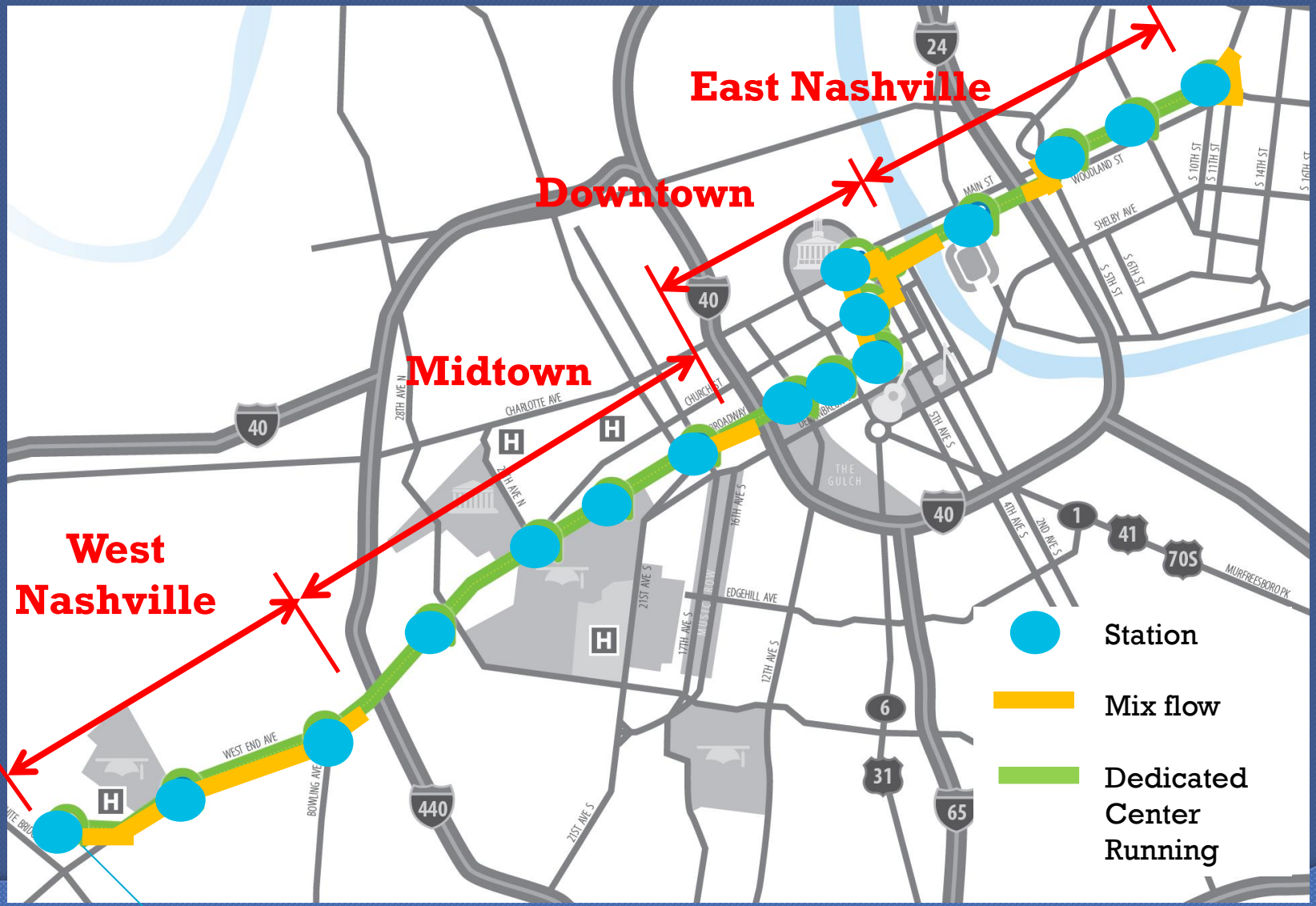
- Increases people capacity while maintaining acceptable traffic flow.
- Average increase in signal delay for Build Case (2.8 Sec.) is less than No Build (4.0 sec.).
- The amount of delay typically remains below acceptable levels, though average signal delay for build case increases.
- For the west, travel time is significantly lower (20-30% time savings) compared to the future No Build car travel time.
- For downtown, not a significant travel time reduction compared to the future No Build car travel time due to the limited exclusive lanes.
- For the east, travel time remains close to the car travel time (including stops and dwell time) as congestion is less.

