AGENDA

Synchro

HCM 2010

SimTraffic

Tools for Analysis of Capacity and Efficient Flow for Roundabout Design: Part III, *Synchro & SimTraffic*

OUTLINE

- Synchro
  - HCM 2010
  - Coding Requirements
  - Example
- Differences between Synchro & SimTraffic
- SimTraffic Calibration for Roundabouts

SYNCHRO 9 DEFINED

- Software package for modeling and optimizing traffic signal timings.
  - Capacity Analysis
  - Coordination
  - Actuated Signals
  - Time-Space Diagram
  - Integration with SimTraffic
- Analysis of TWSC & AWSC Intersections
- One/Two-Lane Roundabouts

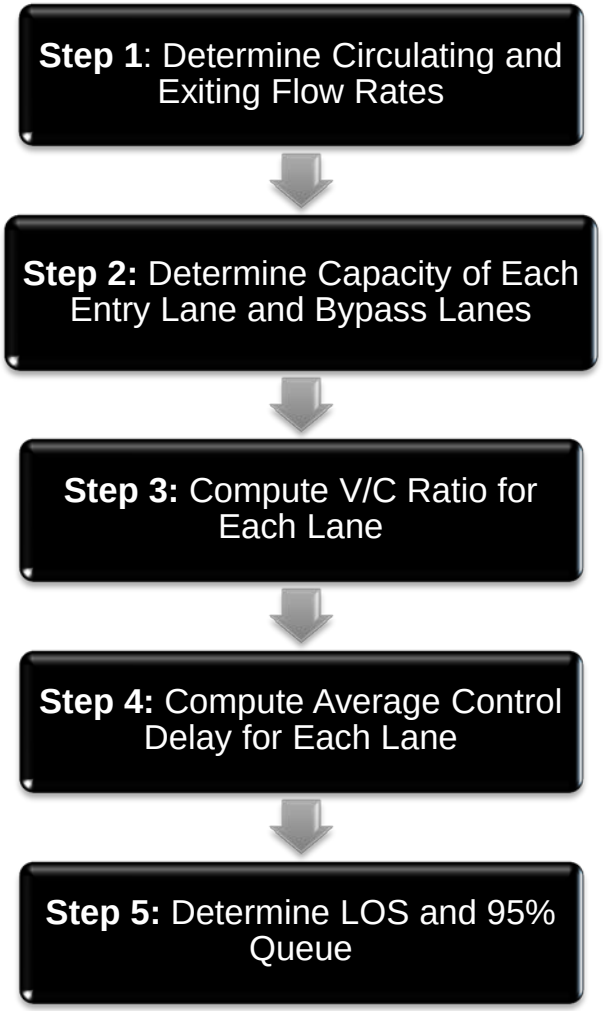
SYNCHRO'S METHODOLOGIES

- Unsignalized Intersections
  - All-Way Stop Control (HCM 2000 & 2010)
  - Two-Way Stop Control (HCM 2000 & 2010)
  - Roundabouts (HCM 2010)
- Signalized Intersections
  - Percentile Delay
  - HCM 2000
  - HCM 2010

HCM 2010 Roundabouts (Chapters 21 & 33)

- Based on empirical data within US
- Lower capacities than other countries
- Analysis of two-lane roundabouts
  - Lane-by-lane analysis for multilane roundabouts
- Entry, exit and conflicting flow rates
- Capacity function of conflicting flow
  - Right & left computed separately
- Right-turn by-pass lanes considered
  - Either yielding exits or free flowing
- Encouraged to calibrate to local conditions
  - Critical and follow-up headways

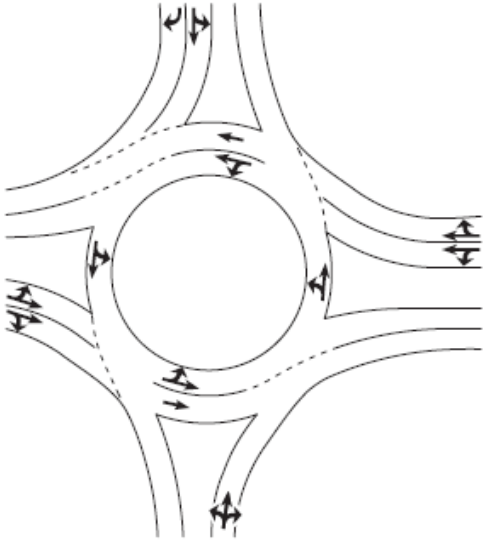
HCM 2010 Roundabouts (cont'd)



HCM 2010 Roundabouts Example 21-2

AGENDA

- Synchro
- HCM 2010
- SimTraffic



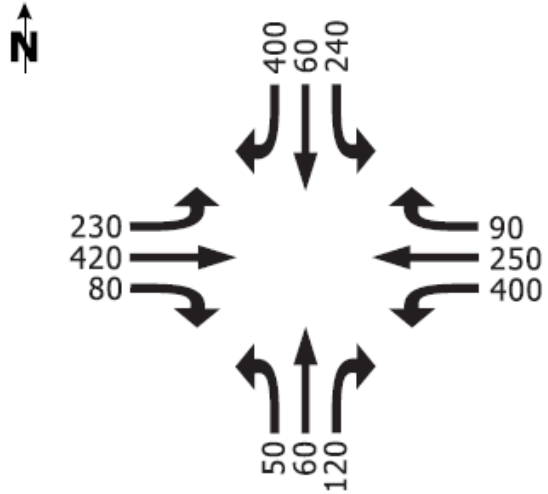
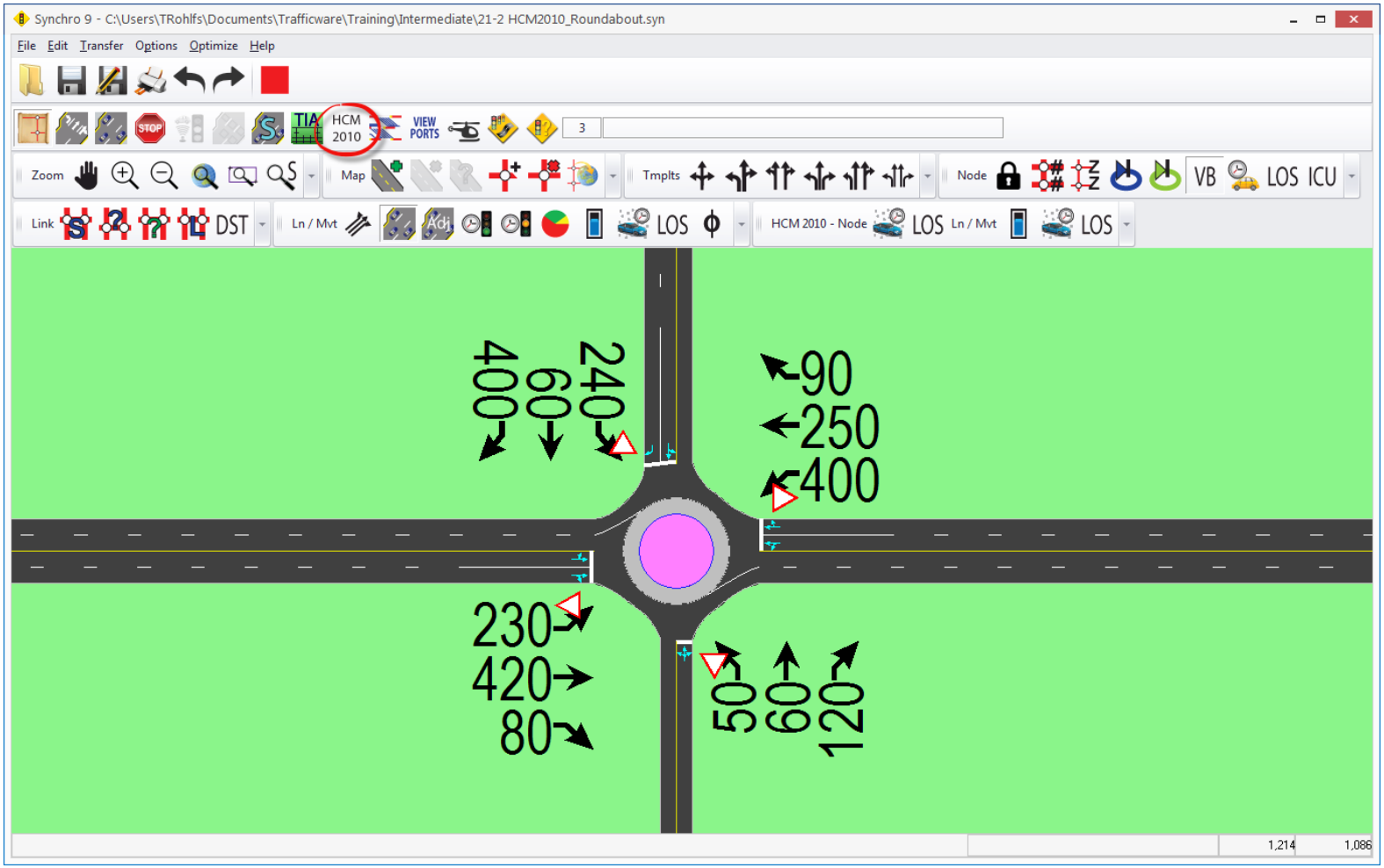


Exhibit 21-24
Demand Volumes and Lane Configurations for Example Problem 2

HCM 2010 Roundabouts Example 21-2

AGENDA

- Synchro
- HCM 2010
- SimTraffic



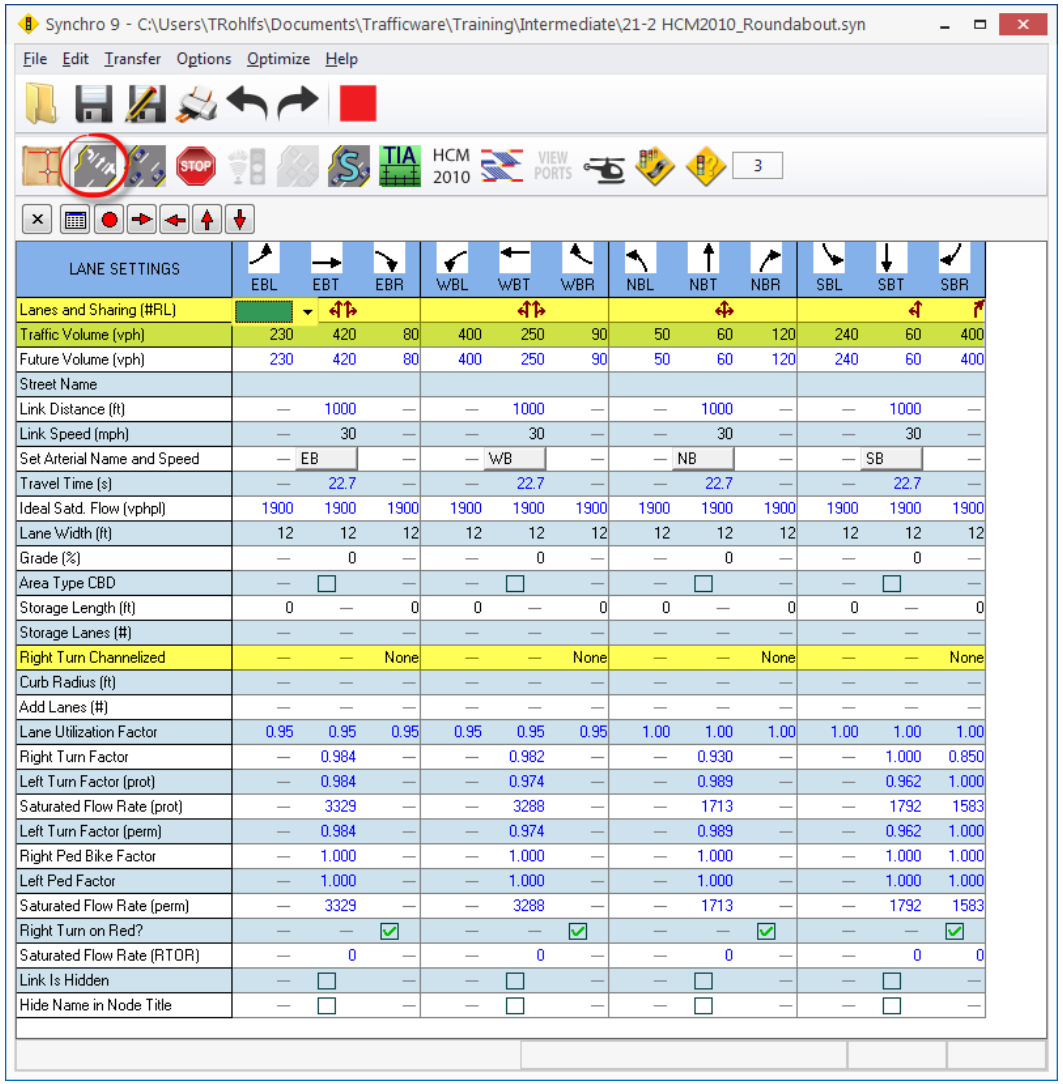
HCM 2010 Roundabouts Example 21-2
Key Inputs

AGENDA

Synchro

HCM 2010

SimTraffic



LANE SETTINGS	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lanes and Sharing (#RL)												
Traffic Volume (vph)	230	420	80	400	250	90	50	60	120	240	60	400
Future Volume (vph)	230	420	80	400	250	90	50	60	120	240	60	400
Street Name												
Link Distance (ft)	—	1000	—	—	1000	—	—	1000	—	—	1000	—
Link Speed (mph)	—	30	—	—	30	—	—	30	—	—	30	—
Set Arterial Name and Speed	—	EB	—	—	WB	—	—	NB	—	—	SB	—
Travel Time (s)	—	22.7	—	—	22.7	—	—	22.7	—	—	22.7	—
Ideal Satd. Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)	—	0	—	—	0	—	—	0	—	—	0	—
Area Type CBD	—	☐	—	—	☐	—	—	☐	—	—	☐	—
Storage Length (ft)	0	—	0	0	—	0	0	—	0	0	—	0
Storage Lanes (#)	—	—	—	—	—	—	—	—	—	—	—	—
Right Turn Channelized	—	—	None	—	—	None	—	—	None	—	—	None
Curb Radius (ft)	—	—	—	—	—	—	—	—	—	—	—	—
Add Lanes (#)	—	—	—	—	—	—	—	—	—	—	—	—
Lane Utilization Factor	0.95	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Right Turn Factor	—	0.984	—	—	0.982	—	—	0.930	—	—	1.000	0.850
Left Turn Factor (prot)	—	0.984	—	—	0.974	—	—	0.989	—	—	0.962	1.000
Saturated Flow Rate (prot)	—	3329	—	—	3288	—	—	1713	—	—	1792	1583
Left Turn Factor (perm)	—	0.984	—	—	0.974	—	—	0.989	—	—	0.962	1.000
Right Ped Bike Factor	—	1.000	—	—	1.000	—	—	1.000	—	—	1.000	1.000
Left Ped Factor	—	1.000	—	—	1.000	—	—	1.000	—	—	1.000	1.000
Saturated Flow Rate (perm)	—	3329	—	—	3288	—	—	1713	—	—	1792	1583
Right Turn on Red?	—	—	☑	—	—	☑	—	—	☑	—	—	☑
Saturated Flow Rate (RTOR)	—	0	—	—	0	—	—	0	—	—	0	0
Link Is Hidden	—	☐	—	—	☐	—	—	☐	—	—	☐	—
Hide Name in Node Title	—	☐	—	—	☐	—	—	☐	—	—	☐	—

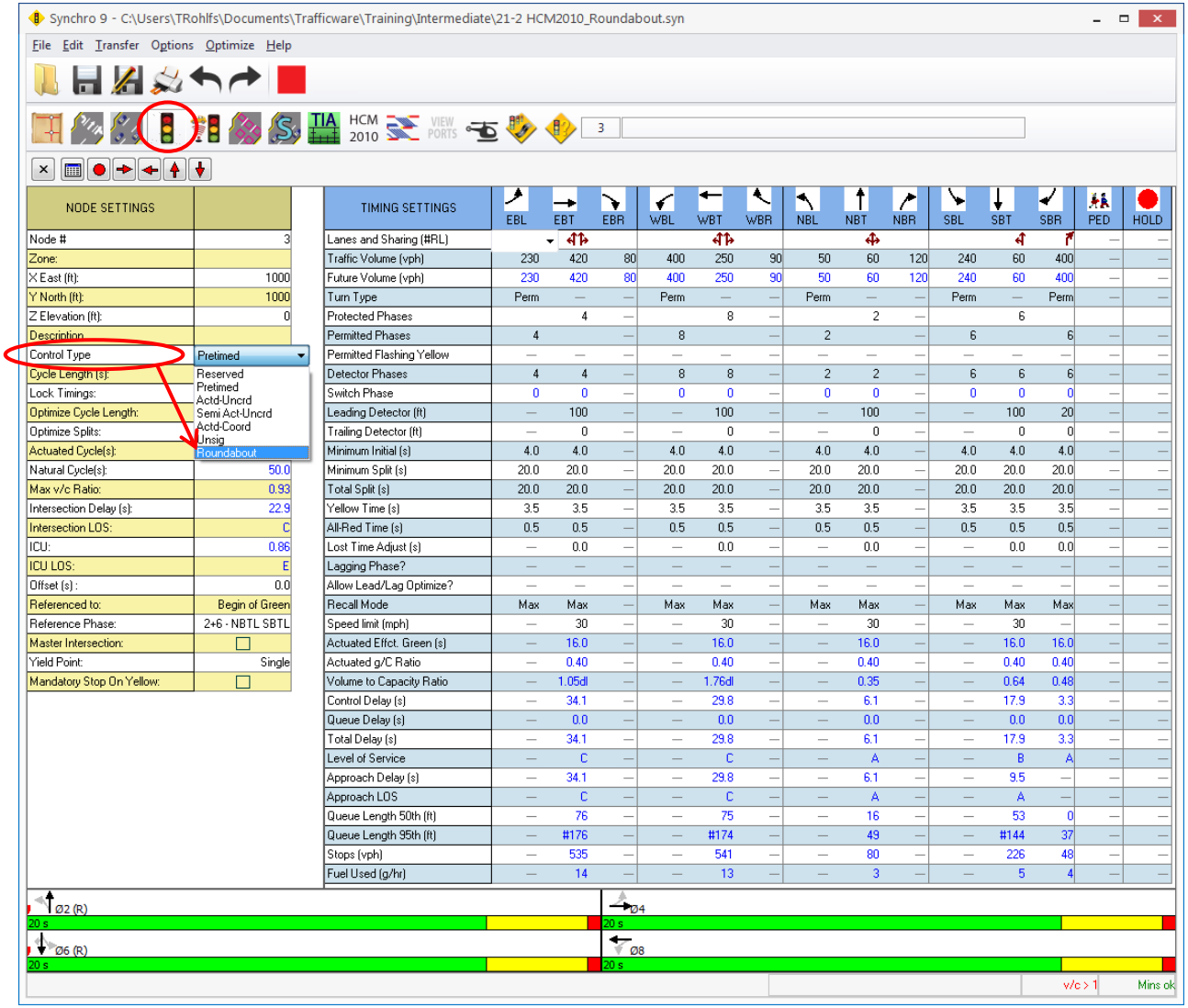
HCM 2010 Roundabouts Example 21-2 Key Inputs

AGENDA

Synchro

HCM 2010

SimTraffic



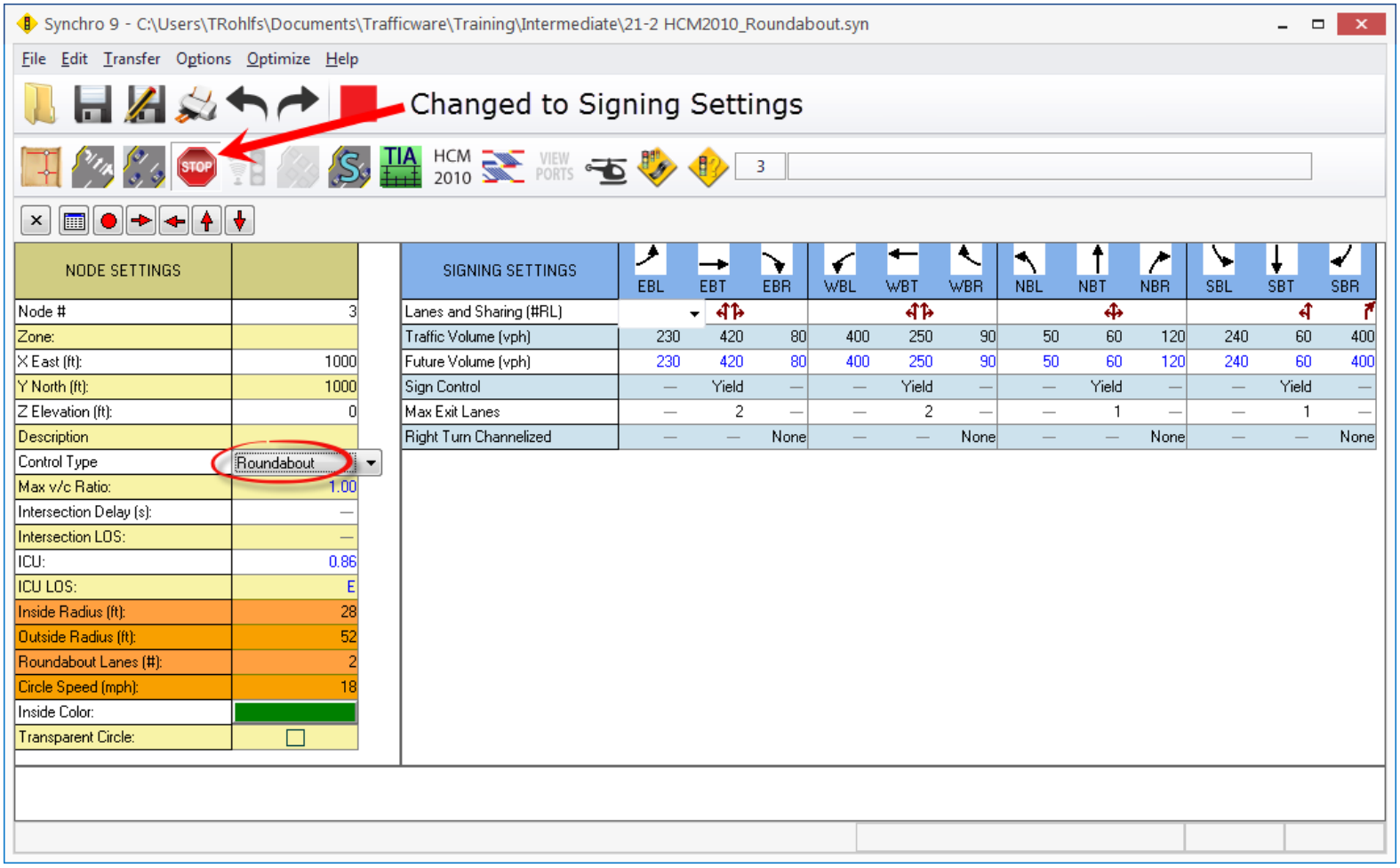
HCM 2010 Roundabouts Example 21-2
Key Inputs

