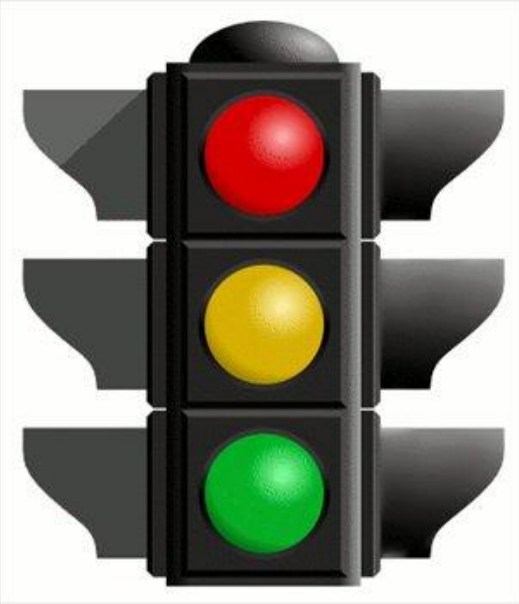
Synchro Studio 8

Overview

By Ioannis Psarros

What is Synchro?

- Software for signal optimization
- Developed by Trafficware
- Optimization can be applied to:
  - Cycle lengths
  - Splits
  - Offsets



Source: http://bikewalklee.blogspot.com

Terminology-1

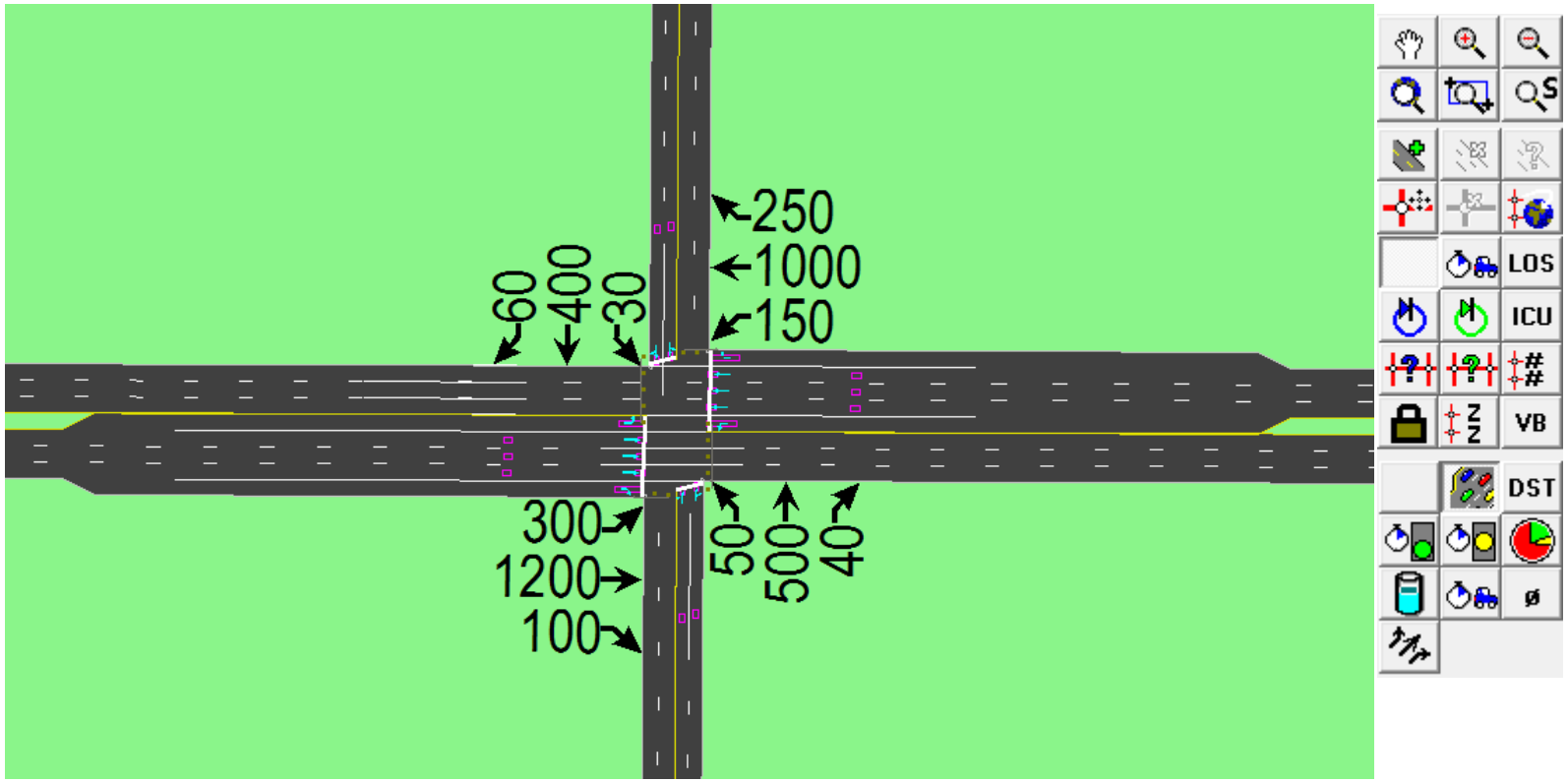
- Cycle length
  - Cycle length is the total time to complete one sequence of all movements around an intersection
- Split
  - An individual (movement) split is the sum of the green time + yellow interval + red clearance interval for a particular movement
- Actuated Traffic Control
  - Fully-actuated signals have detectors on all of the approaches and semi-actuated signals only have detectors at some of the approaches.