Micro-simulation

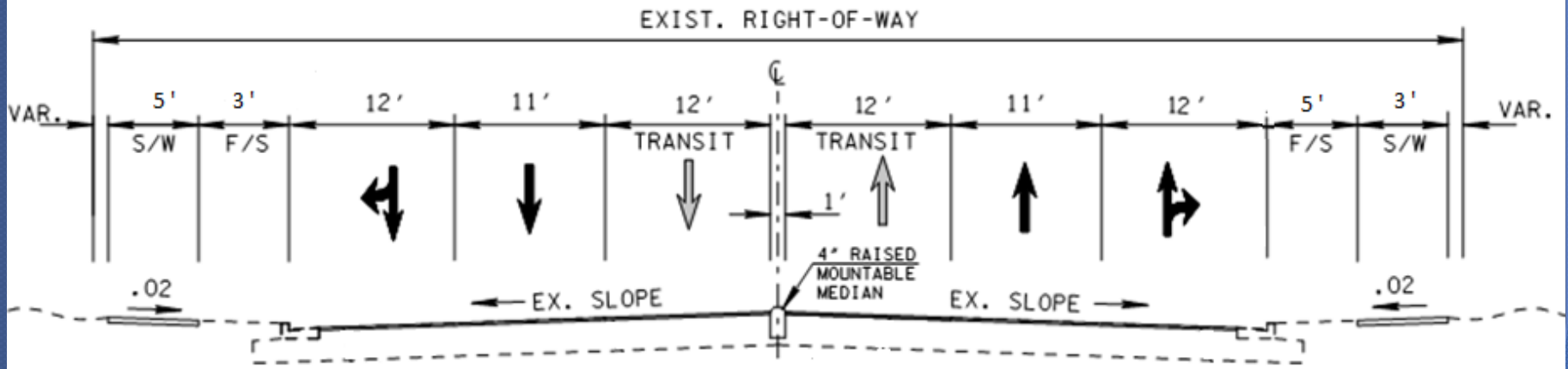
Review

Murphy Rd & 31st Ave.

Midtown


East Nashville
Downtown
Midtown
West Nashville
Station
Mix flow
Dedicated Center Running

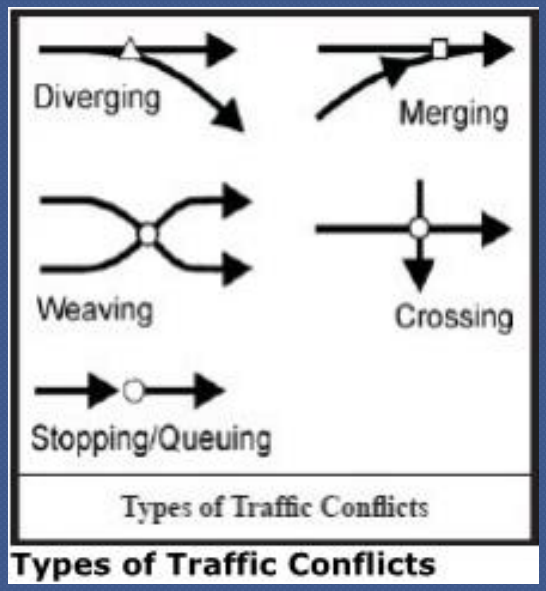
Midtown – Typical



Two lanes each way = No loss of through capacity

Midtown Review

1. How will removing lefts impact access?



Types of Traffic Conflicts

- Access will be safer.
- Medians reduce crashes by 37% and injuries by 48%

Source: FHWA Access management primer, Safe Access is Good for Business,

Midtown Review

2. What will be done to minimize construction impacts?

- Two travel lanes each way
- Rolling closures – Several blocks closed at a time. Not whole road.
- Part width – One side at a time
- Minimize closure period – 2 to 3 mo.
- Off peak work hours.
- Business signs, info cards, web & news

West Nashville

Status

- Design issue meeting March 2014
- Scheduling community meeting

Closing

Questions
&
Comments