AGENDA

Synchro

HCM 2010

SimTraffic



HCM 2010 Roundabouts Example 21-2
Key Inputs

AGENDA

Synchro

HCM 2010

SimTraffic

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HCM 2010 ROUNDABOUT	
Node #	3
Zone:	
X East (ft):	1000
Y North (ft):	1000
Z Elevation (ft):	0
Description	
Max v/c Ratio:	0.81
Intersection Delay (s):	19.7
Intersection LOS:	C
ICU:	0.86
ICU LOS:	E
Inside Radius (ft):	28
Outside Radius (ft):	52
Roundabout Lanes (#):	2
Circle Speed (mph):	18
Inside Color:	
Transparent Circle:	☐

HCM 2010 ROUNDABOUT	EB			WB			NB			SB		
Entry Lanes	2			2			1			2		
Conflicting Circle Lanes	1			1			2			2		
Exit Lanes	2			2			1			1		
Adjusted Approach Flow (vph)	768			779			242			737		
Demand Flow Rate (pc/h)	806			818			247			751		
Vehicles Circulating (pc/h)	764			372			976			772		
Vehicles Exiting (pc/h)	759			851			594			418		
Follow-Up Headway (s)	3.186			3.186			3.186			3.186		
Ped Vol. Crossing Leg (#/hr)	0			0			0			0		
Ped Capacity Adjustment	1.000			1.000			1.000			1.000		
Approach Delay (sec/veh)	31.5			12.9			13.4			16.7		
Approach LOS	D			B			B			C		
Lane	Left	Right	—	Left	Right	—	Left	—	—	Left	Right	—
Critical Headway (s)	5.193	5.193	—	5.193	5.193	—	4.113	—	—	4.293	4.113	—
Designated Moves	LT	TR	—	LT	TR	—	LTR	—	—	LT	R	—
Assumed Moves	LT	TR	—	L	TR	—	LTR	—	—	LT	R	—
Right Turn Channelized	—	—	—	—	—	—	—	—	—	—	—	—
Lane Utilization	0.470	0.530	—	0.540	0.460	—	1.000	—	—	0.429	0.571	—
Entry Flow Rate (pc/h)	379	427	—	442	376	—	247	—	—	322	429	—
Capacity, Entry Lane (pc/h)	526	526	—	779	779	—	571	—	—	633	658	—
Entry HV Adjustment Factor	0.952	0.953	—	0.952	0.952	—	0.979	—	—	0.981	0.981	—
Flow Rate, Entry (vph)	361	407	—	421	358	—	242	—	—	316	421	—
Capacity, Entry (vph)	501	502	—	742	741	—	558	—	—	621	646	—
Volume to Capacity Ratio	0.720	0.811	—	0.567	0.483	—	0.433	—	—	0.508	0.652	—
Control Delay (sec/veh)	27.1	35.3	—	13.9	11.7	—	13.4	—	—	14.2	18.6	—
Level of Service	D	E	—	B	B	—	B	—	—	B	C	—
95th-Percentile Queue (veh)	6	8	—	4	3	—	2	—	—	3	5	—

Maximum volume to capacity ratio

HCM 2010 Roundabouts Example 21-2
Key Inputs

AGENDA

Synchro

HCM 2010

SimTraffic

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HCM 2010 ROUNDABOUT	
Node #	3
Zone:	
X East (ft):	1000
Y North (ft):	1000
Z Elevation (ft):	0
Description	
Max v/c Ratio:	0.81
Intersection Delay (s):	19.7
Intersection LOS:	C
ICU:	0.86
ICU LOS:	E
Inside Radius (ft):	28
Outside Radius (ft):	52
Roundabout Lanes (#):	2
Circle Speed (mph):	18
Inside Color:	
Transparent Circle:	☐

HCM 2010 ROUNDABOUT	EB	WB	NB	SB
Entry Lanes	2	2	1	2
Conflicting Circle Lanes	1	1	2	2
Exit Lanes	1	2	1	1
Adjusted Approach Flow (vph)	768	779	242	737
Demand Flow Rate (pc/h)	806			
Vehicles Circulating (pc/h)	764			
Vehicles Exiting (pc/h)	759			
Follow-Up Headway (s)	3.186			
Ped Vol. Crossing Leg (#/hr)	0			
Ped Capacity Adjustment	1.000			
Approach Delay (sec/veh)	31.5			
Approach LOS	D			
Lane	Left	Right		
Critical Headway (s)	5.193	5.193		
Designated Moves	LT	TR		
Assumed Moves	LT	TR		
Right Turn Channelized				
Lane Utilization	0.470	0.530		
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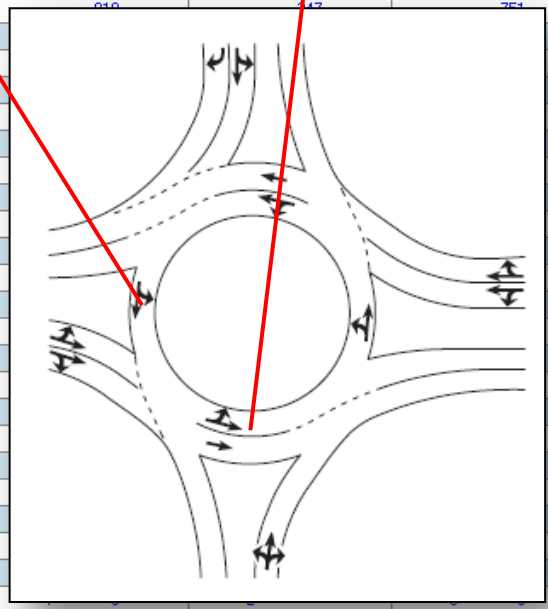
Control Delay (sec/veh)	27.1	35.3		
Level of Service	D	E		
95th-Percentile Queue (veh)	6	8		



Maximum volume to capacity ratio

HCM 2010 Roundabouts Example 21-2 Results

AGENDA

Synchro

HCM 2010

SimTraffic

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X East (ft):	1000
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Inside Color:	
Transparent Circle:	☐

HCM 2010 ROUNDABOUT	EB			WB			NB			SB		
Entry Lanes	2			2			1			2		
Conflicting Circle Lanes	1			1			2			2		
Exit Lanes	2			2			1			1		
Adjusted Approach Flow (vph)	768			779			242			737		
Demand Flow Rate (pc/h)	806			818			247			751		
Vehicles Circulating (pc/h)	764			372			976			772		
Vehicles Exiting (pc/h)	759			851			594			418		
Follow-Up Headway (s)	3.186			3.186			3.186			3.186		
Ped Vol. Crossing Leg (#/hr)	0			0			0			0		
Ped Capacity Adjustment	1.000			1.000			1.000			1.000		
Approach Delay (sec/veh)	31.5			12.9			13.4			16.7		
Approach LOS	D			B			B			C		
Lane	Left	Right	—	Left	Right	—	Left	—	—	Left	Right	—
Critical Headway (s)	5.193	5.193	—	5.193	5.193	—	4.113	—	—	4.293	4.113	—
Designated Moves	LT	TR	—	LT	TR	—	LTR	—	—	LT	R	—
Assumed Moves	LT	TR	—	L	TR	—	LTR	—	—	LT	R	—
Right Turn Channelized	—	—	—	—	—	—	—	—	—	—	—	—
Lane Utilization	0.470	0.530	—	0.540	0.460	—	1.000	—	—	0.429	0.571	—
Entry Flow Rate (pc/h)	379	427	—	442	376	—	247	—	—	322	429	—
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Flow Rate, Entry (vph)	361	407	—	421	358	—	242	—	—	316	421	—
Capacity, Entry (vph)	501	502	—	742	741	—	558	—	—	621	646	—
Volume to Capacity Ratio	0.720	0.811	—	0.567	0.483	—	0.433	—	—	0.508	0.652	—
Control Delay (sec/veh)	27.1	35.3	—	13.9	11.7	—	13.4	—	—	14.2	18.6	—
Level of Service	D	E	—	B	B	—	B	—	—	B	C	—
95th-Percentile Queue (veh)	6	8	—	4	3	—	2	—	—	3	5	—

Maximum volume to capacity ratio

HCM 2010 Roundabouts Results

Control Delay (s/veh)	LOS	v/c > 1
0 – 10	A	F
10 – 15	B	F
15 – 25	C	F
25 – 35	D	F
35 – 50	E	F
> 50	F	F

- Delay Values mimic Unsignalized Thresholds
- Note LOS if v/c > 1.0

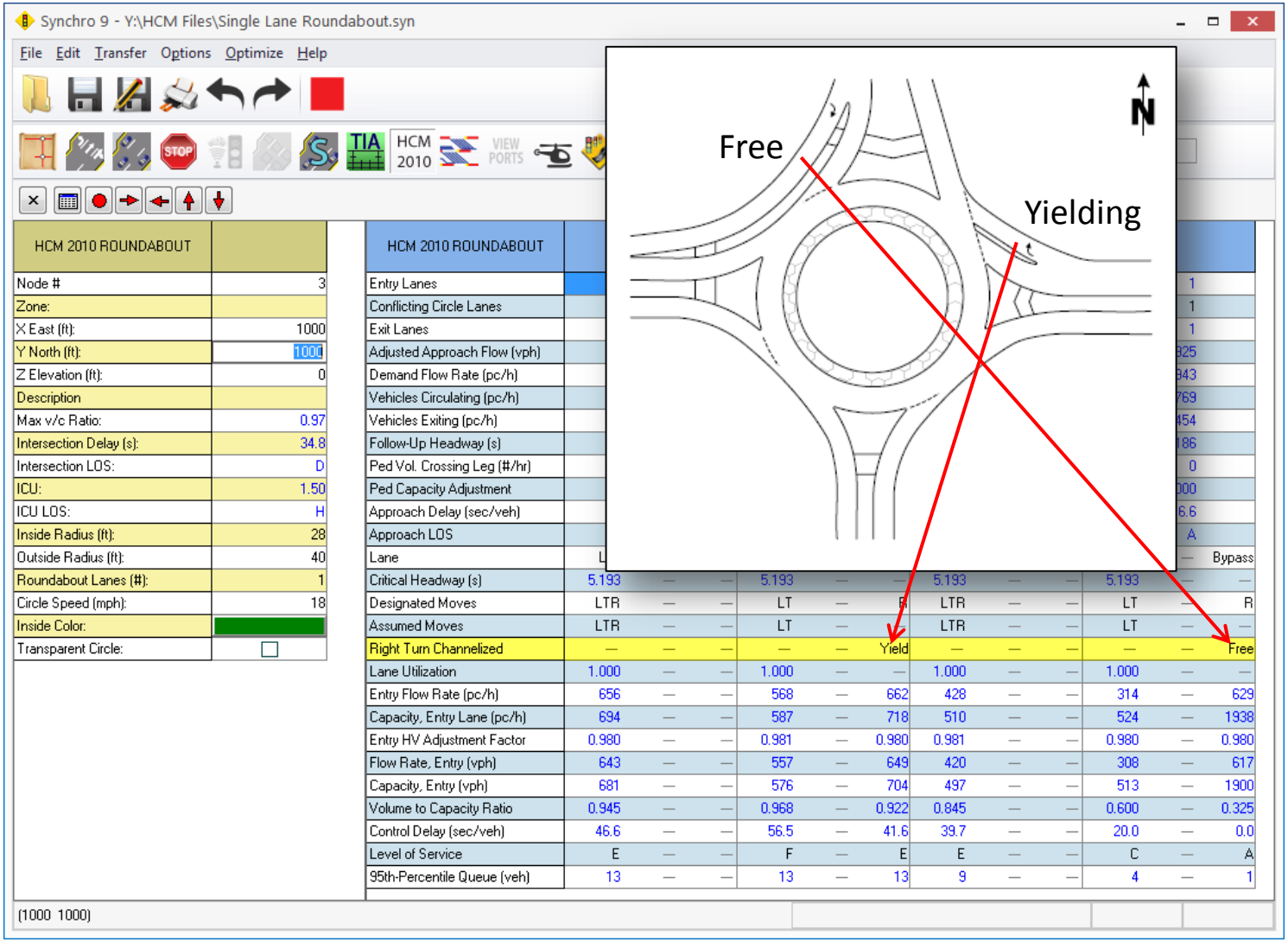
HCM 2010 Roundabouts
Other Considerations

AGENDA

Synchro

HCM 2010

SimTraffic



HCM 2010 Roundabouts
Other Considerations

AGENDA

Synchro

HCM 2010

SimTraffic

HCM 2010 ROUNDABOUT	EB			WB			NB			SB		
Entry Lanes	1			1			1			1		
Conflicting Circle Lanes	1			1			1			1		
Exit Lanes	1			1			1			1		
Adjusted Approach Flow (vph)	643			1207			420			925		
Demand Flow Rate (pc/h)	656			1230			428			943		
Vehicles Circulating (pc/h)	487			655			796			769		
Vehicles Exiting (pc/h)	596			569			347			454		
Follow-Up Headway (s)	2.500			2.500			2.500			2.500		
Ped Vol. Crossing Leg (#/hr)	0			0			50			0		
Ped Capacity Adjustment	1.000			1.000			0.993			1.000		
Approach Delay (sec/veh)	18.4			19.4			19.0			4.1		
Approach LOS	C			C			C			A		
Lane	Left	—	—	Left	—	Bypass	Left	—	—	Left	—	Bypass
Critical Headway (s)	4.800	—	—	4.800	—	—	4.800	—	—	4.800	—	—
Designated Moves	LTR	—	—	LT	—	R	LTR	—	—	LT	—	R
Assumed Moves	LTR	—	—	LT	—	—	LTR	—	—	LT	—	—
Right Turn Channelized	—	—	—	—	—	Yield	—	—	—	—	—	Free
Lane Utilization	1.000	—	—	1.000	—	—	1.000	—	—	1.000	—	—
Entry Flow Rate (pc/h)	656	—	—	568	—	662	428	—	—	314	—	629
Capacity, Entry Lane (pc/h)	891	—	—	755	—	915	657	—	—	675	—	1938
Entry HV Adjustment Factor	0.980	—	—	0.981	—	0.980	0.981	—	—	0.980	—	0.980
Flow Rate, Entry (vph)	643	—	—	557	—	649	420	—	—	308	—	617
Capacity, Entry (vph)	873	—	—	740	—	897	640	—	—	661	—	1900
Volume to Capacity Ratio	0.736	—	—	0.752	—	0.724	0.656	—	—	0.465	—	0.325
Control Delay (sec/veh)	18.4	—	—	21.8	—	17.4	19.0	—	—	12.4	—	0.0
Level of Service	C	—	—	C	—	C	C	—	—	B	—	A
95th-Percentile Queue (veh)	7	—	—	7	—	6	5	—	—	2	—	1

Calibrated

Capacity, Entry (vph)	681	—	—	576	—	704	497	—	—	513	—	1900
Volume to Capacity Ratio	0.945	—	—	0.968	—	0.922	0.845	—	—	0.600	—	0.325
Control Delay (sec/veh)	46.6	—	—	56.5	—	41.6	39.7	—	—	20.0	—	0.0
Level of Service	E	—	—	F	—	E	E	—	—	C	—	A
95th-Percentile Queue (veh)	13	—	—	13	—	13	9	—	—	4	—	1

Non-Calibrated

HCM 2010 Limitations

- Upstream/downstream roundabouts or signalized intersections
- Extremely high entering traffic volumes
- High volumes of pedestrians
- More than two entry lanes
- Limited or short entry designs
- Pedestrian model not based on U.S. roundabouts
- Bicycle operations not available

SimTraffic 9 Defined

- Microscopic Simulation Model
  - Simulate a wide variety of traffic control
  - Each vehicle individually tracked every 0.1 second
  - Vary driver behavior (aggressive to passive)
  - Measures queuing and blocking
  - Real-world type model
  - Account for affects of upstream signalized intersections or roundabouts

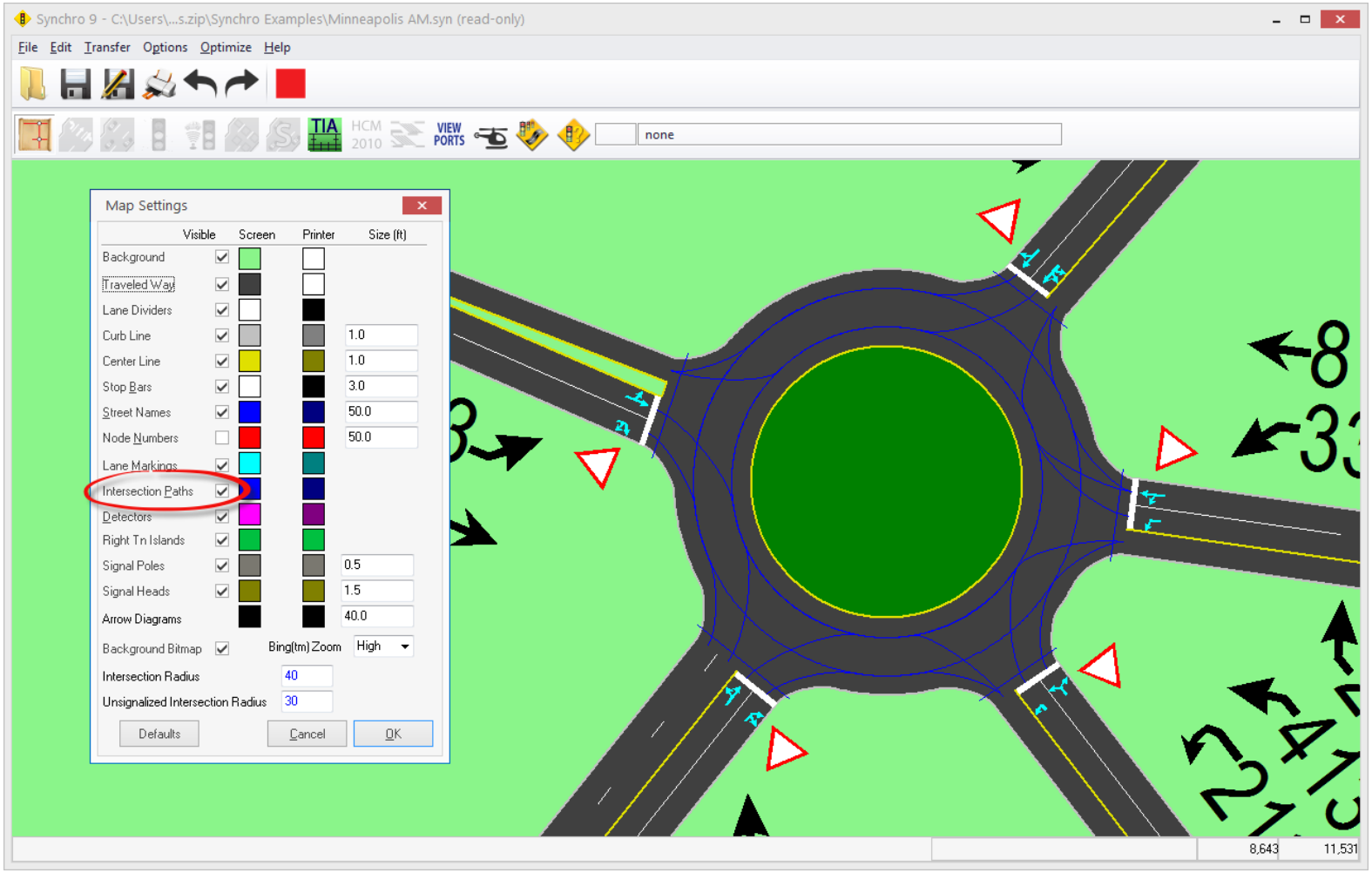
SimTraffic 9 Defined

- Simulating roundabouts within SimTraffic allows more flexibility
- The number of circulating lanes within the roundabout can be user defined to mimic real world applications

SimTraffic Calibration: Vehicle Paths

AGENDA

- Synchro
- HCM 2010
- SimTraffic



SimTraffic Calibration: Vehicle Paths

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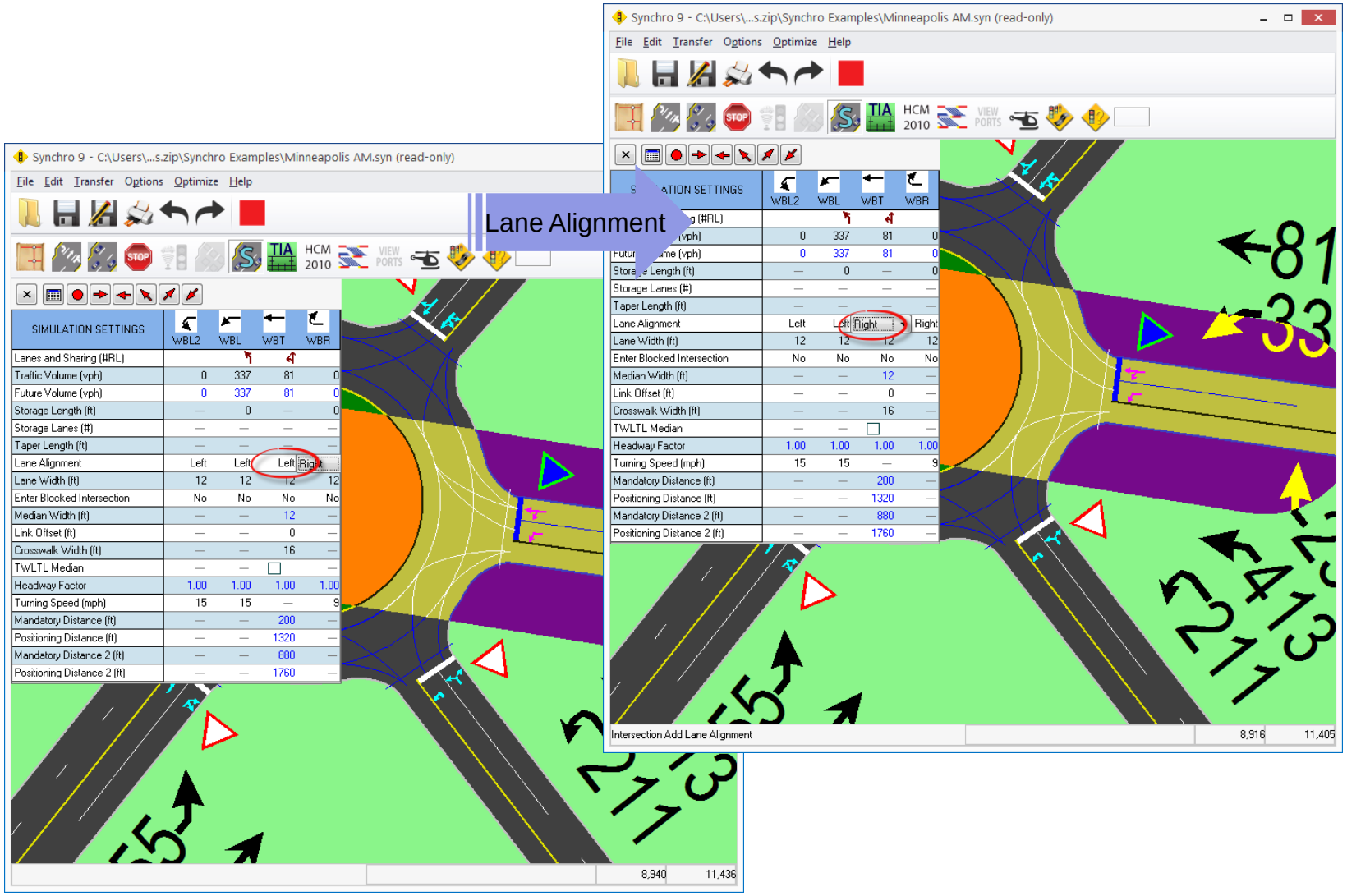