Terminology-2

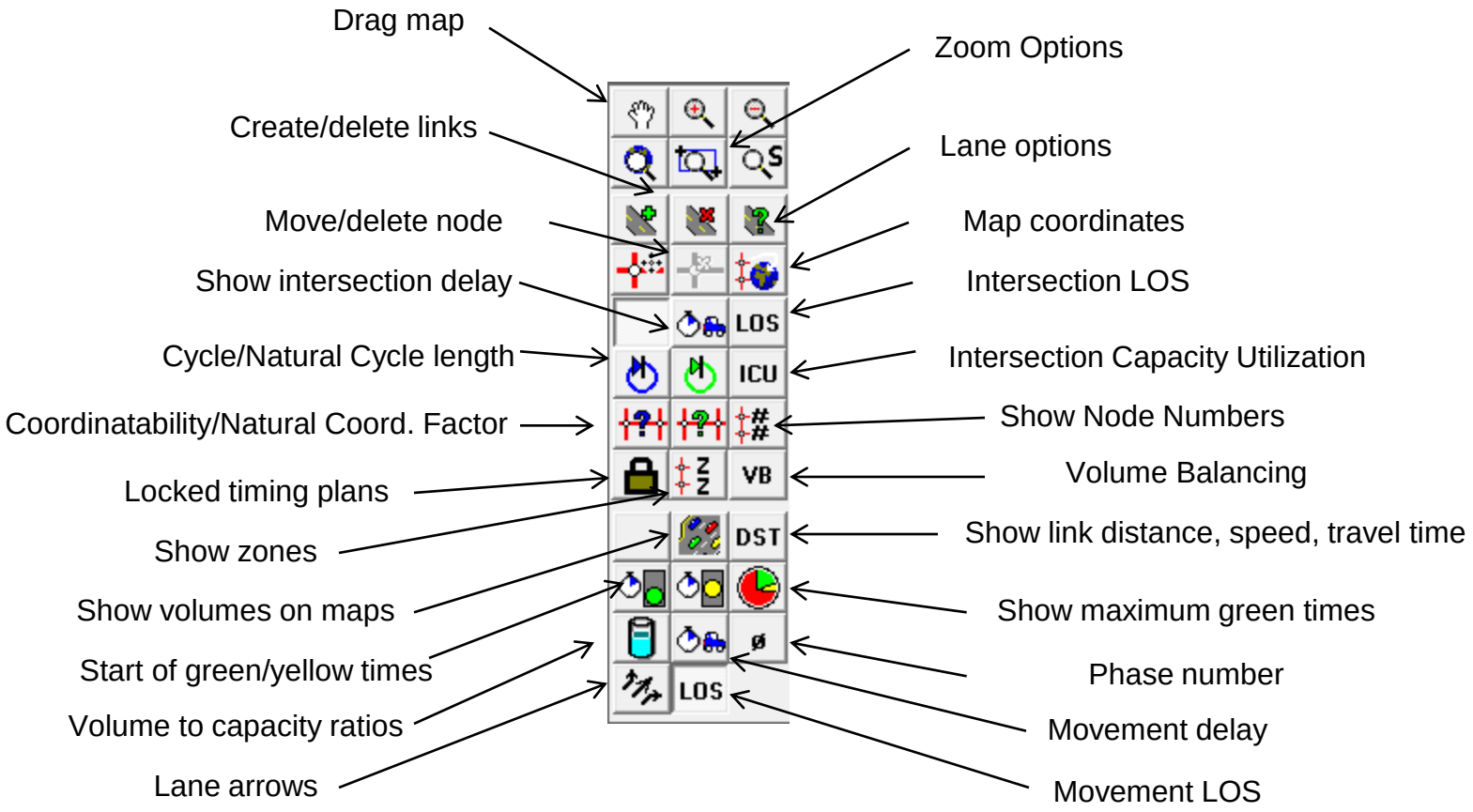
- Signal Coordination
  - Process to synchronize start of the “green light” along the major corridor so that a group of vehicles can travel together (“platoon”) through multiple signals with minimal or no stopping

- Offset
  - Time between start of the “green light” at one intersection and the start of “green light” at another intersection (the offset defines the movement of traffic along the corridor/major road, also referred to as “progression)

Screenshot



Buttons



THE UNIVERSITY OF MEMPHIS

Lane Settings

- Ideal Saturated Flow
  - Default value of 1900 veh/hr/ln (HCM 2000)
  - Do not adjust rate for heavy veh, lane widths, etc. as this is done by Synchro

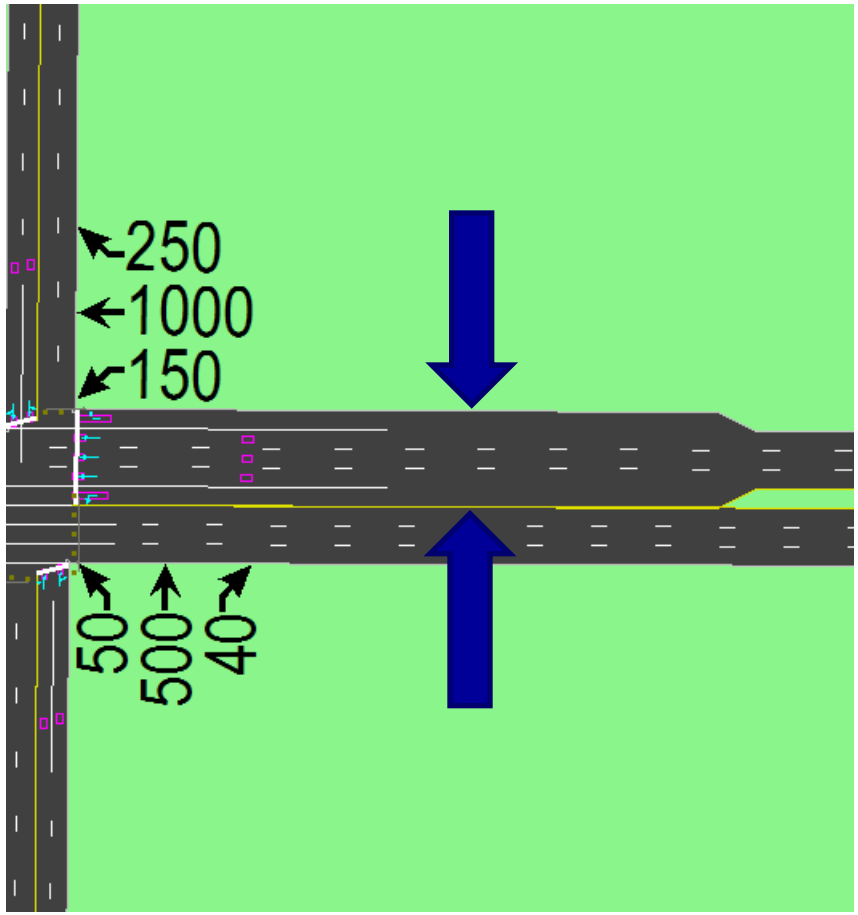
LANE SETTINGS	EBL	EBT	EBR
Lanes and Sharing (#RL)			
Traffic Volume (vph)	300	1200	100
Street Name			
Link Distance (ft)	—	2000	—
Link Speed (mph)	—	50	—
Set Arterial Name and Speed	—	EB	—
Travel Time (s)	—	27.3	—
Ideal Satd. Flow (vphpl)	1900	1900	1900
Lane Width (ft)	12	12	12
Grade (%)	—	0	—
Area Type CBD	—	☐	—
Storage Length (ft)	400	—	400
Storage Lanes (#)	1	—	1
Right Turn Channelized	—	—	None
Curb Radius (ft)	—	—	—
Add Lanes (#)	—	—	—
Lane Utilization Factor	1.00	0.91	1.00
Right Turn Factor	1.000	1.000	0.850
Left Turn Factor (prot)	0.950	1.000	1.000
Saturated Flow Rate (prot)	1805	5187	1615
Left Turn Factor (perm)	0.950	1.000	1.000
Right Ped Bike Factor	1.000	1.000	1.000
Left Ped Factor	1.000	1.000	1.000
Saturated Flow Rate (perm)	1805	5187	1615
Right Turn on Red?	—	—	☑
Saturated Flow Rate (RTOR)	0	0	118

Lane Settings

- CBD (Central Business District)
  - Uses HCM 2000 characteristics for CBD's to make adjustments if selected

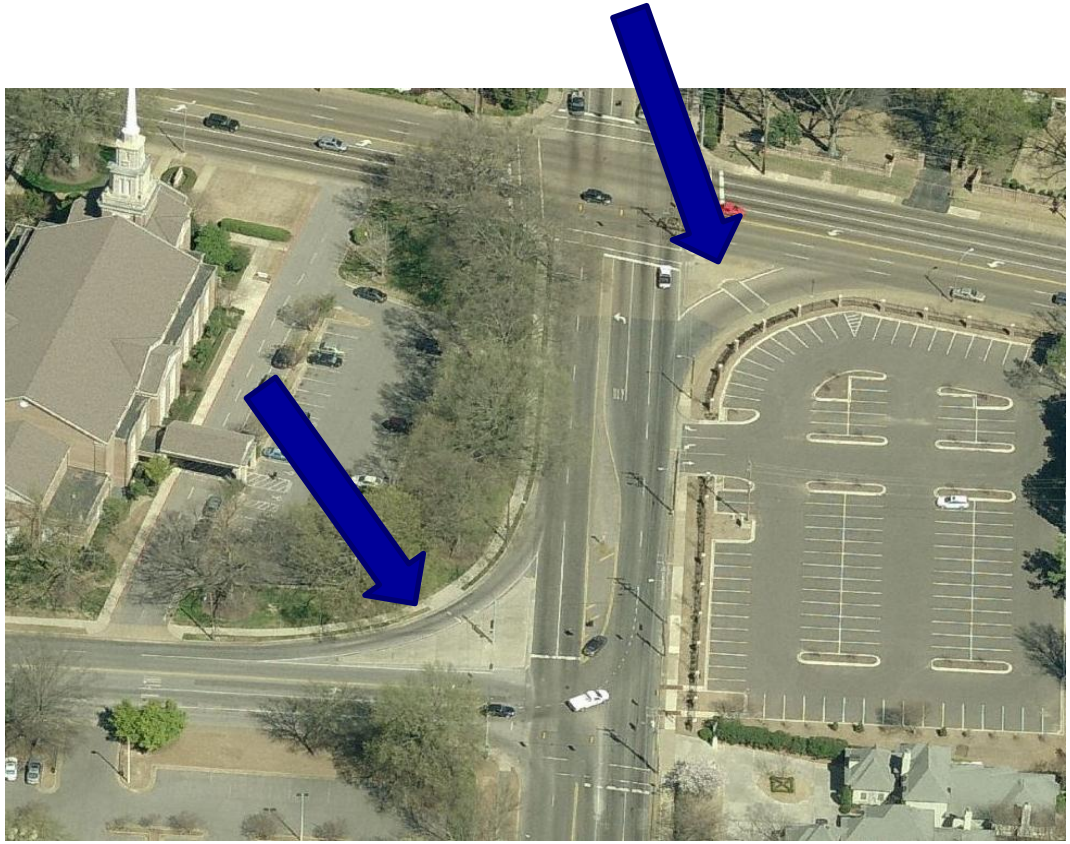
LANE SETTINGS	EBL	EBT	EBR
Lanes and Sharing (#RL)		↑↑↑	
Traffic Volume (vph)	300	1200	100
Street Name			
Link Distance (ft)	—	2000	—
Link Speed (mph)	—	50	—
Set Arterial Name and Speed	—	EB	—
Travel Time (s)	—	27.3	—
Ideal Satd. Flow (vphpl)	1900	1900	1900
Lane Width (ft)	12	12	12
Grade (%)	—	0	—
Area Type CBD	—	☐	—
Storage Length (ft)	400	—	400
Storage Lanes (#)	1	—	1
Right Turn Channelized	—	—	None
Curb Radius (ft)	—	—	—
Add Lanes (#)	—	—	—
Lane Utilization Factor	1.00	0.91	1.00
Right Turn Factor	1.000	1.000	0.850
Left Turn Factor (prot)	0.950	1.000	1.000
Saturated Flow Rate (prot)	1805	5187	1615
Left Turn Factor (perm)	0.950	1.000	1.000
Right Ped Bike Factor	1.000	1.000	1.000
Left Ped Factor	1.000	1.000	1.000
Saturated Flow Rate (perm)	1805	5187	1615
Right Turn on Red?	—	—	☑
Saturated Flow Rate (RTOR)	0	0	118

Lane Settings



LANE SETTINGS	EBL	EBT	EBR
Lanes and Sharing (#RL)		↑↑↑	
Traffic Volume (vph)	300	1200	100
Street Name			
Link Distance (ft)	—	2000	—
Link Speed (mph)	—	50	—
Set Arterial Name and Speed	—	EB	—
Travel Time (s)	—	27.3	—
Ideal Satd. Flow (vphpl)	1900	1900	1900
Lane Width (ft)	12	12	12
Grade (%)	—	0	—
Area Type CBD	—	☐	—
Storage Length (ft)	400	—	400
Storage Lanes (#)	1	—	1
Right Turn Channelized	—	—	None
Curb Radius (ft)	—	—	—
Add Lanes (#)	—	—	—
Lane Utilization Factor	1.00	0.91	1.00
Right Turn Factor	1.000	1.000	0.850
Left Turn Factor (prot)	0.950	1.000	1.000
Saturated Flow Rate (prot)	1805	5187	1615
Left Turn Factor (perm)	0.950	1.000	1.000
Right Ped Bike Factor	1.000	1.000	1.000
Left Ped Factor	1.000	1.000	1.000
Saturated Flow Rate (perm)	1805	5187	1615
Right Turn on Red?	—	—	☑
Saturated Flow Rate (RTOR)	0	0	118

Lane Settings



LANE SETTINGS	EBL	EBT	EBR
Lanes and Sharing (#RL)		↑↑↑	
Traffic Volume (vph)	300	1200	100
Street Name			
Link Distance (ft)	—	2000	—
Link Speed (mph)	—	50	—
Set Arterial Name and Speed	—	EB	—
Travel Time (s)	—	27.3	—
Ideal Satd. Flow (vphpl)	1900	1900	1900
Lane Width (ft)	12	12	12
Grade (%)	—	0	—
Area Type CBD	—	☐	—
Storage Length (ft)	400	—	400
Storage Lanes (#)	1	—	1
Right Turn Channelized	—	—	None
Curb Radius (ft)	—	—	—
Add Lanes (#)	—	—	—
Lane Utilization Factor	1.00	0.91	1.00
Right Turn Factor	1.000	1.000	0.850
Left Turn Factor (prot)	0.950	1.000	1.000
Saturated Flow Rate (prot)	1805	5187	1615
Left Turn Factor (perm)	0.950	1.000	1.000
Right Ped Bike Factor	1.000	1.000	1.000
Left Ped Factor	1.000	1.000	1.000
Saturated Flow Rate (perm)	1805	5187	1615
Right Turn on Red?	—	—	☑
Saturated Flow Rate (RTOR)	0	0	118