SimTraffic Calibration: Vehicle Types

AGENDA

Synchro

HCM 2010

SimTraffic

Heavy Vehicles

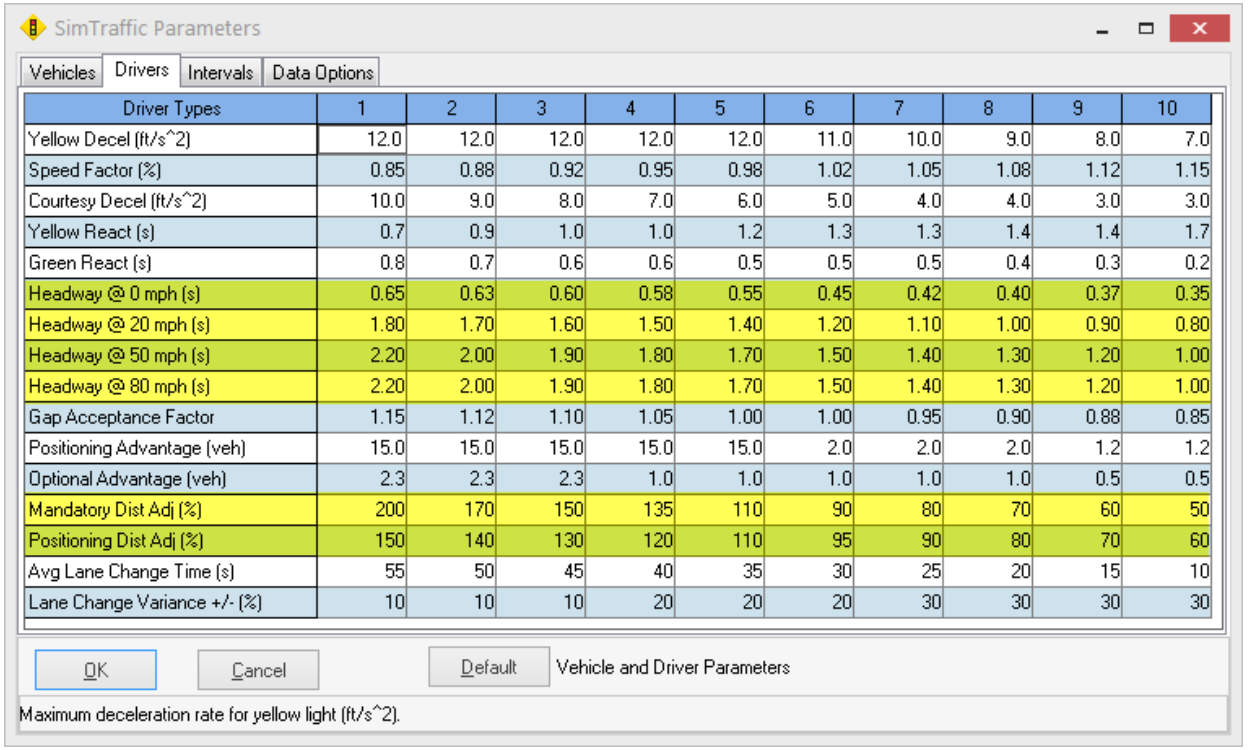
SimTraffic Parameters

Vehicles | Drivers | Intervals | Data Options

Vehicles Types	1	2	3	4	5	6	7	8	9	10
Vehicle Name	Car1	Car2	Truck SU	SemiTrk1	SemiTrk2	Truck DB	Bus	Carpool1	Carpool2	
Vehicle Occurence (%)	0.64	0.16	0.60	0.10	0.05	0.05	0.20	0.16	0.04	0.0
Acceleration	File	File	File	File	File	File	File	File	File	Fil
Vehicle Length (ft)	16.0	14.0	35.0	53.0	53.0	64.0	40.0	16.0	14.0	16.
Vehicle Width (ft)	6.0	6.0	8.0	8.0	8.0	8.0	8.0	6.0	6.0	6.
Vehicle Fleet	Car	Car	Trk	Trk	Trk	Trk	Bus	Pool	Pool	Ca
Occupancy (# people)	1.3	1.3	1.2	1.2	1.2	1.2	20.0	2.8	2.8	1.
Graphics Shape	Car	Car	Truck	SemiTrk	SemiTrk	DBTruck	Bus	Car	Car	Ca
Table Index (1 to 7)	1	2	3	4	5	6	7	1	2	

OK | Cancel | Default | Vehicle and Driver Parameters

SimTraffic Calibration: Driver Types



Driver Types	1	2	3	4	5	6	7	8	9	10
Yellow Decel (ft/s^2)	12.0	12.0	12.0	12.0	12.0	11.0	10.0	9.0	8.0	7.0
Speed Factor (%)	0.85	0.88	0.92	0.95	0.98	1.02	1.05	1.08	1.12	1.15
Courtesy Decel (ft/s^2)	10.0	9.0	8.0	7.0	6.0	5.0	4.0	4.0	3.0	3.0
Yellow React (s)	0.7	0.9	1.0	1.0	1.2	1.3	1.3	1.4	1.4	1.7
Green React (s)	0.8	0.7	0.6	0.6	0.5	0.5	0.5	0.4	0.3	0.2
Headway @ 0 mph (s)	0.65	0.63	0.60	0.58	0.55	0.45	0.42	0.40	0.37	0.35
Headway @ 20 mph (s)	1.80	1.70	1.60	1.50	1.40	1.20	1.10	1.00	0.90	0.80
Headway @ 50 mph (s)	2.20	2.00	1.90	1.80	1.70	1.50	1.40	1.30	1.20	1.00
Headway @ 80 mph (s)	2.20	2.00	1.90	1.80	1.70	1.50	1.40	1.30	1.20	1.00
Gap Acceptance Factor	1.15	1.12	1.10	1.05	1.00	1.00	0.95	0.90	0.88	0.85
Positioning Advantage (veh)	15.0	15.0	15.0	15.0	15.0	2.0	2.0	2.0	1.2	1.2
Optional Advantage (veh)	2.3	2.3	2.3	1.0	1.0	1.0	1.0	1.0	0.5	0.5
Mandatory Dist Adj (%)	200	170	150	135	110	90	80	70	60	50
Positioning Dist Adj (%)	150	140	130	120	110	95	90	80	70	60
Avg Lane Change Time (s)	55	50	45	40	35	30	25	20	15	10
Lane Change Variance +/- (%)	10	10	10	20	20	20	30	30	30	30

- Calibrate Headway to local conditions
- Mandatory & Positioning Distance control lane change distances

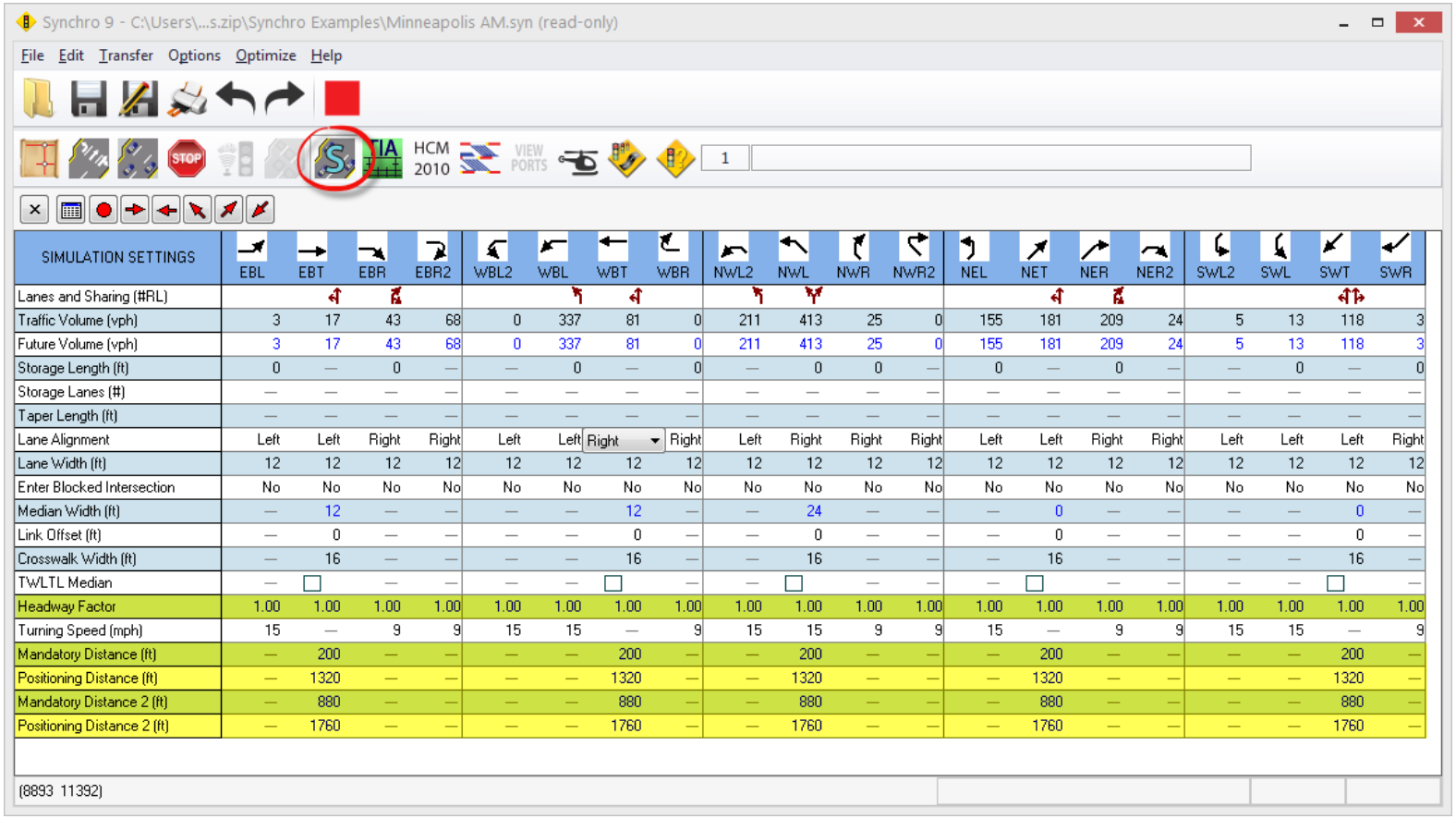
SimTraffic Calibration: Driver Types

AGENDA

Synchro

HCM 2010

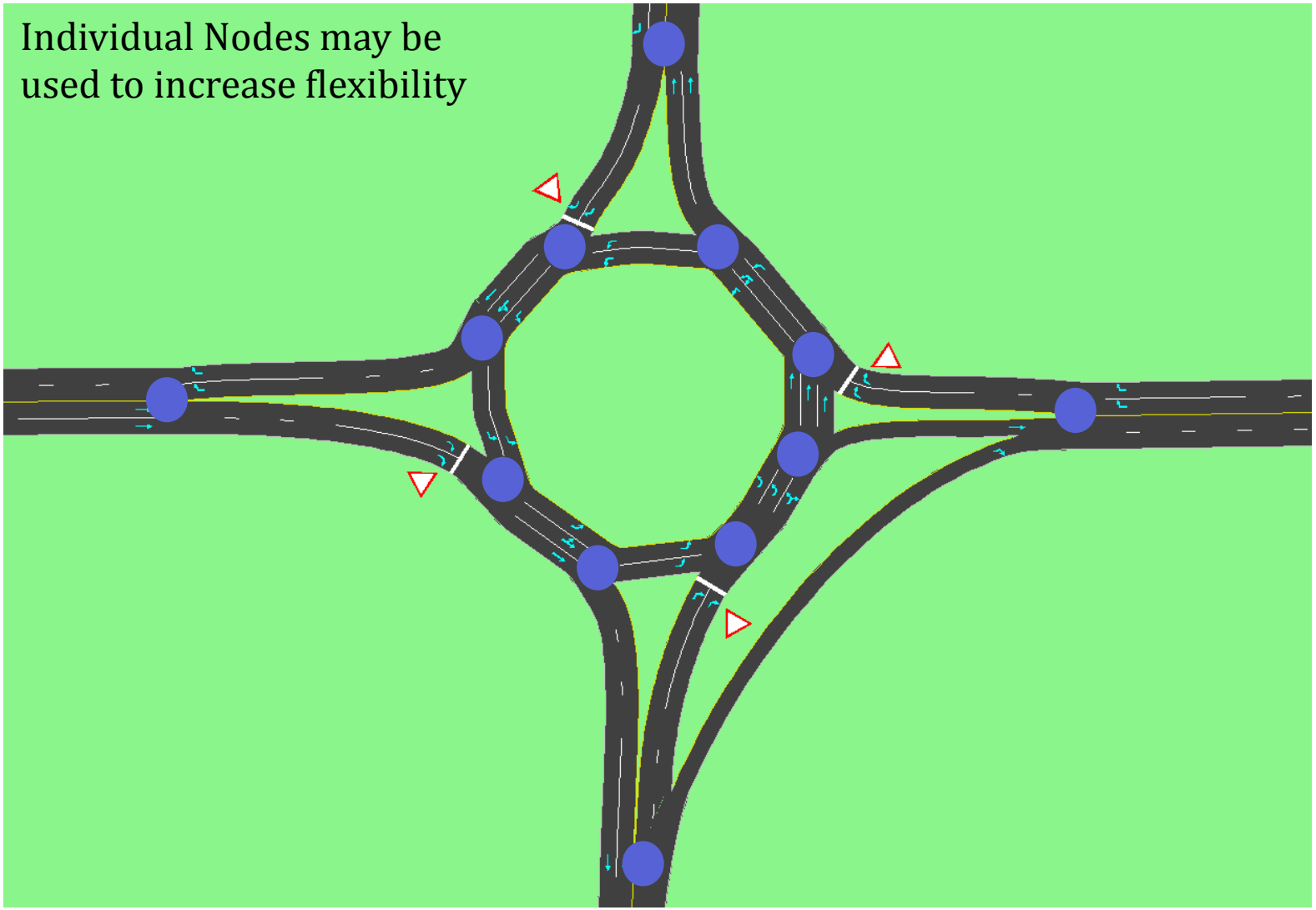
SimTraffic



- Synchro's Simulation Settings are LOCAL
- SimTraffic's Driver Parameters are GLOBAL

SimTraffic Calibration: Multipoint Roundabouts

Individual Nodes may be used to increase flexibility



SUMMARY

- Synchro and HCM 2010 Inputs
- Synchro Simulation Inputs
- SimTraffic Parameters for Roundabouts
- Simulation Requires Additional Effort

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- Barry, C. 2012. Calibration of the HCM 2010 Roundabout Capacity Equations for Georgia Conditions. A Thesis Presented to The Academic Faculty of Georgia Institute of Technology.
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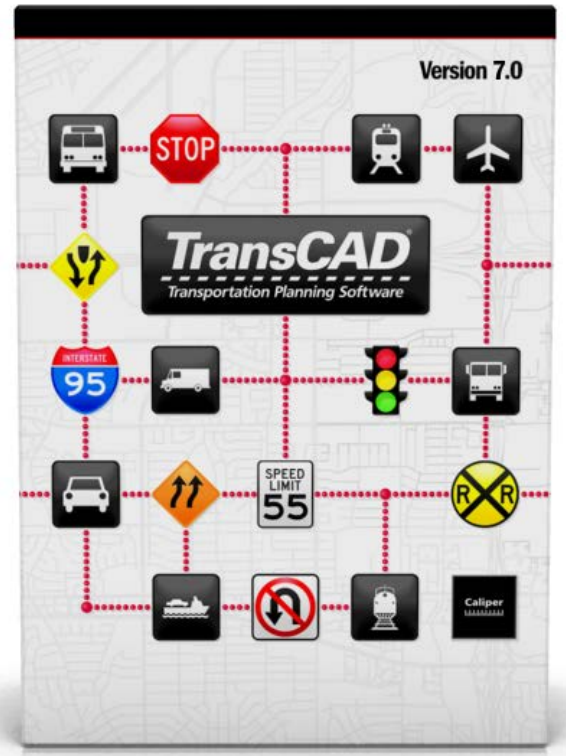
Tools for Analysis of Capacity and Efficient Flow for Roundabout Design-Part III: TransModeler

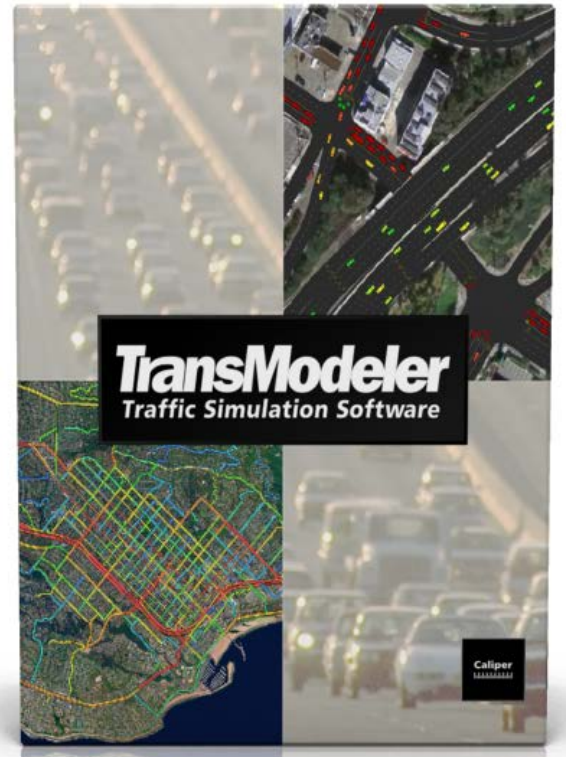
Daniel Morgan, Vice President &
Director of Traffic Simulation
Caliper Corporation

Presentation Outline

- Introduction to Caliper and TransModeler
- Model inputs and methods
  - Step by step data input
- Model output
  - Producing model outputs
- TransModeler strengths and advantages

Caliper Corporation: TransCAD & TransModeler



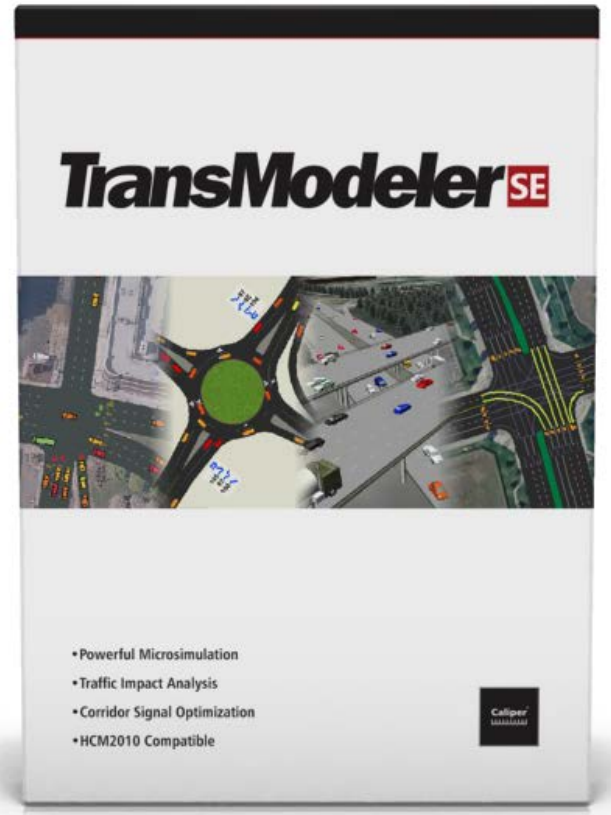


PLANNING: forecast travel demand

OPERATIONS: simulate project impacts

TransModeler SE

	TransModeler	TransModeler SE
Network Size Limits	Unlimited	20 Intersections/ 100 Links
SIMULATION	**TransModeler**	**TransModeler SE**
Microsimulation (freeways, urban streets, 2-lane highways, roundabouts)	●	●
Multi-modal simulation (auto, truck, bicycle)	●	●
Public transportation (bus & rail operations)	●	
DEMAND AND ASSIGNMENT	**TransModeler**	**TransModeler SE**
Turning movement-based demand	●	●
Origin-destination matrix-based demand	●	●
Simulation-based dynamic traffic assignment	●	
TRAFFIC SIGNALS	**TransModeler**	**TransModeler SE**
Traffic signal optimization	●	●
Simulation-based coordinated signal optimization	●	●
MUTCD signal warrant evaluation	●	●
Traffic signal priority and preemption	●	
TRAFFIC IMPACT ANALYSIS	**TransModeler**	**TransModeler SE**
Traffic Impact Analysis toolbox	●	●
ITE 9th Edition and custom trip generation rates	●	●
Simulation-based HCM 2010 LOS	●	●
VISUALIZATION	**TransModeler**	**TransModeler SE**
3-D visualization and animation	●	●
Built-in Google/USGS web map layer imagery	●	●