Lane Settings

Determines how traffic volumes are distributed across each lane

$$f_{LU} = \frac{Tot.App.Vol.}{n \times High\ Lane\ Vol.}$$

LANE SETTINGS	EBL	EBT	EBR
Lanes and Sharing (#RL)		↑↑↑	
Traffic Volume (vph)	300	1200	100
Street Name			
Link Distance (ft)	—	2000	—
Link Speed (mph)	—	50	—
Set Arterial Name and Speed	—	EB	—
Travel Time (s)	—	27.3	—
Ideal Satd. Flow (vphpl)	1900	1900	1900
Lane Width (ft)	12	12	12
Grade (%)	—	0	—
Area Type CBD	—	☐	—
Storage Length (ft)	400	—	400
Storage Lanes (#)	1	—	1
Right Turn Channelized	—	—	None
Curb Radius (ft)	—	—	—
Add Lanes (#)	—	—	—
Lane Utilization Factor	1.00	0.91	1.00
Right Turn Factor	1.000	1.000	0.850
Left Turn Factor (prot)	0.950	1.000	1.000
Saturated Flow Rate (prot)	1805	5187	1615
Left Turn Factor (perm)	0.950	1.000	1.000
Right Ped Bike Factor	1.000	1.000	1.000
Left Ped Factor	1.000	1.000	1.000
Saturated Flow Rate (perm)	1805	5187	1615
Right Turn on Red?	—	—	☑
Saturated Flow Rate (RTOR)	0	0	118

Lane Settings

- Exclusive Lane:
  - $f_{RT} = 0.85$
- Shared Lane:
  - $f_{RT} = 1.0 - (0.15)P_{RT}$
- Single Lane:
  - $f_{RT} = 1.0 - (0.135)P_{RT}$

where P_{RT} = proportion of right turn traffic in lane

LANE SETTINGS	EBL	EBT	EBR
Lanes and Sharing (#RL)		↑↑↑	
Traffic Volume (vph)	300	1200	100
Street Name			
Link Distance (ft)	—	2000	—
Link Speed (mph)	—	50	—
Set Arterial Name and Speed	—	EB	—
Travel Time (s)	—	27.3	—
Ideal Satd. Flow (vphpl)	1900	1900	1900
Lane Width (ft)	12	12	12
Grade (%)	—	0	—
Area Type CBD	—	☐	—
Storage Length (ft)	400	—	400
Storage Lanes (#)	1	—	1
Right Turn Channelized	—	—	None
Curb Radius (ft)	—	—	—
Add Lanes (#)	—	—	—
Lane Utilization Factor	1.00	0.91	1.00
Right Turn Factor	1.000	1.000	0.850
Left Turn Factor (prot)	0.950	1.000	1.000
Saturated Flow Rate (prot)	1805	5187	1615
Left Turn Factor (perm)	0.950	1.000	1.000
Right Ped Bike Factor	1.000	1.000	1.000
Left Ped Factor	1.000	1.000	1.000
Saturated Flow Rate (perm)	1805	5187	1615
Right Turn on Red?	—	—	☑
Saturated Flow Rate (RTOR)	0	0	118

Lane Settings

- Exclusive Lane:
  - $f_{LT} = 0.95$
- Shared Lane:
  - $f_{RT} = 1/(1.0 + 0.05P_{LT})$

where P_{LT} = proportion of left turn traffic in lane

- Permitted left factors are based on actuated green times per the 2000 HCM

LANE SETTINGS	EBL	EBT	EBR
Lanes and Sharing (#RL)		↑↑↑	
Traffic Volume (vph)	300	1200	100
Street Name			
Link Distance (ft)	—	2000	—
Link Speed (mph)	—	50	—
Set Arterial Name and Speed	—	EB	—
Travel Time (s)	—	27.3	—
Ideal Satd. Flow (vphpl)	1900	1900	1900
Lane Width (ft)	12	12	12
Grade (%)	—	0	—
Area Type CBD	—	☐	—
Storage Length (ft)	400	—	400
Storage Lanes (#)	1	—	1
Right Turn Channelized	—	—	None
Curb Radius (ft)	—	—	—
Add Lanes (#)	—	—	—
Lane Utilization Factor	1.00	0.91	1.00
Right Turn Factor	1.000	1.000	0.850
Left Turn Factor (prot)	0.950	1.000	1.000
Saturated Flow Rate (prot)	1805	5187	1615
Left Turn Factor (perm)	0.950	1.000	1.000
Right Ped Bike Factor	1.000	1.000	1.000
Left Ped Factor	1.000	1.000	1.000
Saturated Flow Rate (perm)	1805	5187	1615
Right Turn on Red?	—	—	☑
Saturated Flow Rate (RTOR)	0	0	118

Lane Settings

- Adjusted flow rates
  - Used in capacity, delay, and optimization calculations
  - Not used for simulation modeling in SimTraffic

LANE SETTINGS	EBL	EBT	EBR
Lanes and Sharing (#RL)			
Traffic Volume (vph)	300	1200	100
Street Name			
Link Distance (ft)	—	2000	—
Link Speed (mph)	—	50	—
Set Arterial Name and Speed	—	EB	—
Travel Time (s)	—	27.3	—
Ideal Satd. Flow (vphpl)	1900	1900	1900
Lane Width (ft)	12	12	12
Grade (%)	—	0	—
Area Type CBD	—	☐	—
Storage Length (ft)	400	—	400
Storage Lanes (#)	1	—	1
Right Turn Channelized	—	—	None
Curb Radius (ft)	—	—	—
Add Lanes (#)	—	—	—
Lane Utilization Factor	1.00	0.91	1.00
Right Turn Factor	1.000	1.000	0.850
Left Turn Factor (prot)	0.950	1.000	1.000
Saturated Flow Rate (prot)	1805	5187	1615
Left Turn Factor (perm)	0.950	1.000	1.000
Right Ped Bike Factor	1.000	1.000	1.000
Left Ped Factor	1.000	1.000	1.000
Saturated Flow Rate (perm)	1805	5187	1615
Right Turn on Red?	—	—	☑
Saturated Flow Rate (RTOR)	0	0	118

Lane Settings

- These factors are calculated based upon HCM 2000 methods

LANE SETTINGS	EBL	EBT	EBR
Lanes and Sharing (#RL)		↑↑↑	
Traffic Volume (vph)	300	1200	100
Street Name			
Link Distance (ft)	—	2000	—
Link Speed (mph)	—	50	—
Set Arterial Name and Speed	—	EB	—
Travel Time (s)	—	27.3	—
Ideal Satd. Flow (vphpl)	1900	1900	1900
Lane Width (ft)	12	12	12
Grade (%)	—	0	—
Area Type CBD	—	☐	—
Storage Length (ft)	400	—	400
Storage Lanes (#)	1	—	1
Right Turn Channelized	—	—	None
Curb Radius (ft)	—	—	—
Add Lanes (#)	—	—	—
Lane Utilization Factor	1.00	0.91	1.00
Right Turn Factor	1.000	1.000	0.850
Left Turn Factor (prot)	0.950	1.000	1.000
Saturated Flow Rate (prot)	1805	5187	1615
Left Turn Factor (perm)	0.950	1.000	1.000
Right Ped Bike Factor	1.000	1.000	1.000
Left Ped Factor	1.000	1.000	1.000
Saturated Flow Rate (perm)	1805	5187	1615
Right Turn on Red?	—	—	☑
Saturated Flow Rate (RTOR)	0	0	118

Lane Settings

- Right-Turn on Red (ROTR)
  - HCM does not support ROTR calculations
  - Synchro adjusts applies different formulation to calculate ROTR
  - A separate saturation flow rate is calculated for these movements