1. Bundles Microsimulation and HCM2010 Analysis
2. Enables Ground Truth Geometry
3. Scales for Broader Roundabout Impacts

TransModeler in 3 Key Points

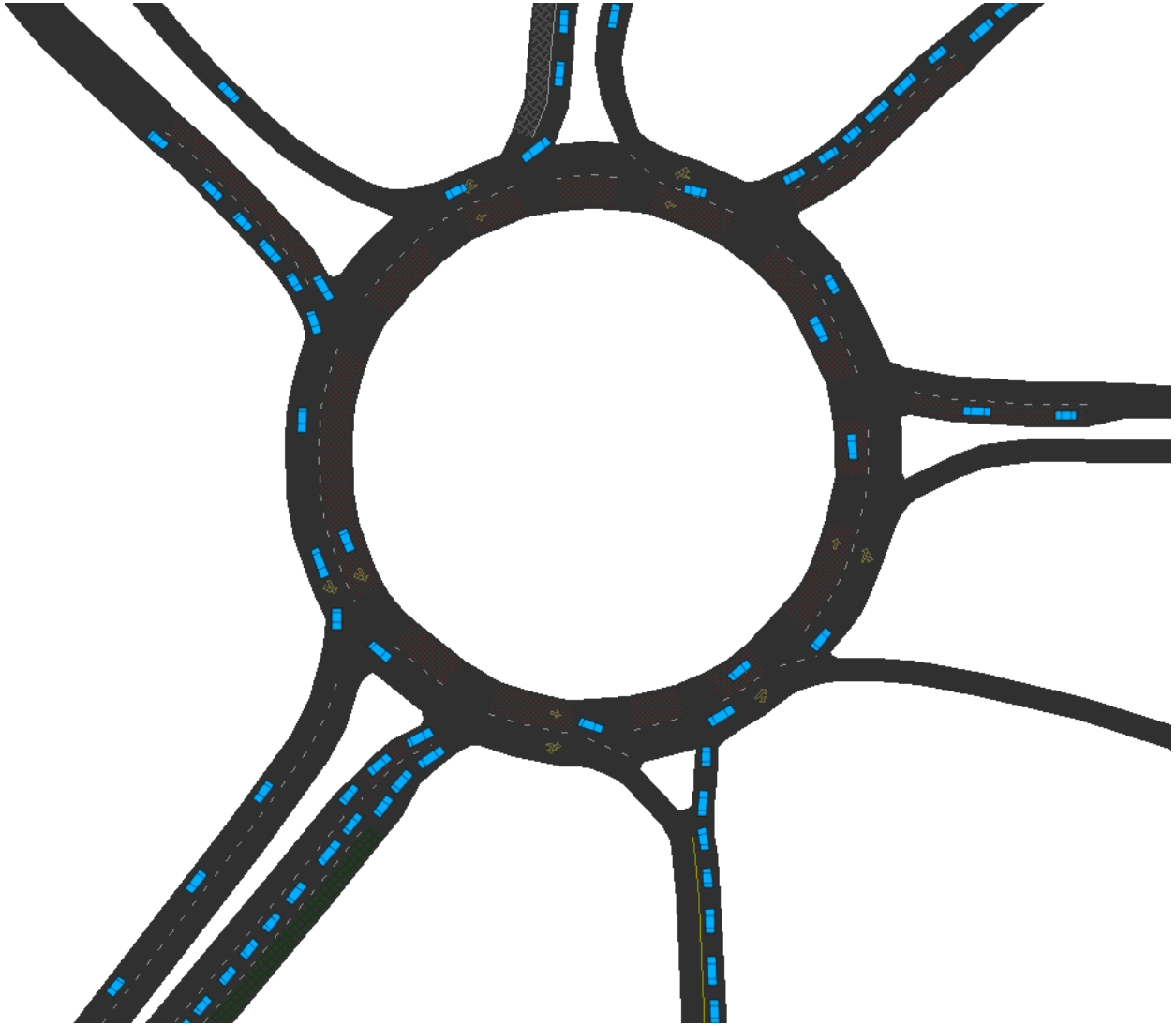
KEY POINT 1: Microsimulation + HCM2010

- **Integration of HCM with Microsimulation**
  - HCM2010 methods for intersections
  - Simulation-based LOS for all facility types
- **Driver behaviors**
  - Core algorithms: car following and lane changing
  - Enhanced, extended for congested merge & weave, oversaturated conditions
- **Route choice**
  - Fast computation for large networks
  - High-fidelity simulation-based DTA

KEY POINT 1: Microsimulation Methods

- Core Microsimulation Algorithms
  - Car Following
  - Lane Changing
  - Gap Acceptance
  - Geometric, Striping Effects

- Roundabout-specific Driver Behaviors
  - (Intrabunch) Headway Gap Acceptance
  - Circulating Lane Preference



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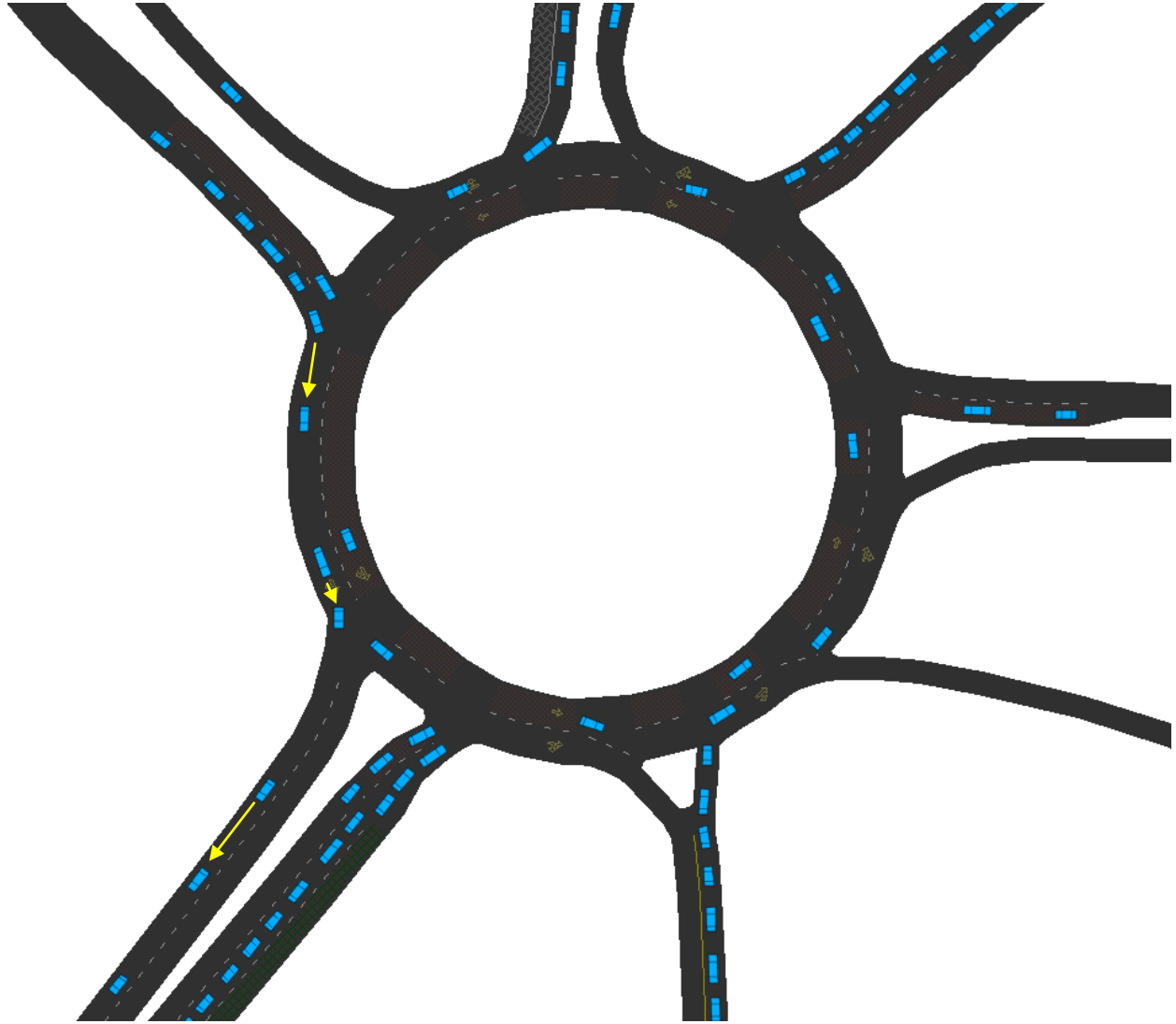

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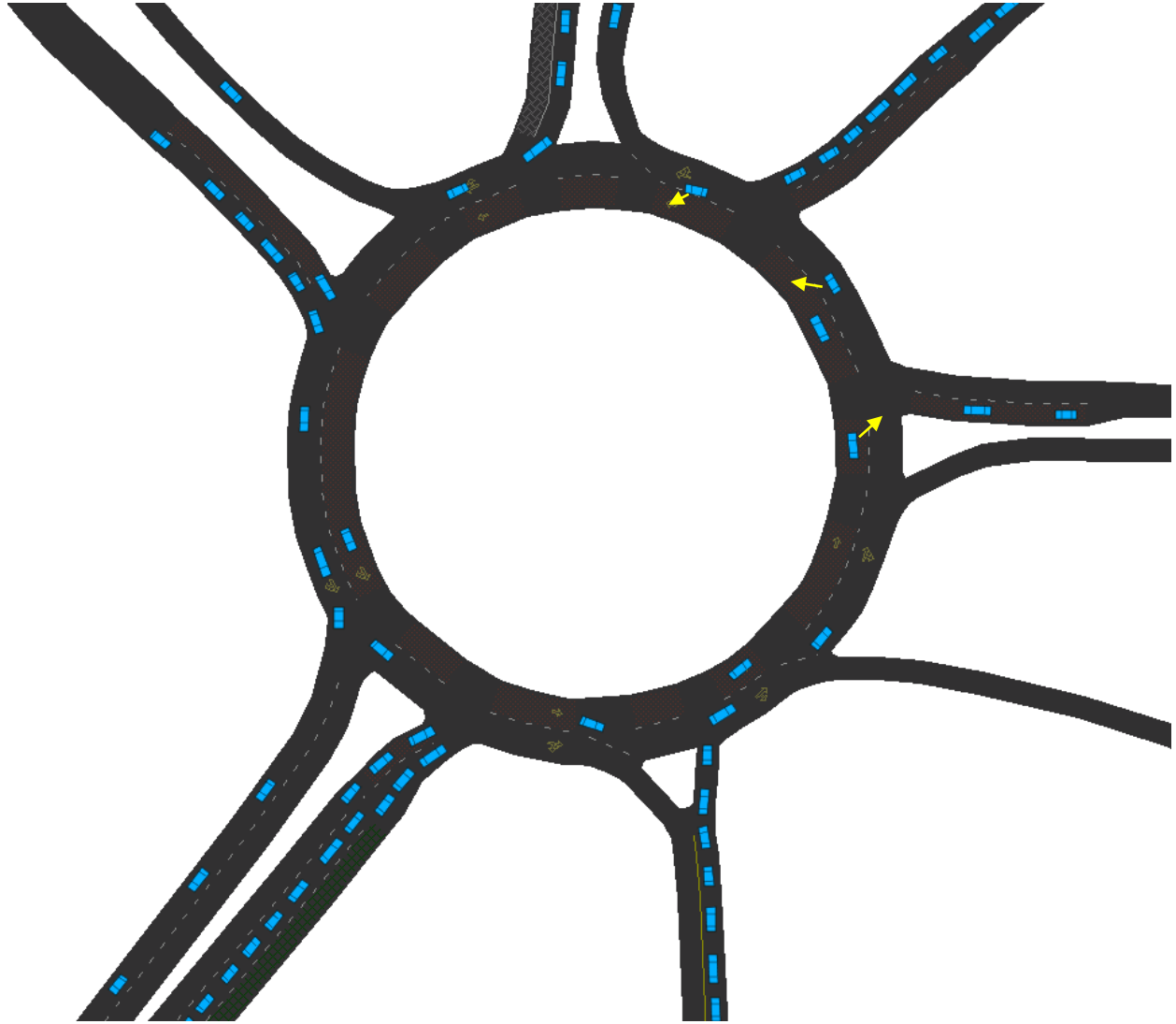

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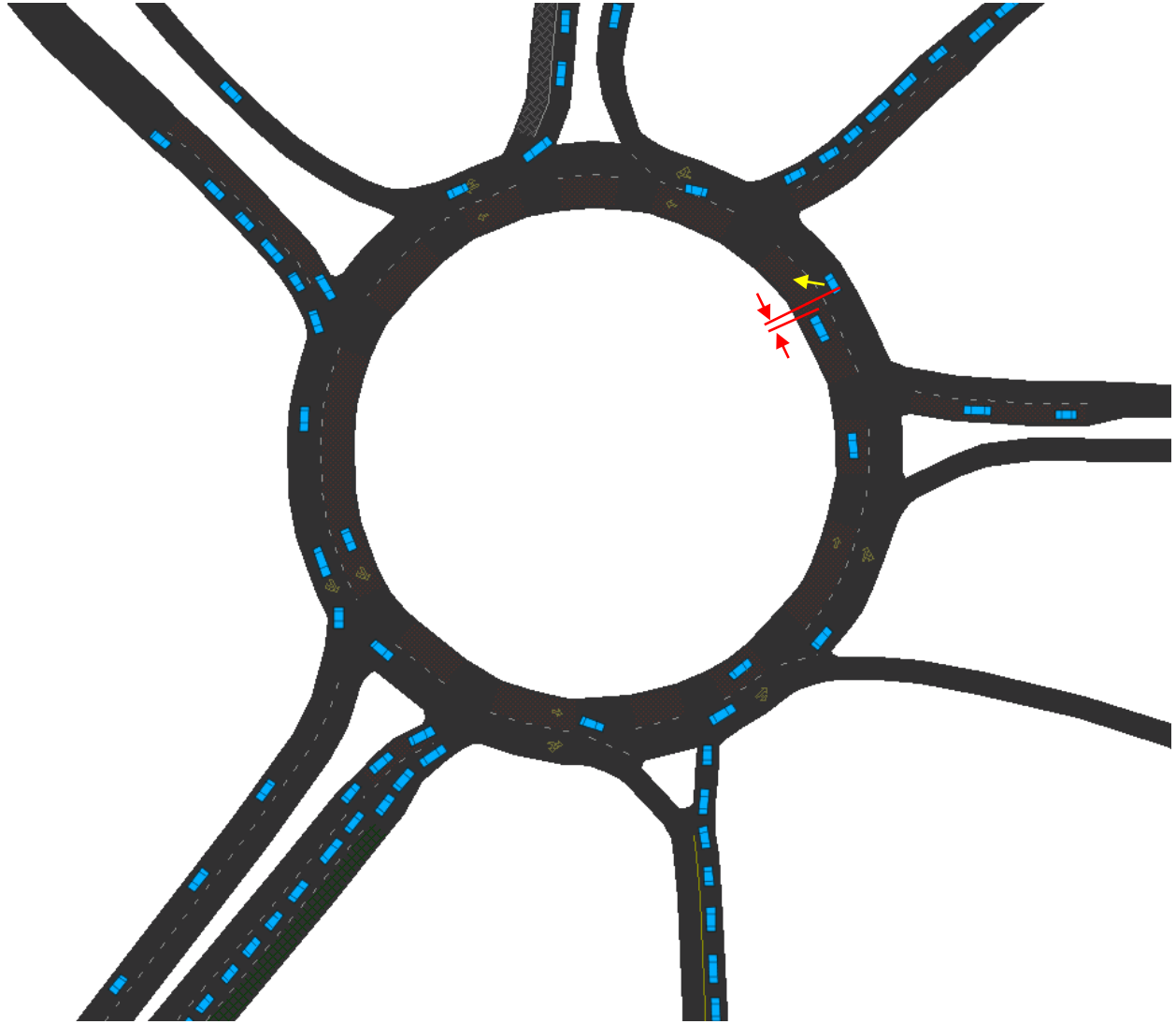

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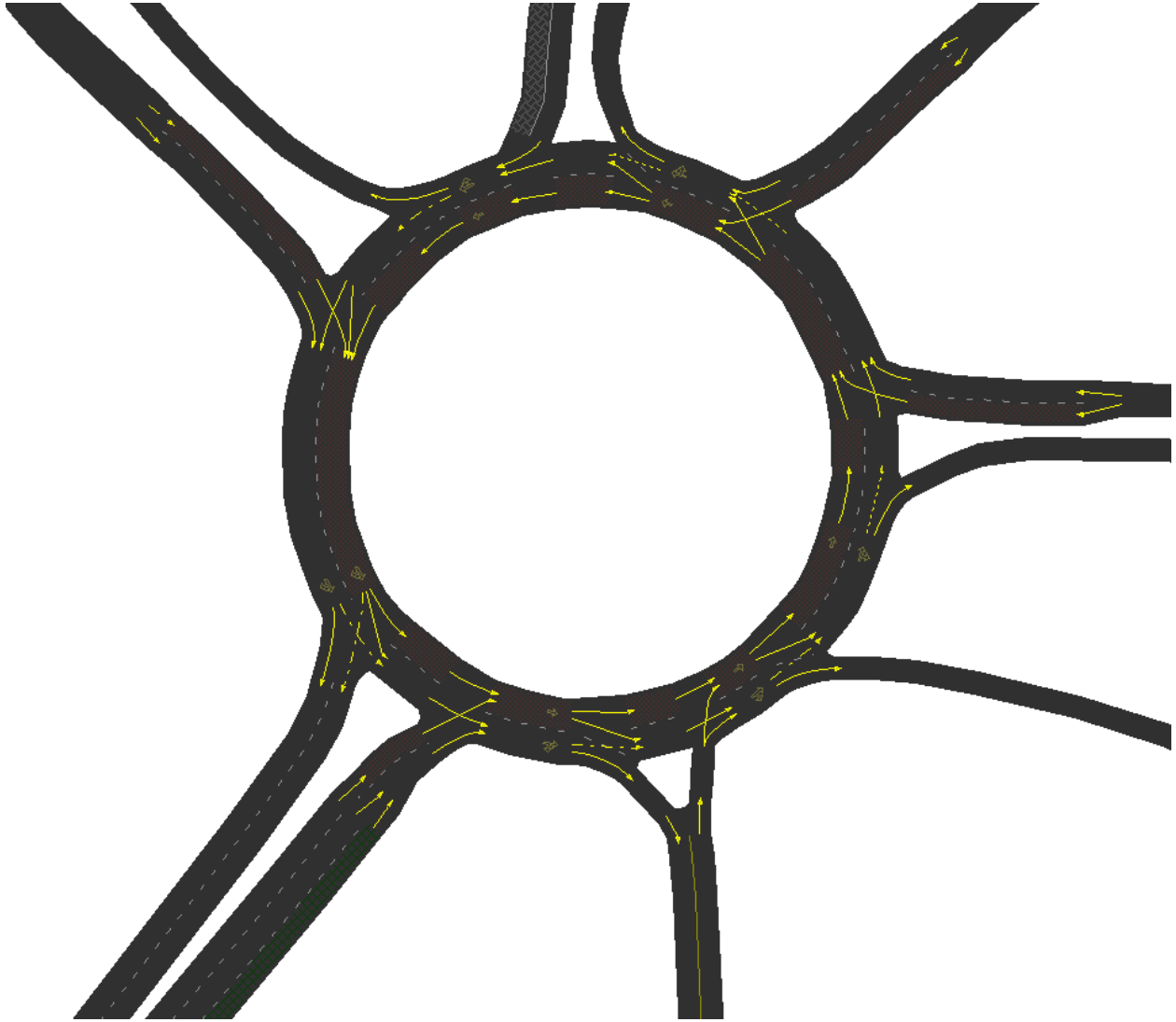

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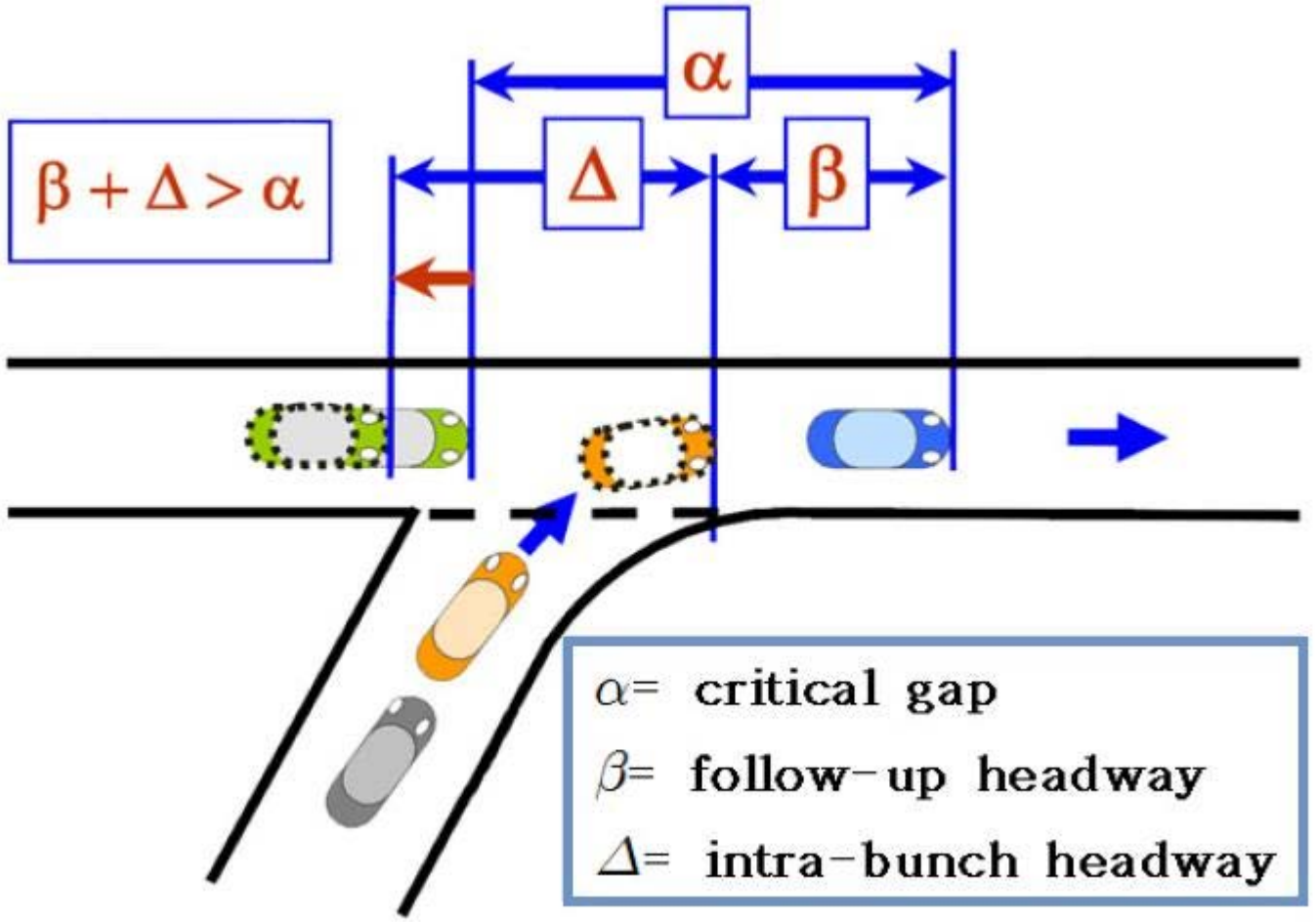

Source: International Journal of Highway Engineering Vol.15 No.5 pp.217-226

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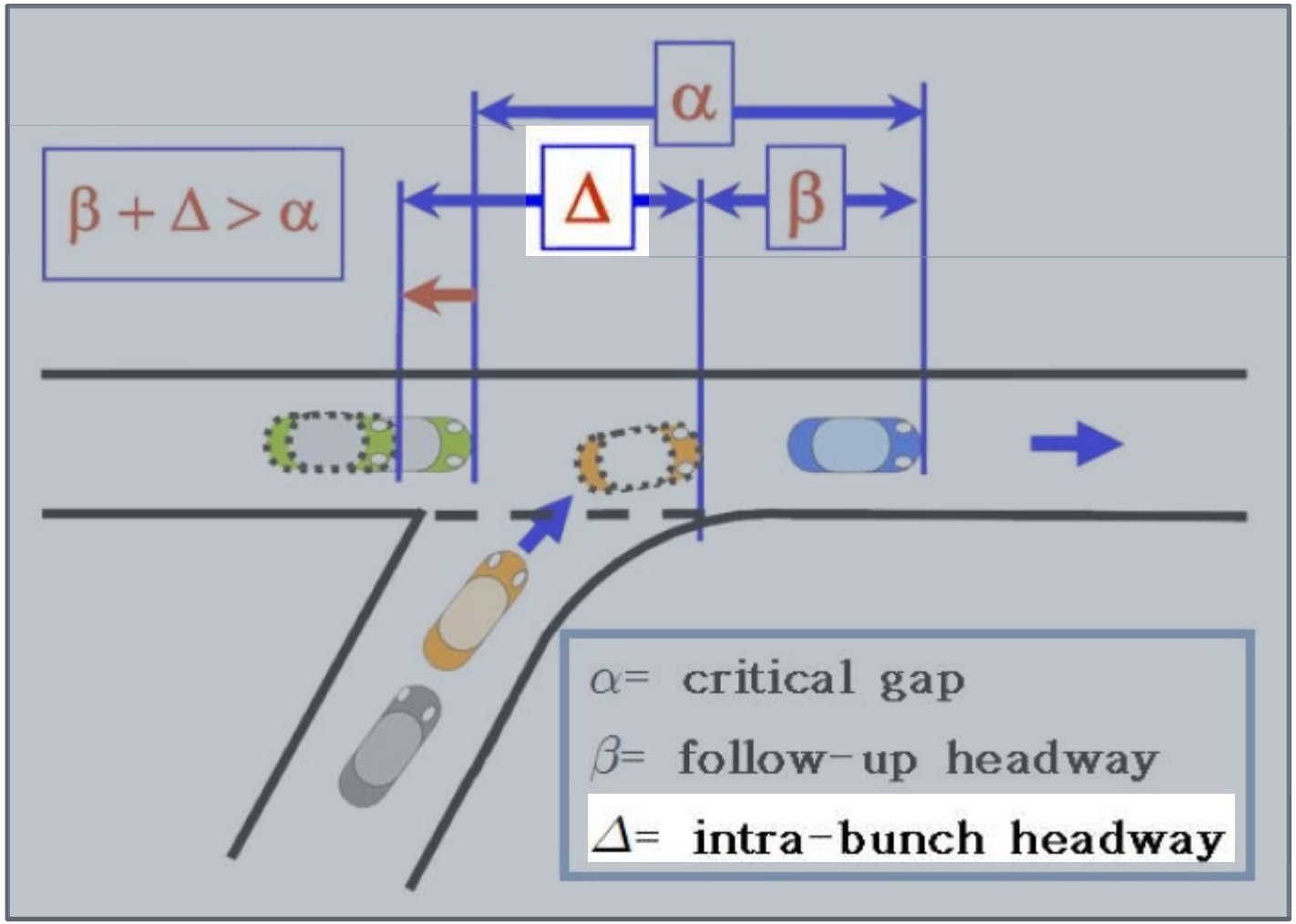

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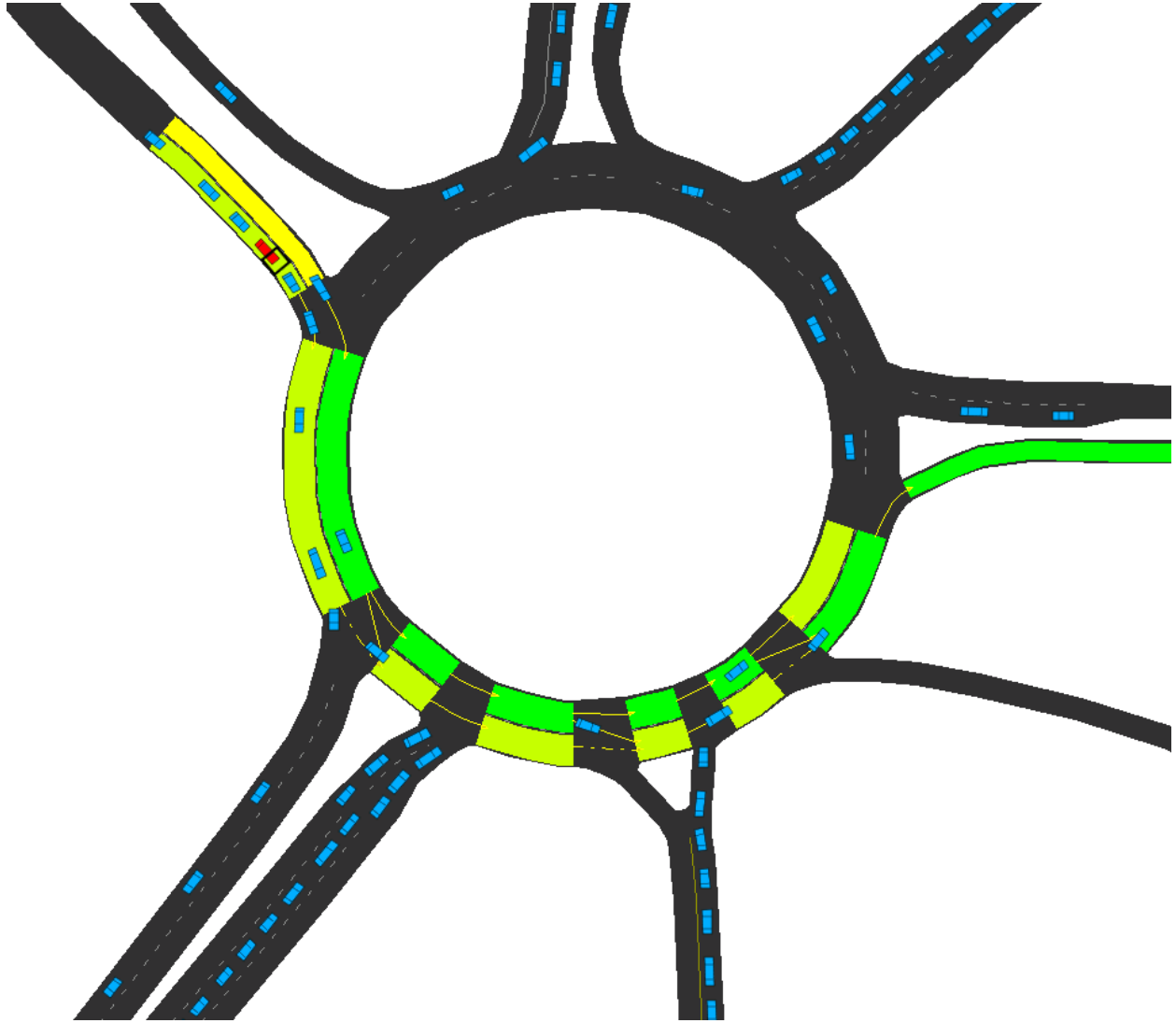
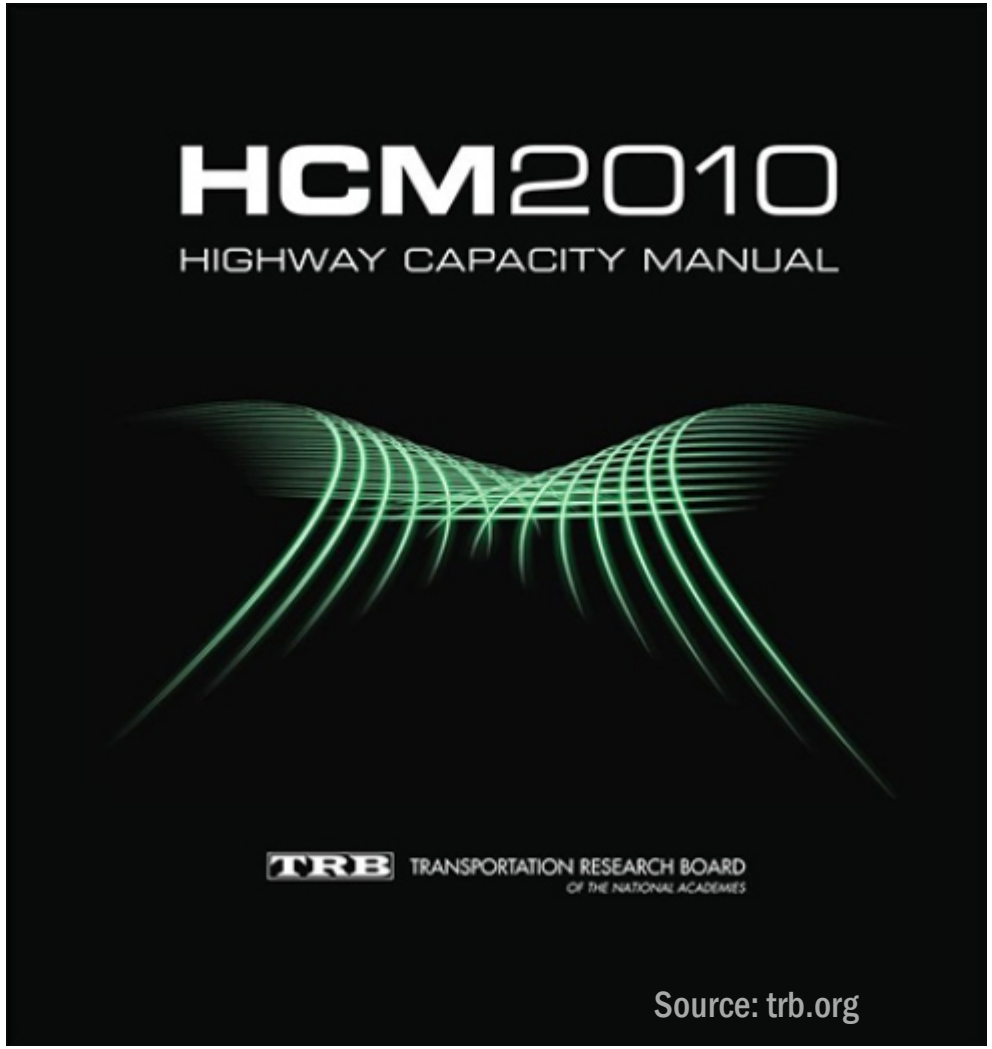


KEY POINT 1: HCM2010 Methods

- Chapter 21
- Calibrate to Critical Gap Headway, Follow-up Headway
- Derived from Empirical Data (NCHRP 3-92)



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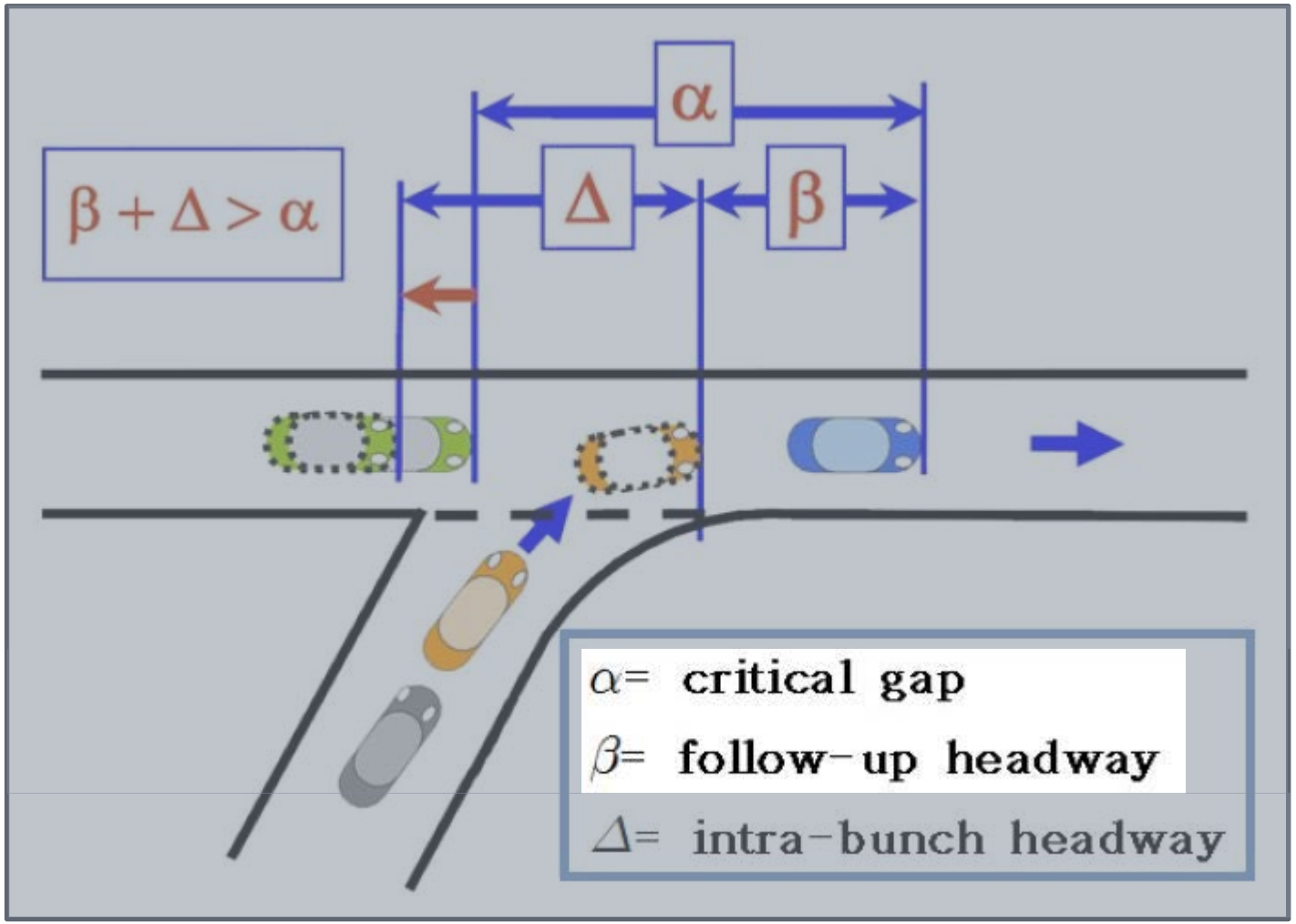

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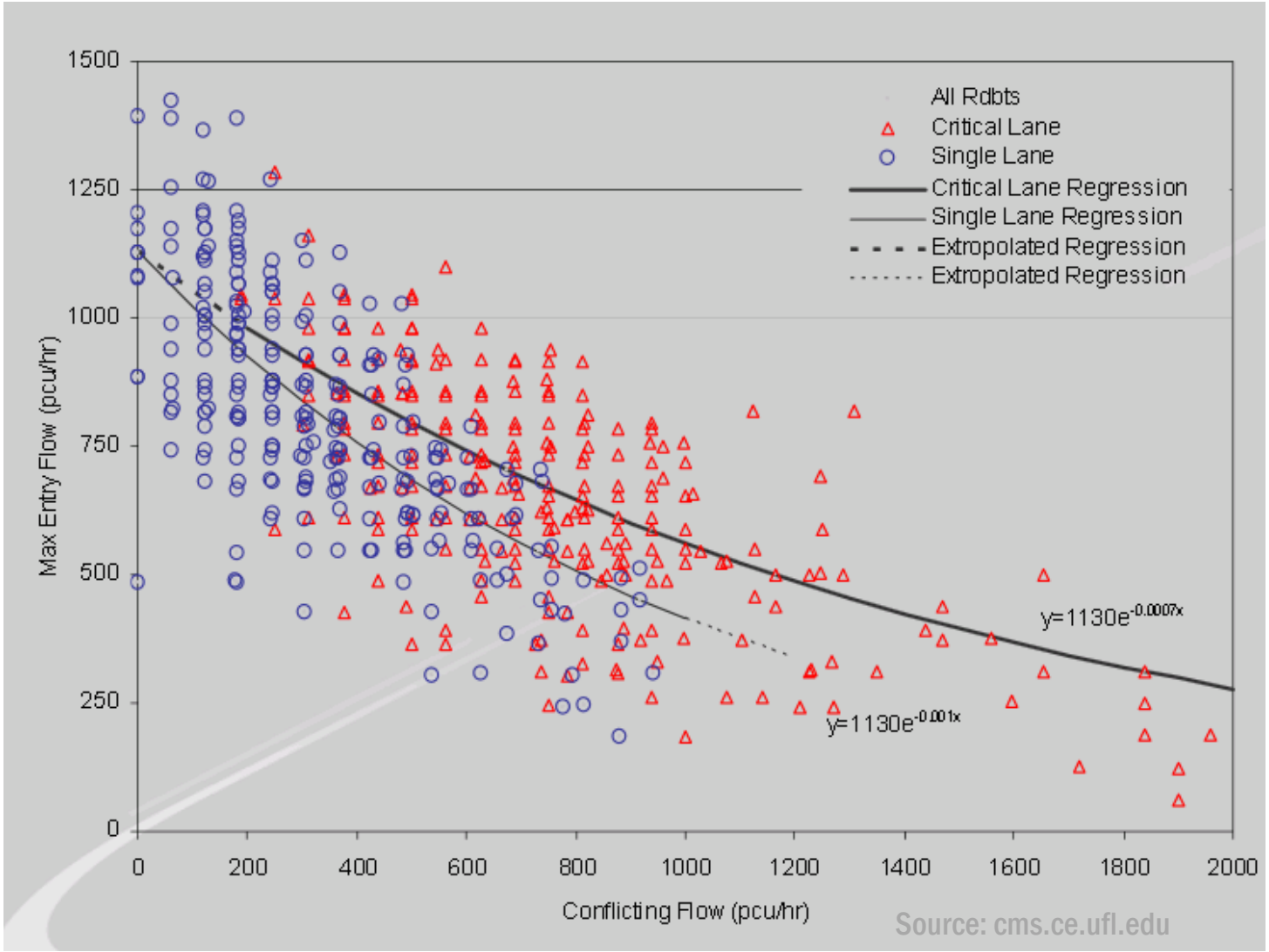
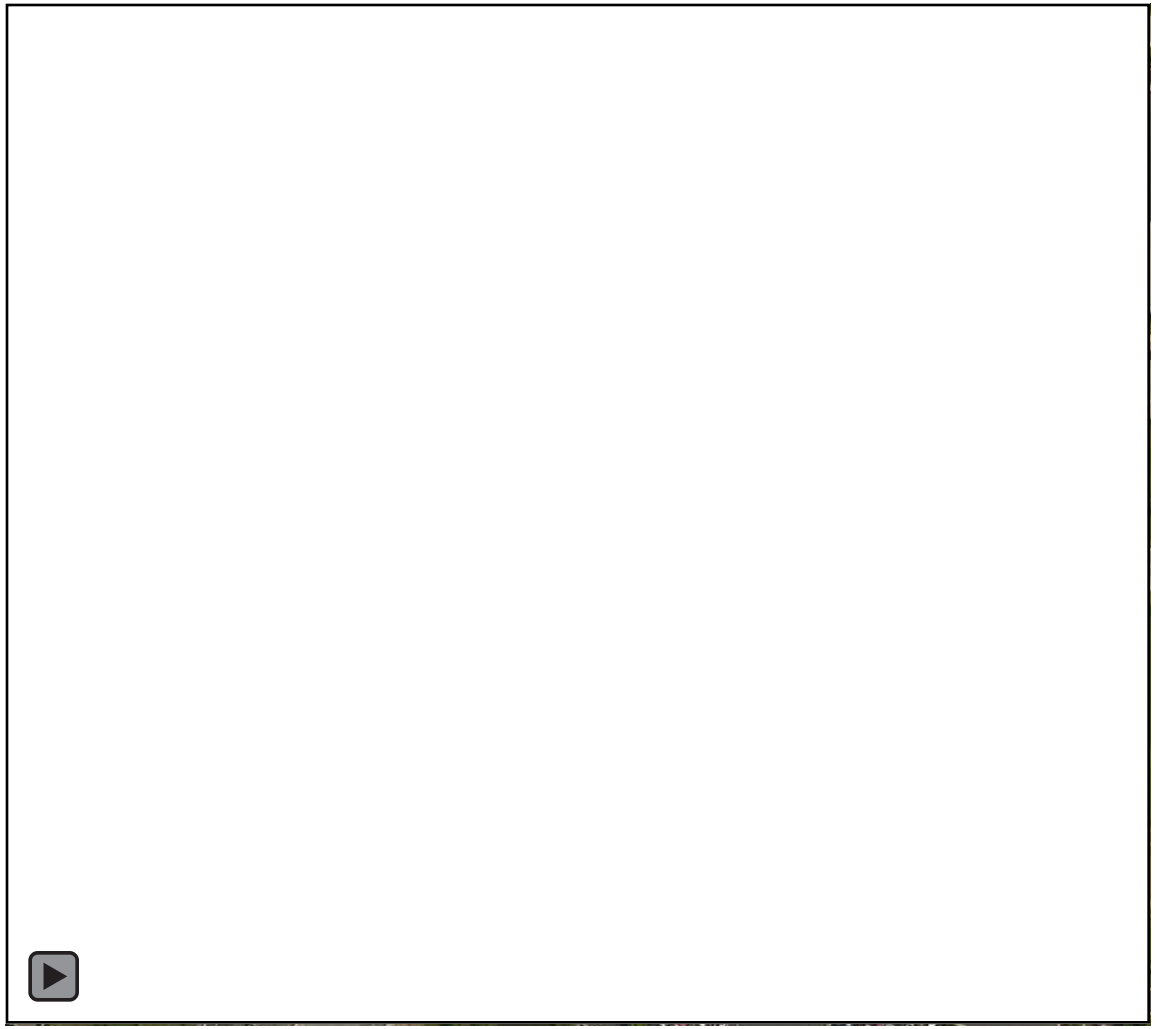