LANE SETTINGS	EBL	EBT	EBR
Lanes and Sharing (#RL)		↑↑↑	
Traffic Volume (vph)	300	1200	100
Street Name			
Link Distance (ft)	—	2000	—
Link Speed (mph)	—	50	—
Set Arterial Name and Speed	—	EB	—
Travel Time (s)	—	27.3	—
Ideal Satd. Flow (vphpl)	1900	1900	1900
Lane Width (ft)	12	12	12
Grade (%)	—	0	—
Area Type CBD	—	☐	—
Storage Length (ft)	400	—	400
Storage Lanes (#)	1	—	1
Right Turn Channelized	—	—	None
Curb Radius (ft)	—	—	—
Add Lanes (#)	—	—	—
Lane Utilization Factor	1.00	0.91	1.00
Right Turn Factor	1.000	1.000	0.850
Left Turn Factor (prot)	0.950	1.000	1.000
Saturated Flow Rate (prot)	1805	5187	1615
Left Turn Factor (perm)	0.950	1.000	1.000
Right Ped Bike Factor	1.000	1.000	1.000
Left Ped Factor	1.000	1.000	1.000
Saturated Flow Rate (perm)	1805	5187	1615
Right Turn on Red?	—	—	☑
Saturated Flow Rate (RTOR)	0	0	118

Volume Settings

$$PHF = \frac{V}{4 \times V_{15}}$$

$$GF = (1 + r)^{Y}$$

where r = growth rate

Y = number of years

VOLUME SETTINGS	EBL	EBT	EBR
Lanes and Sharing (#RL)		↑↑↑	↱
Traffic Volume (vph)	300	1200	100
Conflicting Peds. (#/hr)	0	—	0
Conflicting Bicycles (#/hr)	—	—	0
Peak Hour Factor	0.85	0.85	0.85
Growth Factor	1.00	1.00	1.00
Heavy Vehicles (%)	0	0	0
Bus Blockages (#/hr)	0	0	0
Adj. Parking Lane?	☐	☐	☐
Parking Maneuvers (#/hr)	—	—	—
Traffic from mid-block (%)	—	0	—
Link OD Volumes	—	—	—
Adjusted Flow (vph)	353	1412	118
Traffic in shared lane (%)	—	—	—
Lane Group Flow (vph)	353	1412	118

Volume Settings

$$F_{bb} = [N - (14.4N_b/3600)]/N$$

where:

F_{bb} = bus blockage factor

N = number of lanes

N_b = number of buses stopping/hr

VOLUME SETTINGS	EBL	EBT	EBR
Lanes and Sharing (#RL)		↑↑↑	↱
Traffic Volume (vph)	300	1200	100
Conflicting Peds. (#/hr)	0	—	0
Conflicting Bicycles (#/hr)	—	—	0
Peak Hour Factor	0.85	0.85	0.85
Growth Factor	1.00	1.00	1.00
Heavy Vehicles (%)	0	0	0
Bus Blockages (#/hr)	0	0	0
Adj. Parking Lane?	☐	☐	☐
Parking Maneuvers (#/hr)	—	—	—
Traffic from mid-block (%)	—	0	—
Link OD Volumes	—	—	—
Adjusted Flow (vph)	353	1412	118
Traffic in shared lane (%)	—	—	—
Lane Group Flow (vph)	353	1412	118

Volume Settings

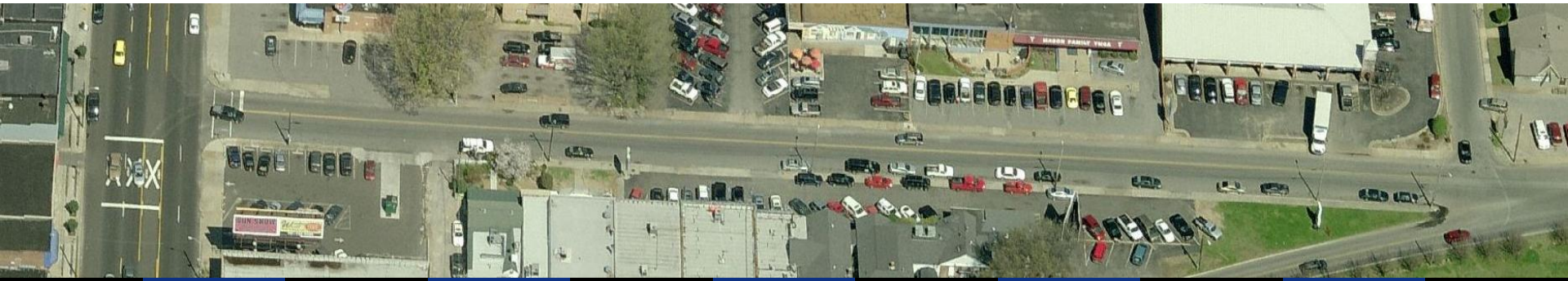
- On-Street Parking
  - Check the adjacent parking lane box
  - Estimate number of parking maneuvers

VOLUME SETTINGS	EBL	EBT	EBR
Lanes and Sharing (#RL)		↑↑↑	↱
Traffic Volume (vph)	300	1200	100
Conflicting Peds. (#/hr)	0	—	0
Conflicting Bicycles (#/hr)	—	—	0
Peak Hour Factor	0.85	0.85	0.85
Growth Factor	1.00	1.00	1.00
Heavy Vehicles (%)	0	0	0
Bus Blockages (#/hr)	0	0	0
Adj. Parking Lane?	☐	☐	☐
Parking Maneuvers (#/hr)	—	—	—
Traffic from mid-block (%)	—	0	—
Link OD Volumes	—	—	—
Adjusted Flow (vph)	353	1412	118
Traffic in shared lane (%)	—	—	—
Lane Group Flow (vph)	353	1412	118

Volume Settings

- Sources: driveways, un-modeled streets
- Synchro balances upstream & downstream traffic by adjusting mid-block traffic
- Higher values of mid-block traffic reduces the effectiveness of signal optimization

VOLUME SETTINGS	EBL	EBT	EBR
Lanes and Sharing (#RL)			
Traffic Volume (vph)	300	1200	100
Conflicting Peds. (#/hr)	0	—	0
Conflicting Bicycles (#/hr)	—	—	0
Peak Hour Factor	0.85	0.85	0.85
Growth Factor	1.00	1.00	1.00
Heavy Vehicles (%)	0	0	0
Bus Blockages (#/hr)	0	0	0
Adj. Parking Lane?	☐	☐	☐
Parking Maneuvers (#/hr)	—	—	—
Traffic from mid-block (%)	—	0	—
Link OD Volumes	—	—	—
Adjusted Flow (vph)	353	1412	118
Traffic in shared lane (%)	—	—	—
Lane Group Flow (vph)	353	1412	118



Volume Settings

- Allows for detailed control over O-D movements for adjacent intersections
- Used for:
  - Links less than 300 ft. long
  - Freeway interchange intersections
  - Median of a wide arterial
  - Between nodes of a “dog-legged” intersection (“T” intersections)