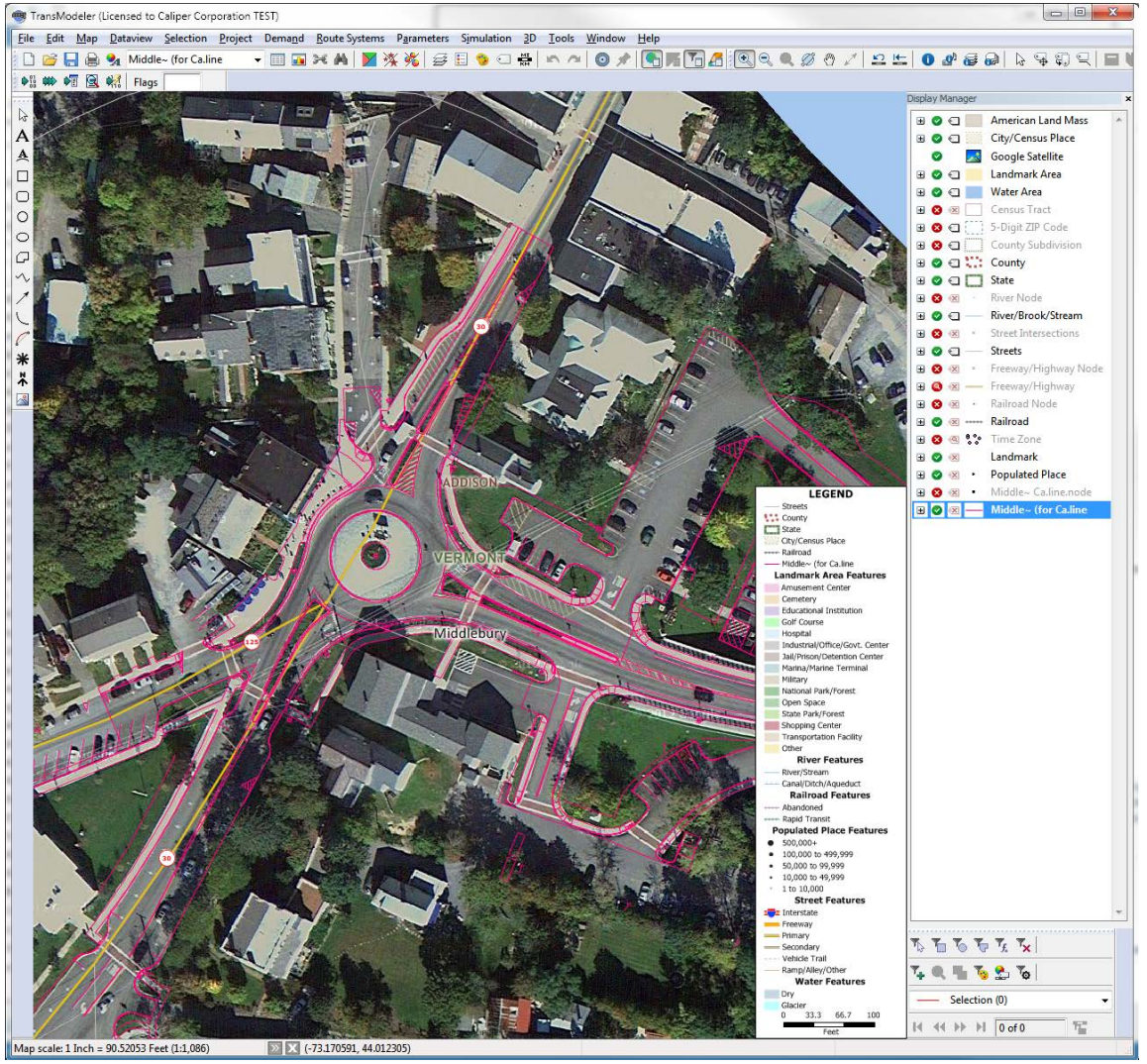
KEY POINT 2: Ground Truth Geometry

- **Road Network Development**
  - Tools make common road editing tasks routine
  - Automation of priority, ROW, gap determination
  - Quickdraw roundabout creation
  - Complete flexibility for modeling alternative and novel roundabout designs



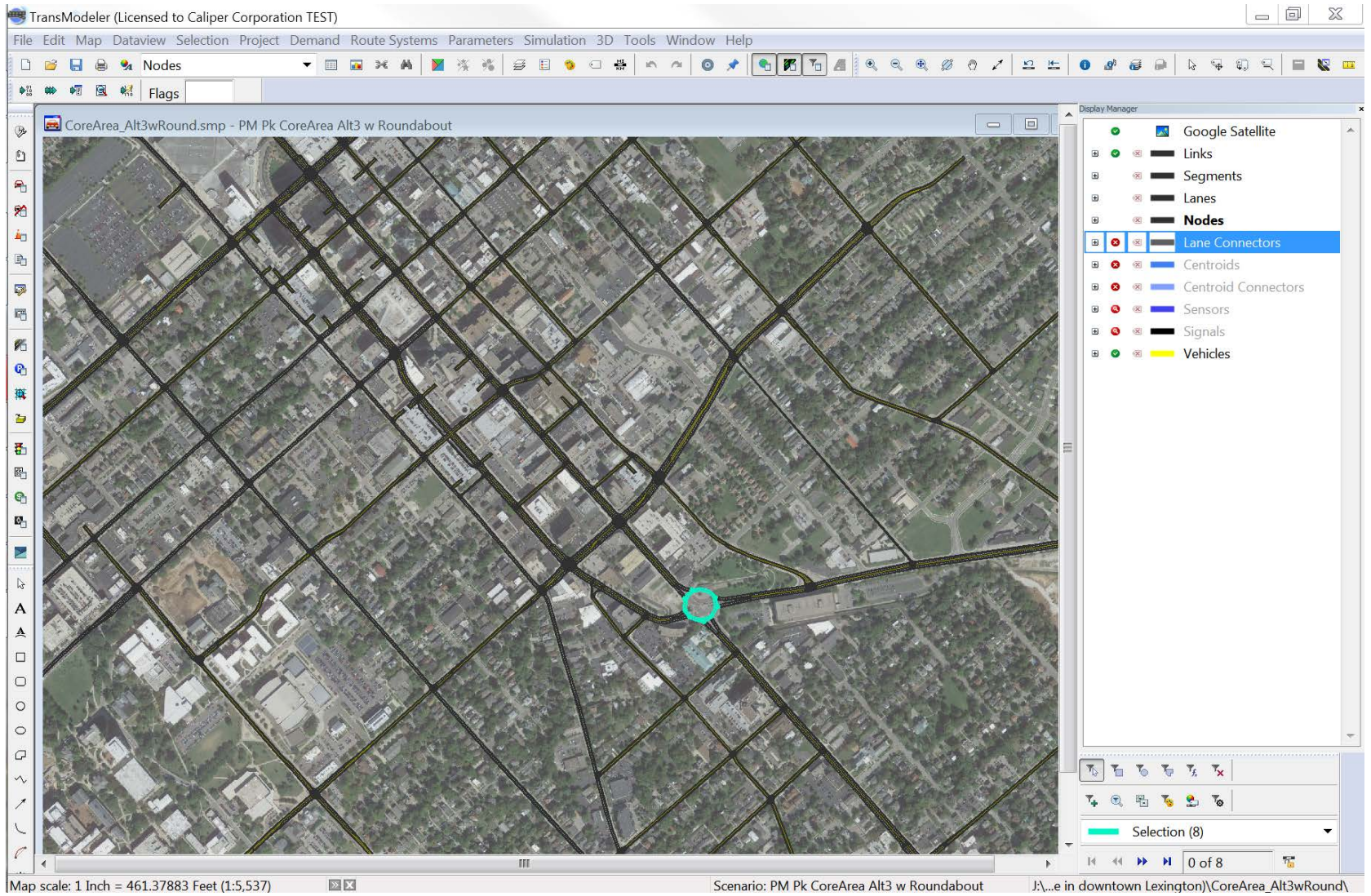
KEY POINT 2: Ground Truth Geometry

- **Easy access to and integration with GIS and CAD data**
  - Pre-installed with extensive map and census data (street line data, state/county/municipality boundaries, populated places, rail, water, etc.)
  - Built-in Google/USGS web map layers
  - The ability to import AutoCAD files



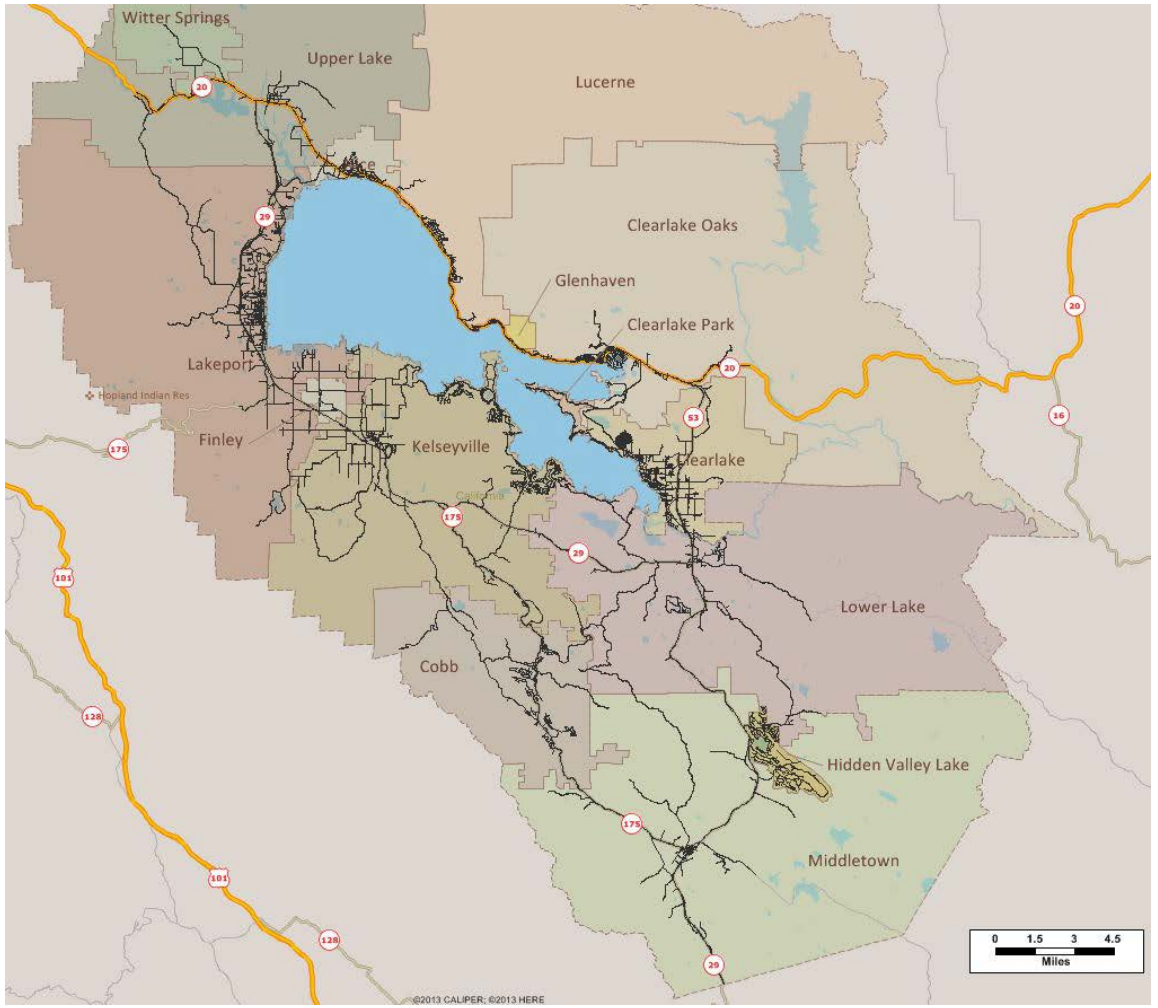
KEY POINT 3: Scales for Broader Roundabout Impacts

- **Broad Range of Applications**
  - Traditional traffic impact studies
  - Geometric design
  - Capacity analysis
  - Alternatives analysis
  - Signal timing, optimization
  - ITS



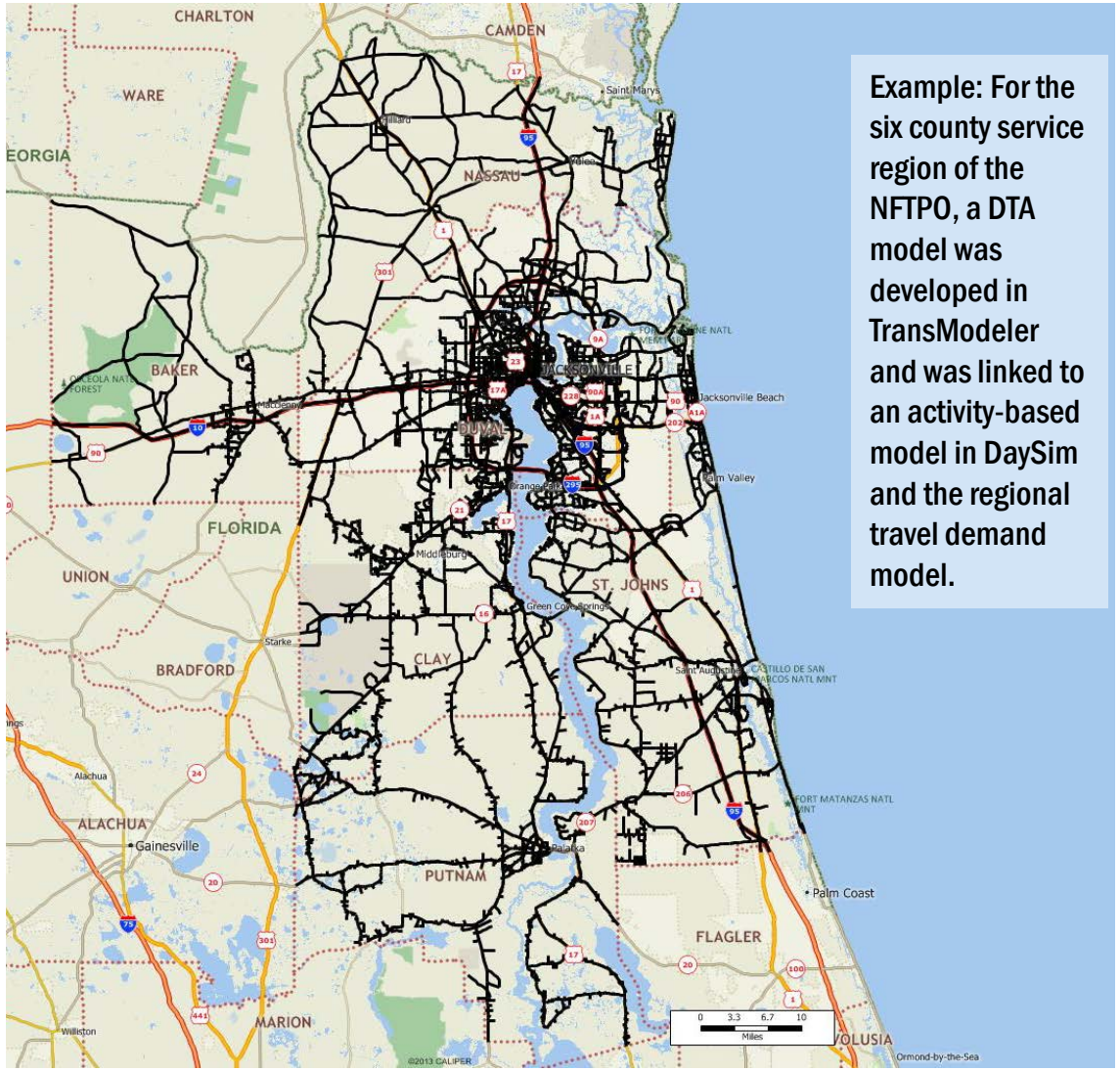
KEY POINT 3: Scales for Broader Roundabout Impacts

- **Wide area simulation**
  - GIS facilitates network, model data development
  - Optimized for modern multi-core processors
  - Hybrid simulation for tailoring to run-time needs



KEY POINT 3: Scales for Broader Roundabout Impacts

- **Travel Demand Model Integration**
  - Imports streets from planning networks
  - Simulates matrices from subarea analyses
  - Compatible with all styles of travel models and all travel demand model platforms
    - Links to traffic analysis zone (TAZ) centroids
    - Streamlines project impact analysis, prioritization



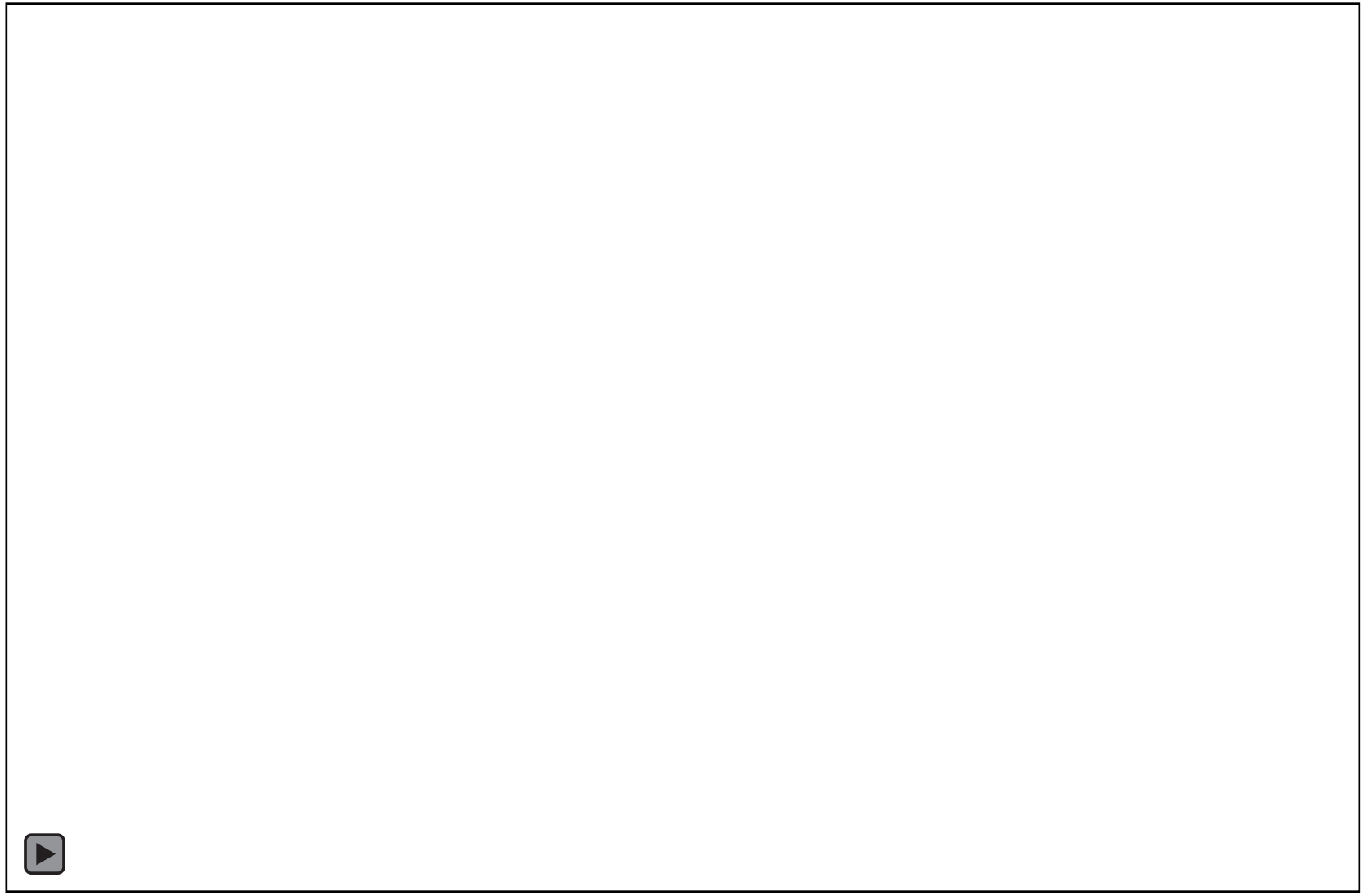
Example: For the six county service region of the NFTPO, a DTA model was developed in TransModeler and was linked to an activity-based model in DaySim and the regional travel demand model.