VOLUME SETTINGS	EBL	EBT	EBR
Lanes and Sharing (#RL)			
Traffic Volume (vph)	300	1200	100
Conflicting Peds. (#/hr)	0	—	0
Conflicting Bicycles (#/hr)	—	—	0
Peak Hour Factor	0.85	0.85	0.85
Growth Factor	1.00	1.00	1.00
Heavy Vehicles (%)	0	0	0
Bus Blockages (#/hr)	0	0	0
Adj. Parking Lane?	☐	☐	☐
Parking Maneuvers (#/hr)	—	—	—
Traffic from mid-block (%)	—	0	—
Link OD Volumes	—	—	—
Adjusted Flow (vph)	353	1412	118
Traffic in shared lane (%)	—	—	—
Lane Group Flow (vph)	353	1412	118

Volume Settings

- Pass. Car Equivalents are used to balance lanes
- Values for PCEs:
  - Rights = 1.18
  - Protected Lefts = 1.05
  - Permitted Lefts = 1.05 – 6.67
  - Perm. Plus Prot. =1.05 – 1.82

VOLUME SETTINGS	EBL	EBT	EBR
Lanes and Sharing (#RL)			
Traffic Volume (vph)	300	1200	100
Conflicting Peds. (#/hr)	0	—	0
Conflicting Bicycles (#/hr)	—	—	0
Peak Hour Factor	0.85	0.85	0.85
Growth Factor	1.00	1.00	1.00
Heavy Vehicles (%)	0	0	0
Bus Blockages (#/hr)	0	0	0
Adj. Parking Lane?	☐	☐	☐
Parking Maneuvers (#/hr)	—	—	—
Traffic from mid-block (%)	—	0	—
Link OD Volumes	—	—	—
Adjusted Flow (vph)	353	1412	118
Traffic in shared lane (%)	—	—	—
Lane Group Flow (vph)	353	1412	118

Calculated based on opposing traffic volumes

Node Settings

- Controller Types
  - Pretimed
  - Semi-Actuated-Uncoordinated
  - Actuated-Uncoordinated
  - Actuated-Coordinated
  - Unsignalized
  - Roundabouts

NODE SETTINGS	
Node #	3
Zone:	
X East (ft):	10230
Y North (ft):	10833
Z Elevation (ft):	0
Description	
Control Type	Pretimed
Cycle Length (s):	70.0
Lock Timings:	☐
Optimize Cycle Length:	Optimize
Optimize Splits:	Optimize
Actuated Cycle(s):	70.0
Natural Cycle(s):	70.0
Max v/c Ratio:	0.97
Intersection Delay (s):	36.0
Intersection LOS:	D
ICU:	0.87
ICU LOS:	E
Offset (s) :	0.0
Referenced to:	Begin of Green
Reference Phase:	6+2 - SBTL NBTL
Master Intersection:	☐
Yield Point:	Single

Node Settings (Cont.)

- Actuated Cycle Length
  - Average cycle length for an actuated signal
- Natural Cycle Length
  - Shortest cycle length that will give acceptable capacity
  - Cycle length intersection would run at if it was independent of other intersections

NODE SETTINGS	
Node #	3
Zone:	
X East (ft):	10230
Y North (ft):	10833
Z Elevation (ft):	0
Description	
Control Type	Pretimed
Cycle Length (s):	70.0
Lock Timings:	☐
Optimize Cycle Length:	Optimize
Optimize Splits:	Optimize
Actuated Cycle(s):	70.0
Natural Cycle(s):	70.0
Max v/c Ratio:	0.97
Intersection Delay (s):	36.0
Intersection LOS:	D
ICU:	0.87
ICU LOS:	E
Offset (s) :	0.0
Referenced to:	Begin of Green
Reference Phase:	6+2 - SBTL NBTL
Master Intersection:	☐
Yield Point:	Single

Timing Settings

Left Turn Types

- Permitted
- Protected
- Permitted & Protected
- Split

Right Turn Types

- Permitted
- Protected
- Permitted & Protected
- Overlap
- Protected & Overlap
- Free
- Custom

TIMING SETTINGS	EBL	EBT	EBR
Lanes and Sharing (#RL)			
Traffic Volume (vph)	300	1200	100
Turn Type	Prot	—	Perm
Protected Phases	7	4	
Permitted Phases			4
Detector Phases	7	4	4
Switch Phase	0	0	0
Leading Detector (ft)	20	100	20
Trailing Detector (ft)	0	0	0
Minimum Initial (s)	4.0	4.0	4.0
Minimum Split (s)	12.0	21.9	21.9
Total Split (s)	20.0	29.3	29.3
Yellow Time (s)	5.0	5.0	5.0
All-Red Time (s)	0.9	0.9	0.9
Lost Time Adjust (s)	0.0	0.0	0.0
Lagging Phase?	☐	☑	☑
Allow Lead/Lag Optimize?	☑	☑	☑
Recall Mode	Max	Max	Max
Actuated Effct. Green (s)	14.1	23.4	23.4
Actuated g/C Ratio	0.20	0.33	0.33
Volume to Capacity Ratio	0.97	0.81	0.19
Control Delay (s)	71.5	26.0	4.6
Queue Delay (s)	0.0	0.0	0.0
Total Delay (s)	71.5	26.0	4.6
Level of Service	E	C	A
Approach Delay (s)	—	33.2	—
Approach LOS	—	C	—
Queue Length 50th (ft)	152	200	0
Queue Length 95th (ft)	#282	234	27

Timing Settings

- Startup lost time minus extension of effective green time
  - Extension of effective green is the time vehicles continue to enter the intersection during yellow
  - Default value is zero

TIMING SETTINGS	EBL	EBT	EBR
Lanes and Sharing (#RL)			
Traffic Volume (vph)	300	1200	100
Turn Type	Prot	—	Perm
Protected Phases	7	4	
Permitted Phases			4
Detector Phases	7	4	4
Switch Phase	0	0	0
Leading Detector (ft)	20	100	20
Trailing Detector (ft)	0	0	0
Minimum Initial (s)	4.0	4.0	4.0
Minimum Split (s)	12.0	21.9	21.9
Total Split (s)	20.0	29.3	29.3
Yellow Time (s)	5.0	5.0	5.0
All-Red Time (s)	0.9	0.9	0.9
Lost Time Adjust (s)	0.0	0.0	0.0
Lagging Phase?	☐	☑	☑
Allow Lead/Lag Optimize?	☑	☑	☑
Recall Mode	Max	Max	Max
Actuated Effct. Green (s)	14.1	23.4	23.4
Actuated g/C Ratio	0.20	0.33	0.33
Volume to Capacity Ratio	0.97	0.81	0.19
Control Delay (s)	71.5	26.0	4.6
Queue Delay (s)	0.0	0.0	0.0
Total Delay (s)	71.5	26.0	4.6
Level of Service	E	C	A
Approach Delay (s)	—	33.2	—
Approach LOS	—	C	—
Queue Length 50th (ft)	152	200	0
Queue Length 95th (ft)	#282	234	27

Timing Settings

- Lead/Lag Optimization
  - Change/optimize the sequence of phases included in a cycle