Step-by-Step Data Input

Roundabouts in TransModeler

Easy to Locate Existing Roundabouts

1. Draw geographically accurate road network using built-in tools
2. Add intersection controls (e.g., traffic signals), if applicable
3. Input traffic demand (e.g., TM counts, O-D matrices)
4. Adjust parameters
   - Headway Threshold (Intrabunch Headway)
   - Circulating Lane Preference: locally or globally



Roundabout Quickdraw

1. Draw geographically accurate road network using built-in tools
2. Add intersection controls (e.g., traffic signals), if applicable
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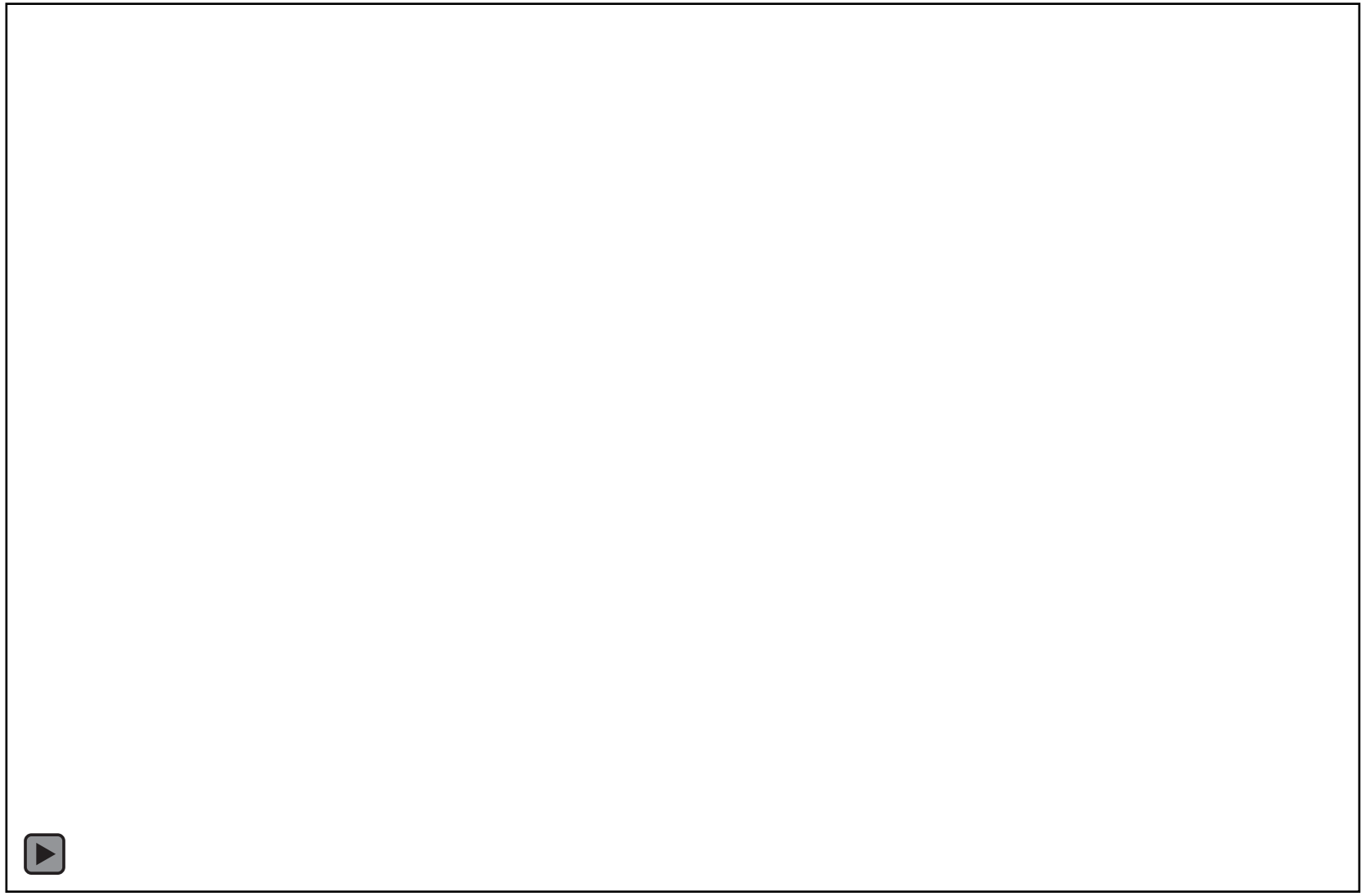
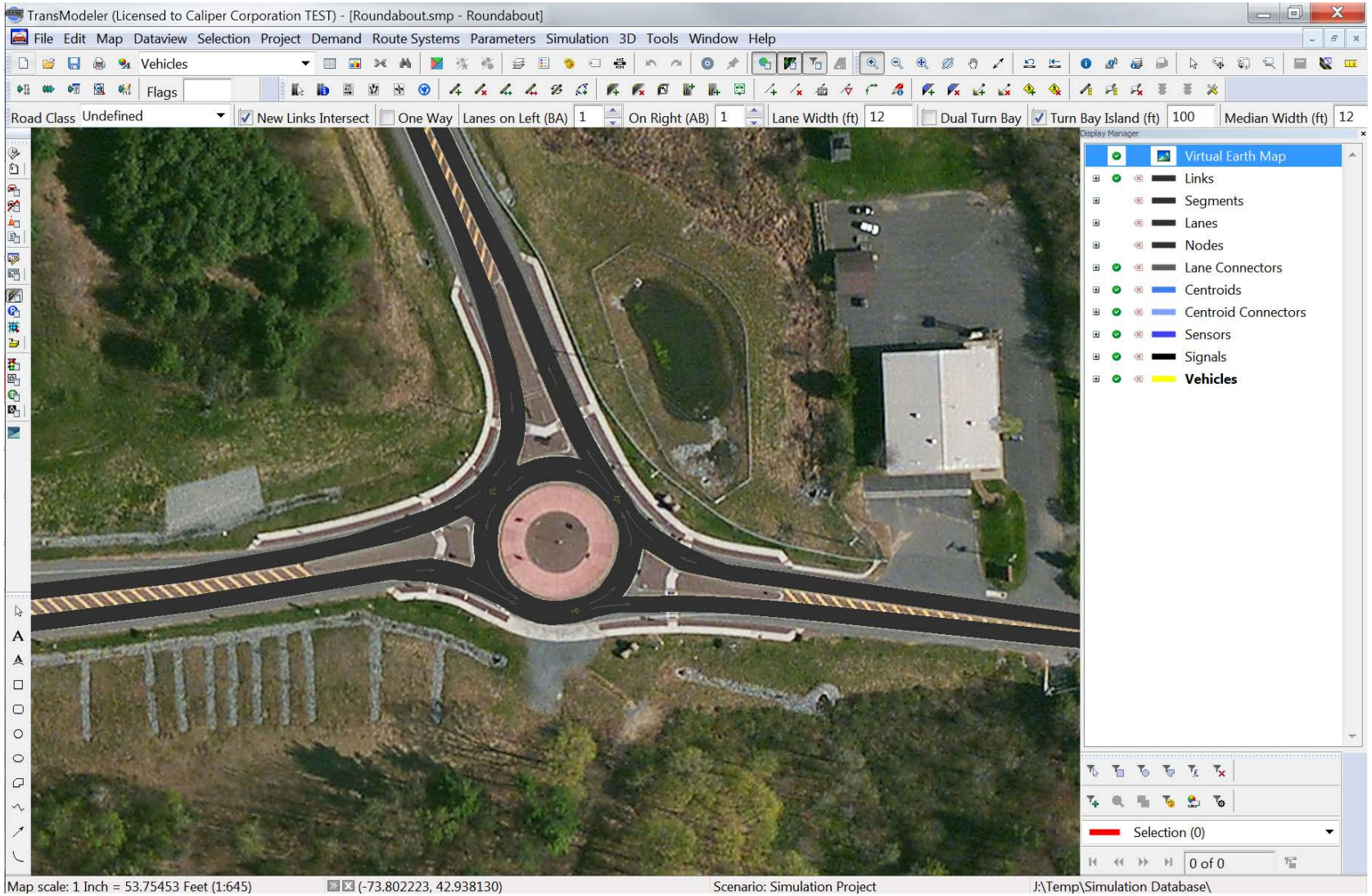


Detailed Roundabout Representations

1. **Draw geographically accurate road network using built-in tools**
2. Add intersection controls (e.g., traffic signals), if applicable
3. Input traffic demand (e.g., TM counts, O-D matrices)
4. Adjust parameters
   - Headway Threshold (Intrabunch Headway)
   - Circulating Lane Preference: locally or globally



Import from AutoCAD

1. Draw geographically accurate road network using built-in tools
2. Add intersection controls (e.g., traffic signals), if applicable
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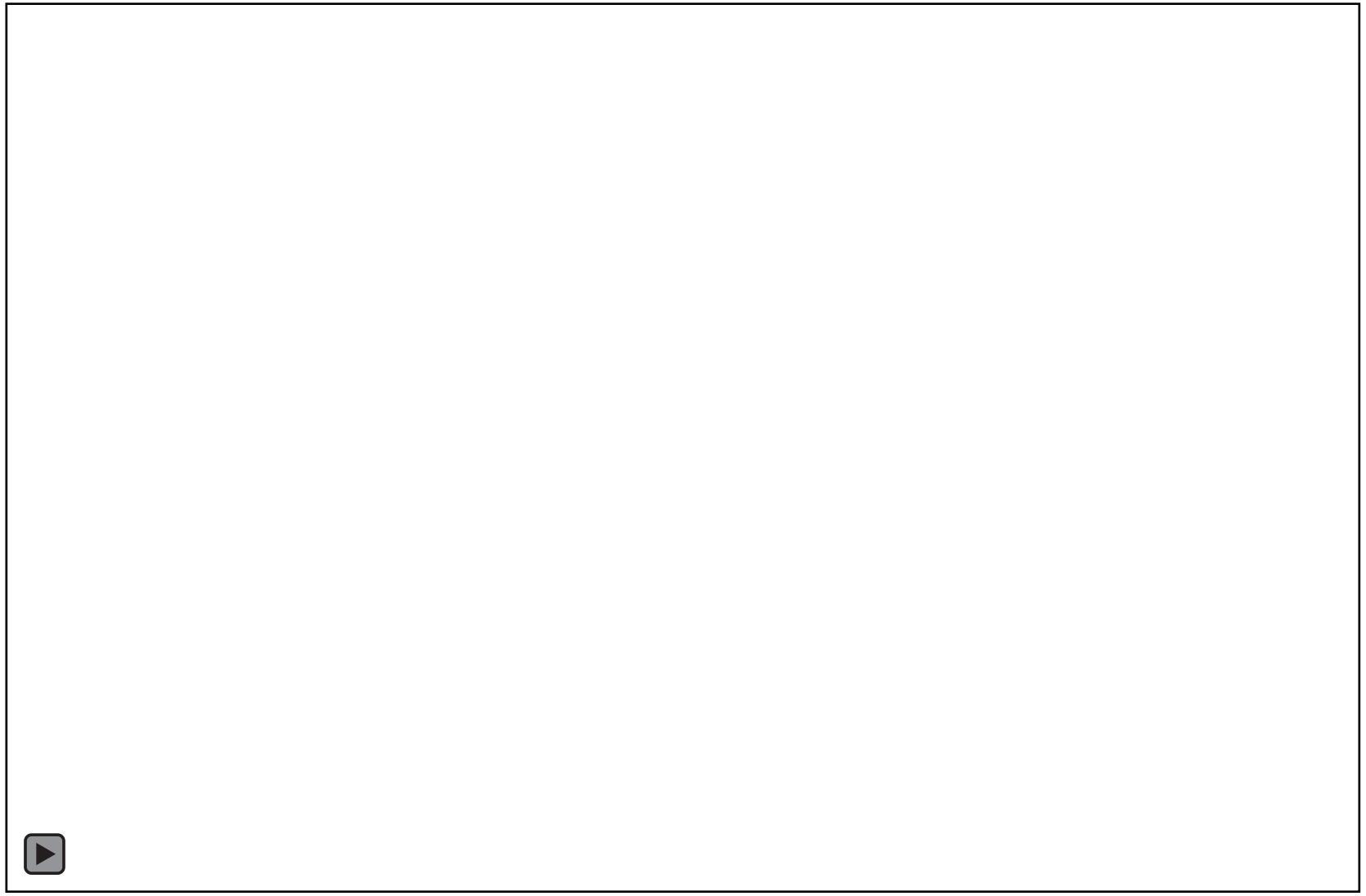

Add Traffic Signals

1. Draw geographically accurate road network using built-in tools
2. **Add intersection controls (e.g., traffic signals), if applicable**
3. Input traffic demand (e.g., TM counts, O-D matrices)
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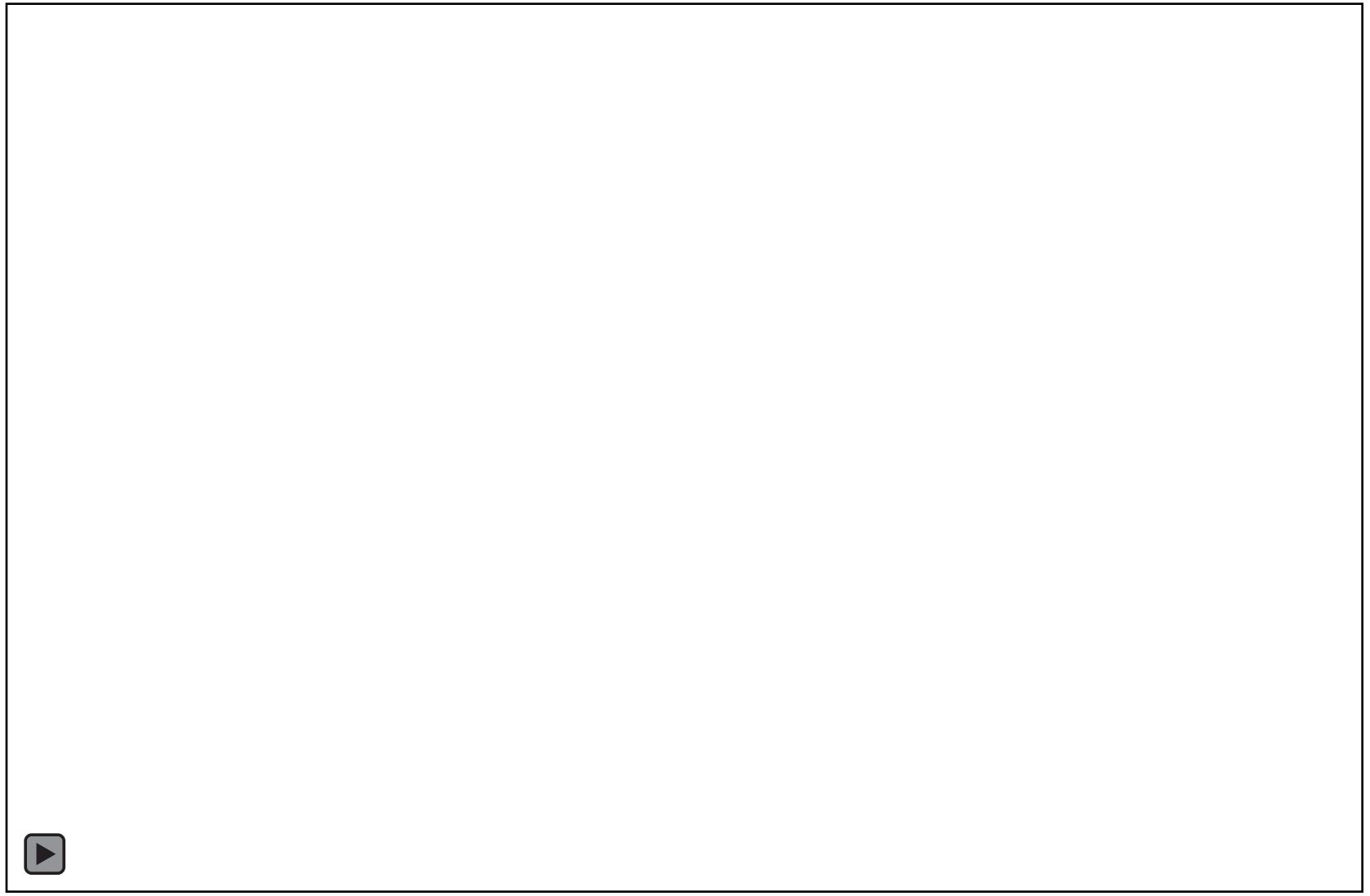

Input Traffic Demand

1. Draw geographically accurate road network using built-in tools
2. Add intersection controls (e.g., traffic signals), if applicable
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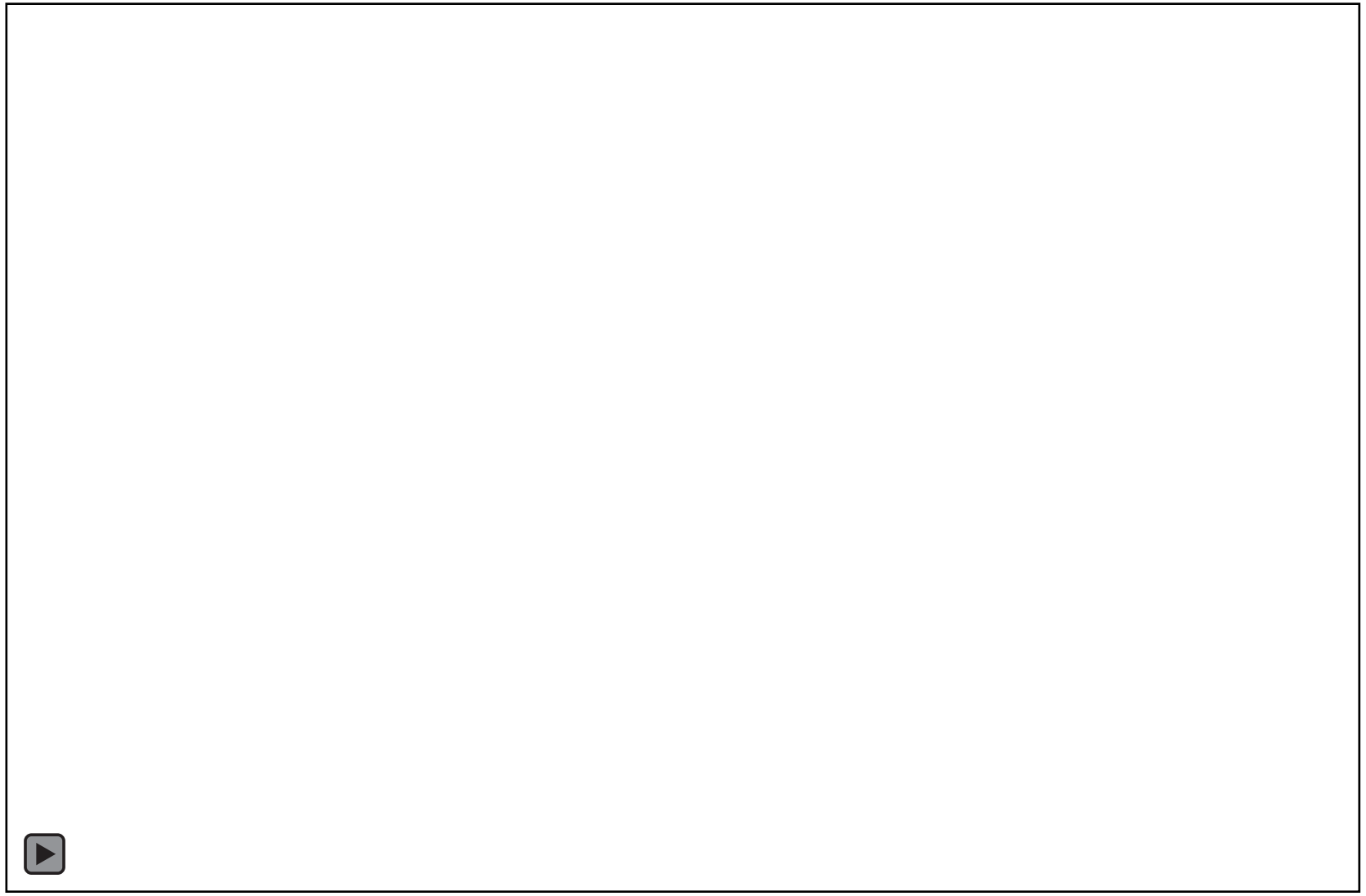