TIMING SETTINGS	EBL	EBT	EBR
Lanes and Sharing (#RL)			
Traffic Volume (vph)	300	1200	100
Turn Type	Prot	—	Perm
Protected Phases	7	4	
Permitted Phases			4
Detector Phases	7	4	4
Switch Phase	0	0	0
Leading Detector (ft)	20	100	20
Trailing Detector (ft)	0	0	0
Minimum Initial (s)	4.0	4.0	4.0
Minimum Split (s)	12.0	21.9	21.9
Total Split (s)	20.0	29.3	29.3
Yellow Time (s)	5.0	5.0	5.0
All-Red Time (s)	0.9	0.9	0.9
Lost Time Adjust (s)	0.0	0.0	0.0
Lagging Phase?	☐	☑	☑
Allow Lead/Lag Optimize?	☑	☑	☑
Recall Mode	Max	Max	Max
Actuated Effct. Green (s)	14.1	23.4	23.4
Actuated g/C Ratio	0.20	0.33	0.33
Volume to Capacity Ratio	0.97	0.81	0.19
Control Delay (s)	71.5	26.0	4.6
Queue Delay (s)	0.0	0.0	0.0
Total Delay (s)	71.5	26.0	4.6
Level of Service	E	C	A
Approach Delay (s)	—	33.2	—
Approach LOS	—	C	—
Queue Length 50th (ft)	152	200	0
Queue Length 95th (ft)	#282	234	27

Timing Settings

- Recall Modes
  - No recall – phase can be skipped
  - Minimum recall – never skip, always service min. initial
  - Maximum recall - never skip, always service max. split
  - Pedestrian recall – never skip, always service ped. clearance interval
  - Coordinated Min. & Max. – used with coordinated signals

TIMING SETTINGS	EBL	EBT	EBR
Lanes and Sharing (#RL)			
Traffic Volume (vph)	300	1200	100
Turn Type	Prot	—	Perm
Protected Phases	7	4	
Permitted Phases			4
Detector Phases	7	4	4
Switch Phase	0	0	0
Leading Detector (ft)	20	100	20
Trailing Detector (ft)	0	0	0
Minimum Initial (s)	4.0	4.0	4.0
Minimum Split (s)	12.0	21.9	21.9
Total Split (s)	20.0	29.3	29.3
Yellow Time (s)	5.0	5.0	5.0
All-Red Time (s)	0.9	0.9	0.9
Lost Time Adjust (s)	0.0	0.0	0.0
Lagging Phase?	☐	☑	☑
Allow Lead/Lag Optimize?	☑	☑	☑
Recall Mode	Max	Max	Max
Actuated Effct. Green (s)	14.1	23.4	23.4
Actuated g/C Ratio	0.20	0.33	0.33
Volume to Capacity Ratio	0.97	0.81	0.19
Control Delay (s)	71.5	26.0	4.6
Queue Delay (s)	0.0	0.0	0.0
Total Delay (s)	71.5	26.0	4.6
Level of Service	E	C	A
Approach Delay (s)	—	33.2	—
Approach LOS	—	C	—
Queue Length 50th (ft)	152	200	0
Queue Length 95th (ft)	#282	234	27

Timing Settings

- Synchro allows for an all red phase for pedestrians or a hold phase

TIMING SETTINGS	PED	HOLD
Lanes and Sharing (#RL)		
Traffic Volume (vph)		
Turn Type		
Protected Phases		
Permitted Phases		
Detector Phases		
Switch Phase		
Leading Detector (ft)		
Trailing Detector (ft)		
Minimum Initial (s)		
Minimum Split (s)		
Total Split (s)		
Yellow Time (s)		
All-Red Time (s)		
Lost Time Adjust (s)		
Lagging Phase?		
Allow Lead/Lag Optimize?		
Recall Mode		
Actuated Effct. Green (s)		
Actuated g/C Ratio		
Volume to Capacity Ratio		
Control Delay (s)		
Queue Delay (s)		
Total Delay (s)		
Level of Service		
Approach Delay (s)		
Approach LOS		
Queue Length 50th (ft)		
Queue Length 95th (ft)		

Timing Settings (Unsignalized)

- Three Sign Control settings
  - Free: traffic doesn't stop
  - Yield: yield sign
  - Stop: stop sign
- Roundabouts are also selected using control type

NODE SETTINGS	
Node #	3
Zone:	
X East (ft):	10230
Y North (ft):	10833
Z Elevation (ft):	0
Description	
Control Type	Unsig
Max v/c Ratio:	3.41
Intersection Delay (s):	—
Intersection LOS:	—
ICU:	0.80
ICU LOS:	D

SIGNING SETTINGS	EBL	EBT	EBR
Lanes and Sharing (#RL)			
Traffic Volume (vph)	300	1200	100
Sign Control	—	Yield	—
Median Width (ft)	—	12	—
TWLTL Median	—	☐	—
Right Turn Channelized	—	—	None
Critical Gap, tC (s)	—	—	—
Follow Up Time, tF (s)	—	—	—
Volume to Capacity Ratio	—	—	—
Control Delay (s)	—	—	—
Level of Service	—	—	—
Queue Length 95th (ft)	—	—	—

Phasing Settings

- Vehicle extension
  - Amount of time green time is extended when vehicle crosses detector
- Minimum Gap
  - Min time for a following vehicle to cross intersection (refers to the distance between 2 following vehicles)

PHASING SETTINGS	2-NBTL
Minimum Initial (s)	4.0
Minimum Split (s)	20.0
Maximum Split (s)	20.0
Yellow Time (s)	3.5
All-Red Time (s)	0.5
Lagging Phase?	—
Allow Lead/Lag Optimize?	—
Vehicle Extension (s)	3.0
Minimum Gap (s)	3.0
Time Before Reduce (s)	0.0
Time To Reduce (s)	0.0
Recall Mode	Max
Pedestrian Phase	☑
Walk Time (s)	5.0
Flash Dont Walk (s)	11.0
Pedestrian Calls (#/hr)	0
Dual Entry?	☑
Inhibit Max?	☑
90th %ile Green Time (s)	16 cd
70th %ile Green Time (s)	16 cd
50th %ile Green Time (s)	16 cd
30th %ile Green Time (s)	16 cd
10th %ile Green Time (s)	16 cd

Phasing Settings

- Time Before Reduce
  - Amount of time before gap reduction begins
- Time To Reduce
  - Amount of time to reduce the gap to

PHASING SETTINGS	2-NBTL
Minimum Initial (s)	4.0
Minimum Split (s)	20.0
Maximum Split (s)	20.0
Yellow Time (s)	3.5
All-Red Time (s)	0.5
Lagging Phase?	—
Allow Lead/Lag Optimize?	—
Vehicle Extension (s)	3.0
Minimum Gap (s)	3.0
Time Before Reduce (s)	0.0
Time To Reduce (s)	0.0
Recall Mode	Max
Pedestrian Phase	☑
Walk Time (s)	5.0
Flash Dont Walk (s)	11.0
Pedestrian Calls (#/hr)	0
Dual Entry?	☑
Inhibit Max?	☑
90th %ile Green Time (s)	16 cd
70th %ile Green Time (s)	16 cd
50th %ile Green Time (s)	16 cd
30th %ile Green Time (s)	16 cd
10th %ile Green Time (s)	16 cd

Phasing Settings

- Walk times, don't walk times, and number of push button calls/hr are all entered in the phasing settings