Adjust Roundabout Parameters

1. Draw geographically accurate road network using built-in tools
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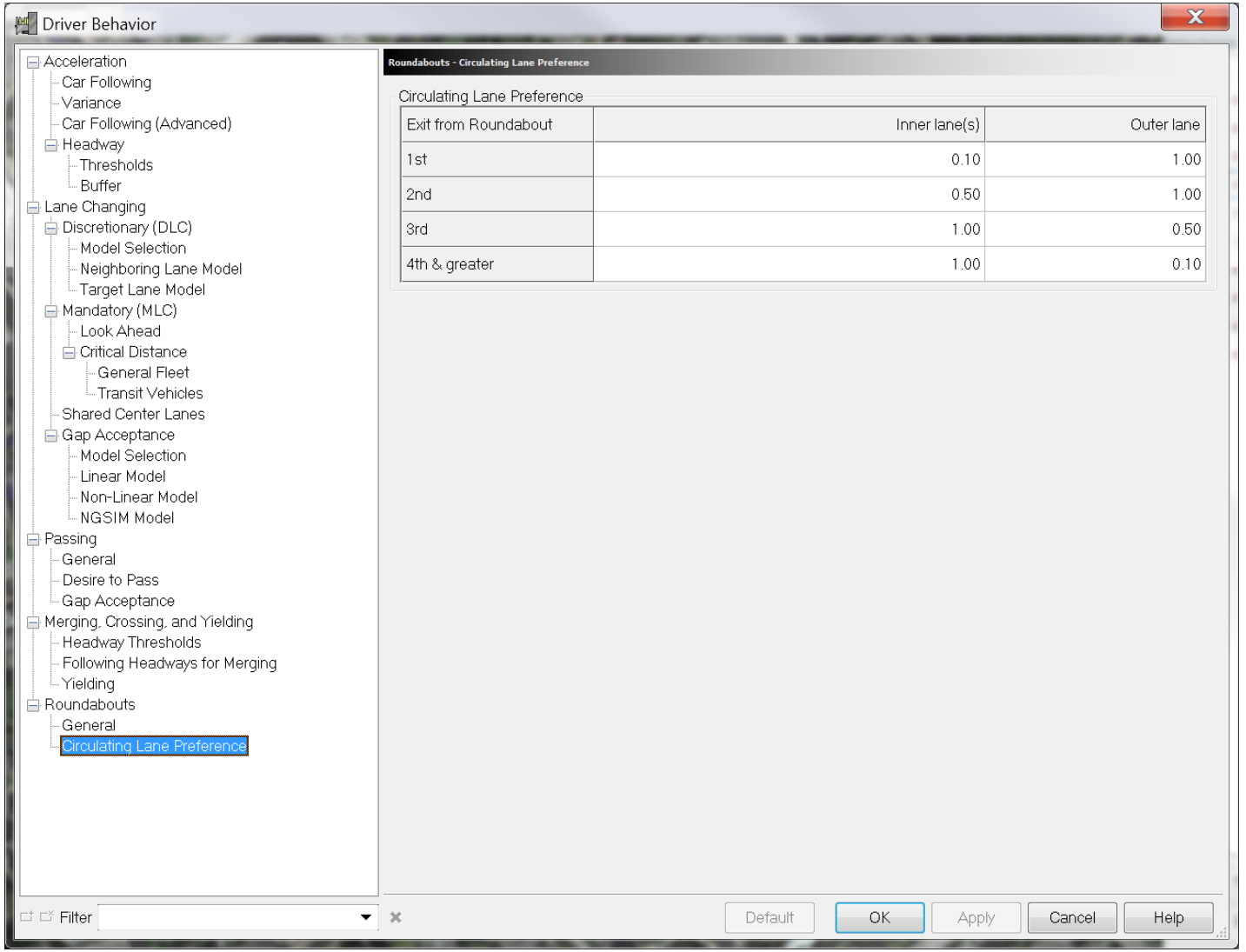
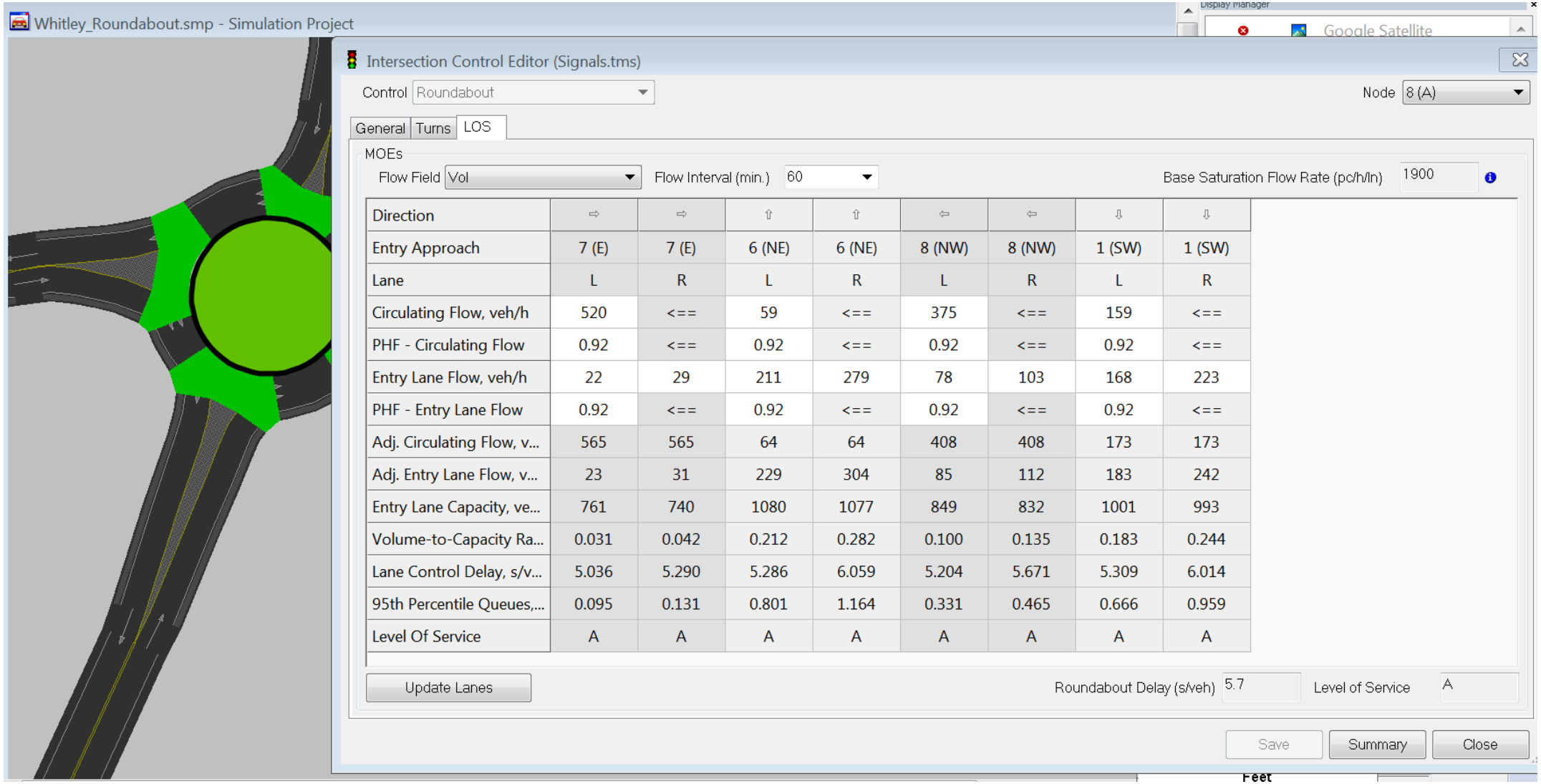


Output

Roundabouts in TransModeler

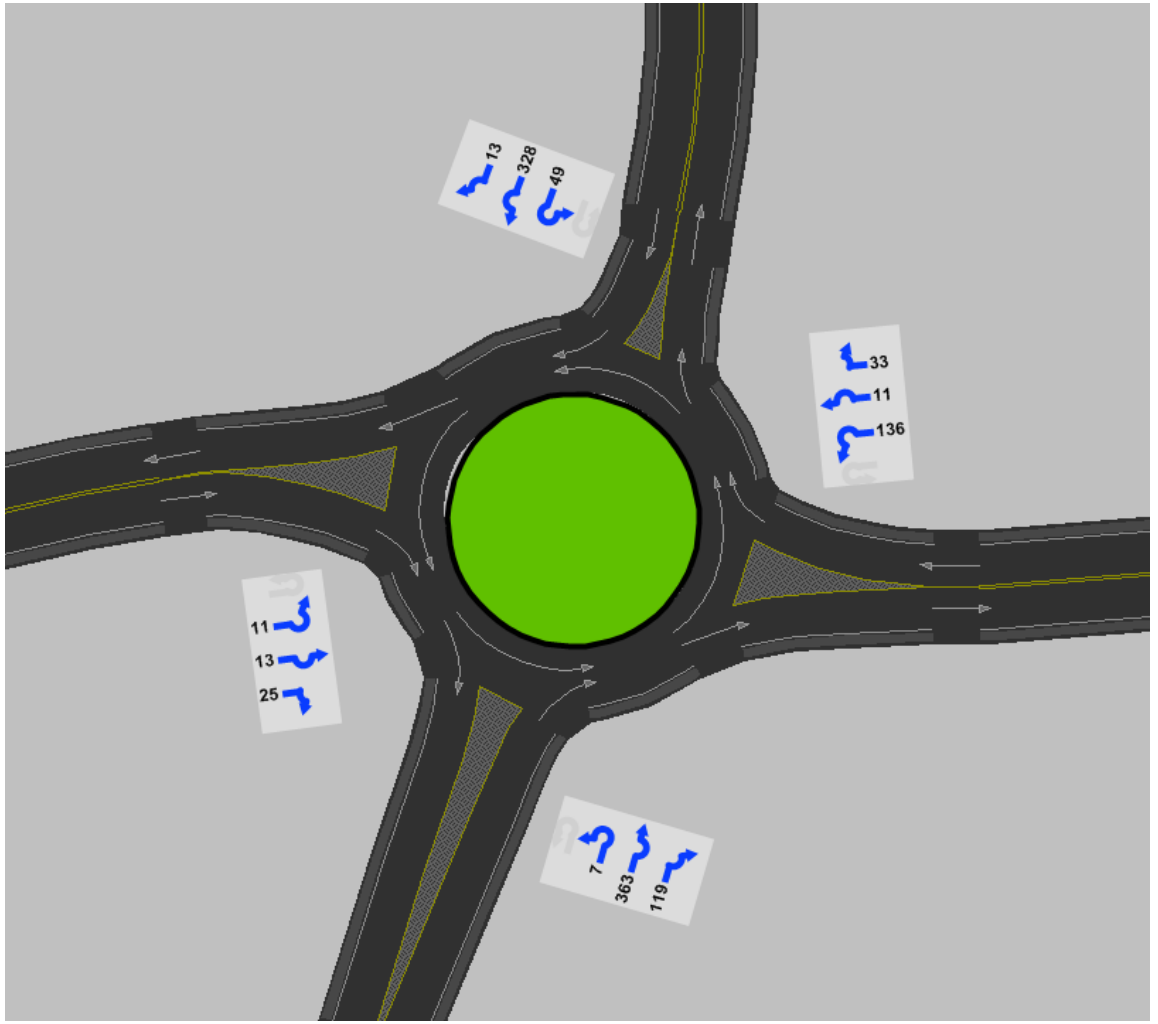
HCM 2014 Roundabout LOS



Direction	⇨	⇨	⇧	⇧	⇦	⇦	⇩	⇩
Entry Approach	7 (E)	7 (E)	6 (NE)	6 (NE)	8 (NW)	8 (NW)	1 (SW)	1 (SW)
Lane	L	R	L	R	L	R	L	R
Circulating Flow, veh/h	520	<==	59	<==	375	<==	159	<==
PHF - Circulating Flow	0.92	<==	0.92	<==	0.92	<==	0.92	<==
Entry Lane Flow, veh/h	22	29	211	279	78	103	168	223
PHF - Entry Lane Flow	0.92	<==	0.92	<==	0.92	<==	0.92	<==
Adj. Circulating Flow, v...	565	565	64	64	408	408	173	173
Adj. Entry Lane Flow, v...	23	31	229	304	85	112	183	242
Entry Lane Capacity, ve...	761	740	1080	1077	849	832	1001	993
Volume-to-Capacity Ra...	0.031	0.042	0.212	0.282	0.100	0.135	0.183	0.244
Lane Control Delay, s/v...	5.036	5.290	5.286	6.059	5.204	5.671	5.309	6.014
95th Percentile Queues,...	0.095	0.131	0.801	1.164	0.331	0.465	0.666	0.959
Level Of Service	A	A	A	A	A	A	A	A

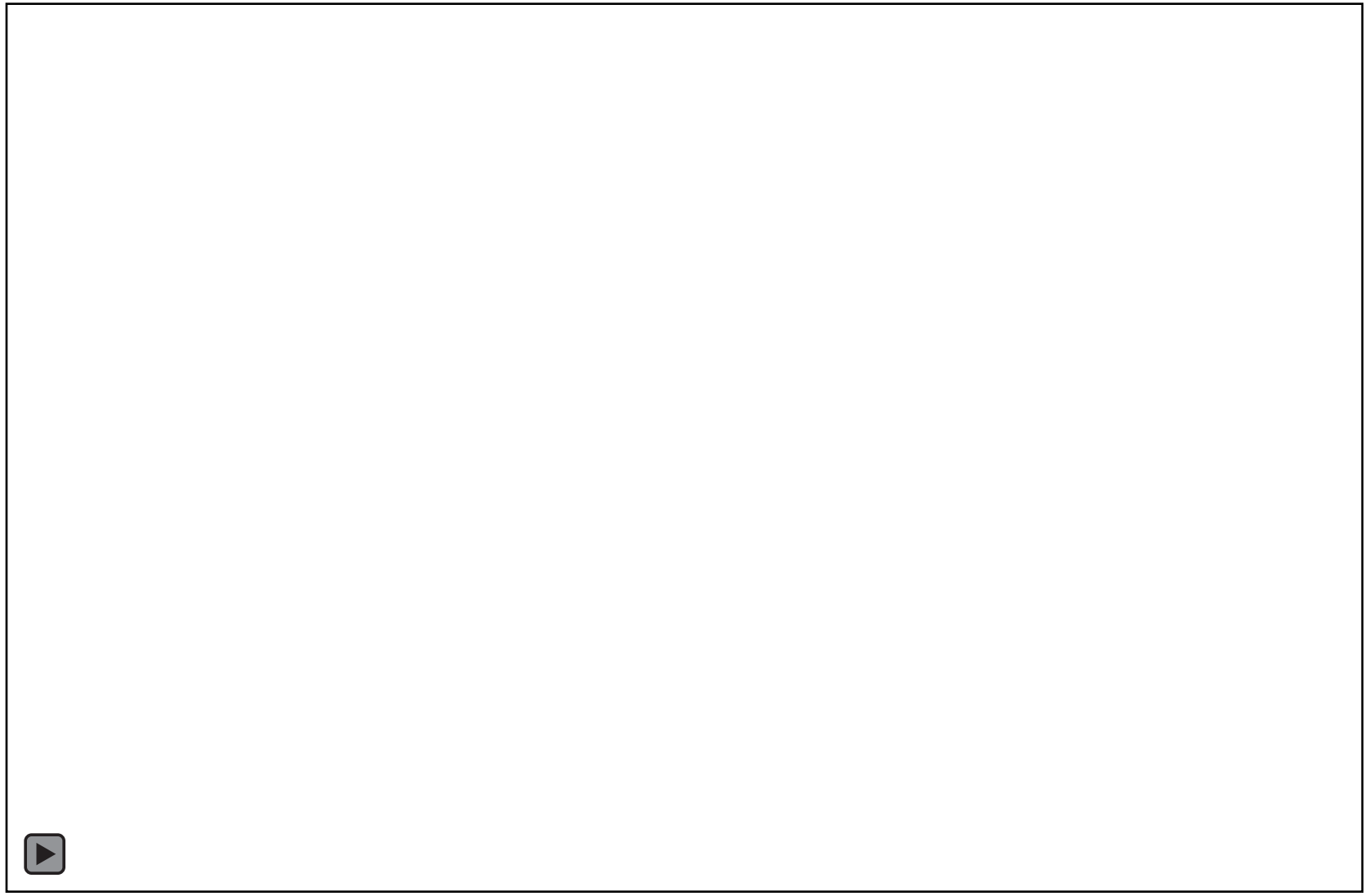
Generate Turning Movement Counts from Simulation

- Produce turning movement counts from simulations



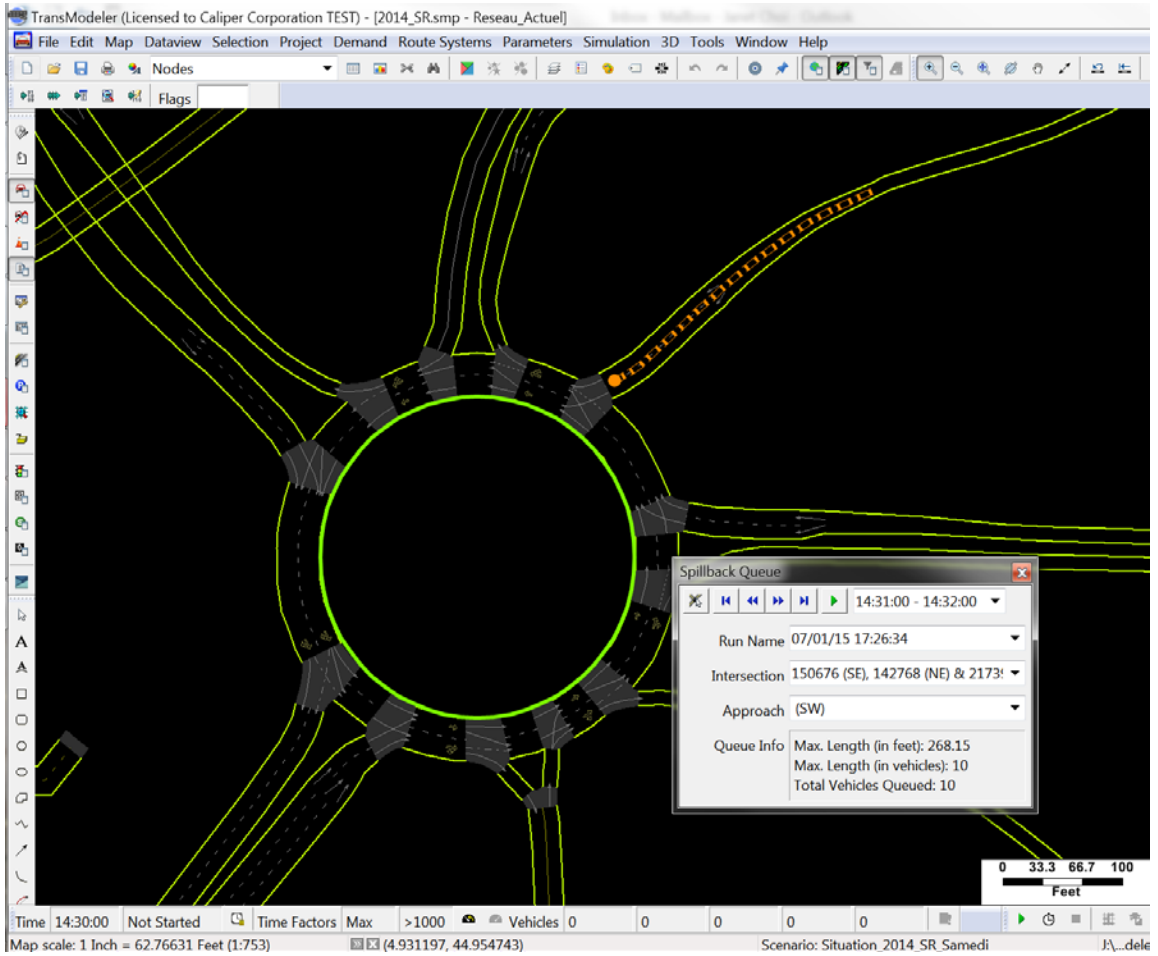
Simulation Output Reports

- Roundabout LOS
- Roundabout LOS by Lane



Other Simulation Outputs

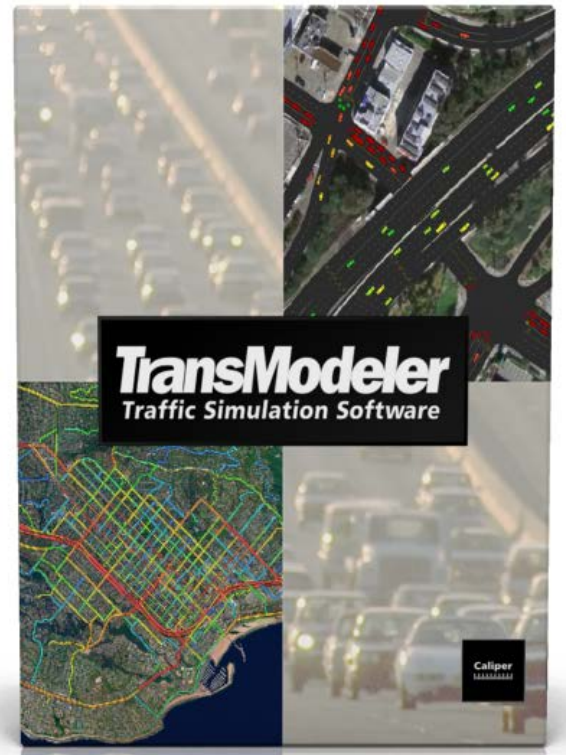
- Lane and spillback queues
- Travel times
- VHT, VMT, trip lengths, travel times

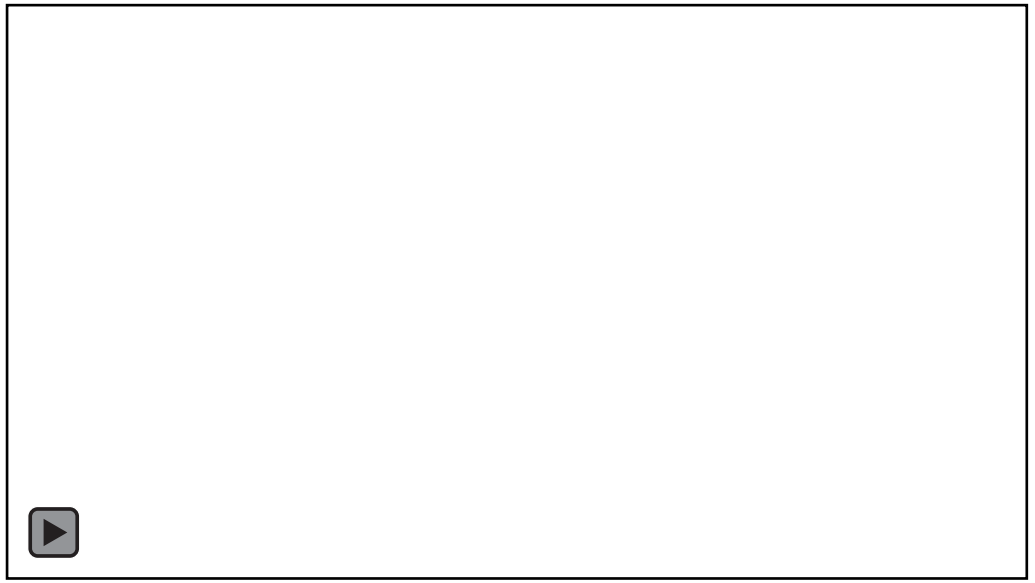


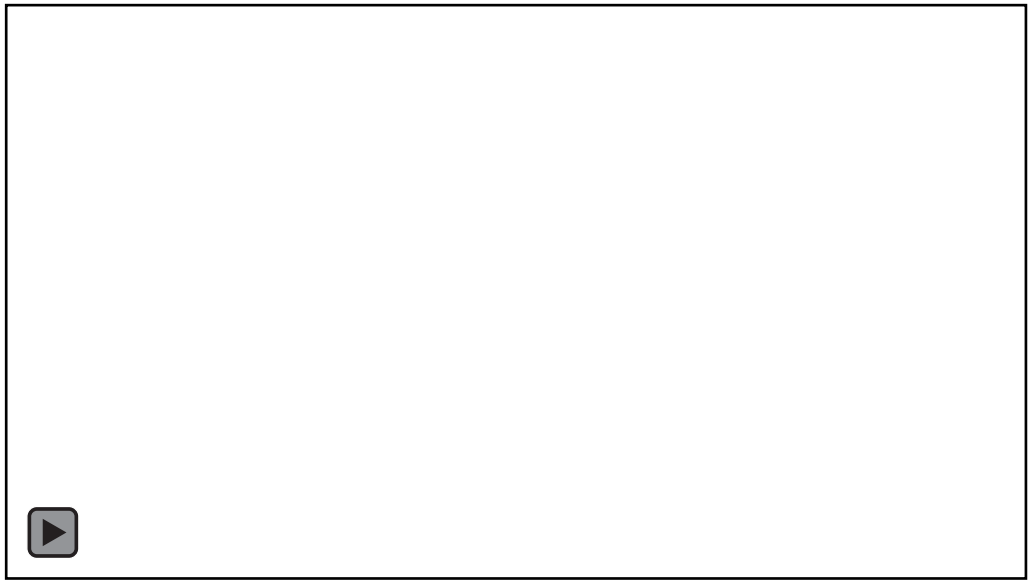
Summary of Key Strengths

Key Strengths of TransModeler

- High-fidelity microsimulation for the most robust operational analysis
- HCM2010 Level of Service analysis, deterministic *and simulation-based*
- Ground truth geometric accuracy, assisted by CAD and GIS
- Scalable for networks, wide geographic areas, and broader range of applications







Thank you!

Questions?

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