PHASING SETTINGS	2-NBTL
Minimum Initial (s)	4.0
Minimum Split (s)	20.0
Maximum Split (s)	20.0
Yellow Time (s)	3.5
All-Red Time (s)	0.5
Lagging Phase?	—
Allow Lead/Lag Optimize?	—
Vehicle Extension (s)	3.0
Minimum Gap (s)	3.0
Time Before Reduce (s)	0.0
Time To Reduce (s)	0.0
Recall Mode	Max
Pedestrian Phase	☑
Walk Time (s)	5.0
Flash Dont Walk (s)	11.0
Pedestrian Calls (#/hr)	0
Dual Entry?	☑
Inhibit Max?	☑
90th %ile Green Time (s)	16 cd
70th %ile Green Time (s)	16 cd
50th %ile Green Time (s)	16 cd
30th %ile Green Time (s)	16 cd
10th %ile Green Time (s)	16 cd

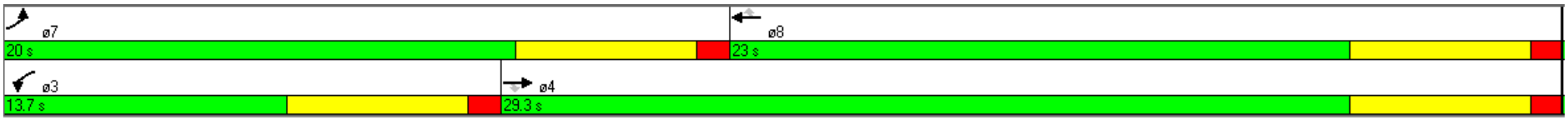
Phasing Settings

- Only used for Actuated-Coordinated signals
- When selected, a non-coordinated phase can be extended and not terminated as scheduled

PHASING SETTINGS	2-NBTL
Minimum Initial (s)	4.0
Minimum Split (s)	20.0
Maximum Split (s)	20.0
Yellow Time (s)	3.5
All-Red Time (s)	0.5
Lagging Phase?	—
Allow Lead/Lag Optimize?	—
Vehicle Extension (s)	3.0
Minimum Gap (s)	3.0
Time Before Reduce (s)	0.0
Time To Reduce (s)	0.0
Recall Mode	Max
Pedestrian Phase	☑
Walk Time (s)	5.0
Flash Dont Walk (s)	11.0
Pedestrian Calls (#/hr)	0
Dual Entry?	☑
Inhibit Max?	☑
90th %ile Green Time (s)	16 cd
70th %ile Green Time (s)	16 cd
50th %ile Green Time (s)	16 cd
30th %ile Green Time (s)	16 cd
10th %ile Green Time (s)	16 cd

Phasing Settings

- Phase Diagram
  - Visualization of phasing
  - Can be adjusted manually

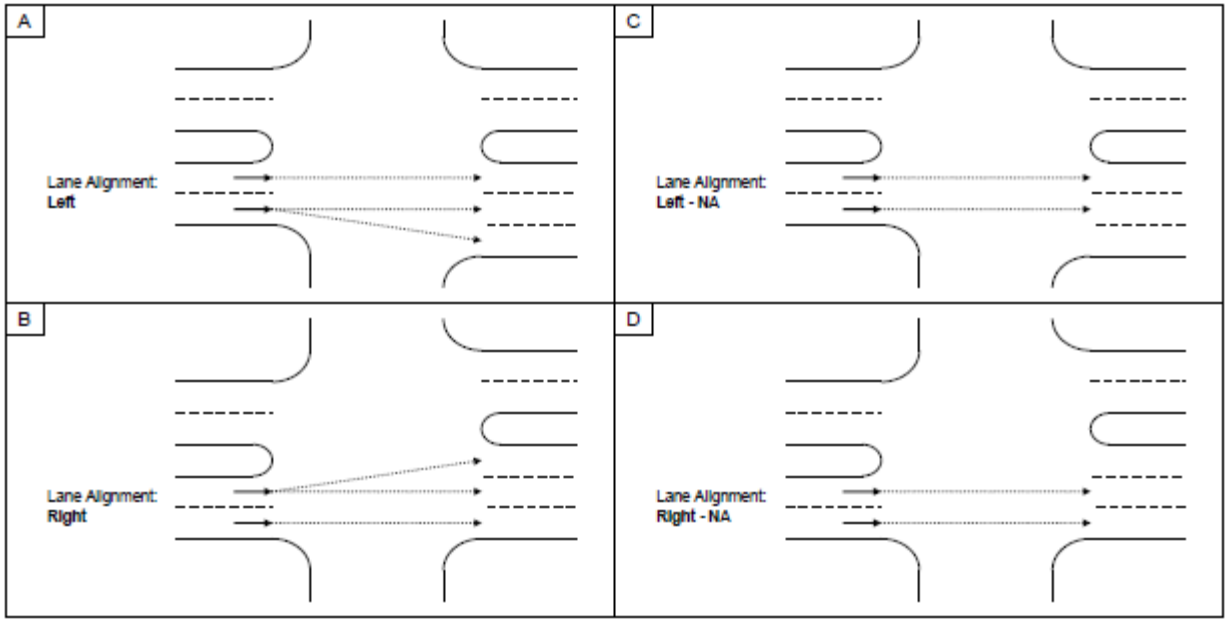


Simulation Settings

- Affects when vehicles can enter storage lane
- Default value is 25 ft.

SIMULATION SETTINGS	EBL	EBT	EBR
Lanes and Sharing (#RL)			
Traffic Volume (vph)	300	1200	100
Storage Length (ft)	400	—	400
Storage Lanes (#)	1	—	1
Taper Length (ft)	25	—	25
Lane Alignment	Left	Left	Right
Lane Width (ft)	12	12	12
Enter Blocked Intersection	No	No	No
Median Width (ft)	—	12	—
Link Offset (ft)	—	0	—
Crosswalk Width (ft)	—	0	—
TWLTL Median	—	☐	—
Headway Factor	1.00	1.00	1.00
Turning Speed (mph)	15	—	9
Mandatory Distance (ft)	—	200	—
Positioning Distance (ft)	—	2199	—
Mandatory Distance 2 (ft)	—	1466	—
Positioning Distance 2 (ft)	—	2932	—

Simulation Settings



SIMULATION SETTINGS	EBL	EBT	EBR
Lanes and Sharing (#RL)			
Traffic Volume (vph)	300	1200	100
Storage Length (ft)	400	—	400
Storage Lanes (#)	1	—	1
Taper Length (ft)	25	—	25
Lane Alignment	Left	Left	Right
Lane Width (ft)	12	12	12
Enter Blocked Intersection	No	No	No
Median Width (ft)	—	12	—
Link Offset (ft)	—	0	—
Crosswalk Width (ft)	—	0	—
TWLTL Median	—	☐	—
Headway Factor	1.00	1.00	1.00
Turning Speed (mph)	15	—	9
Mandatory Distance (ft)	—	200	—
Positioning Distance (ft)	—	2199	—
Mandatory Distance 2 (ft)	—	1466	—
Positioning Distance 2 (ft)	—	2932	—

Simulation Settings

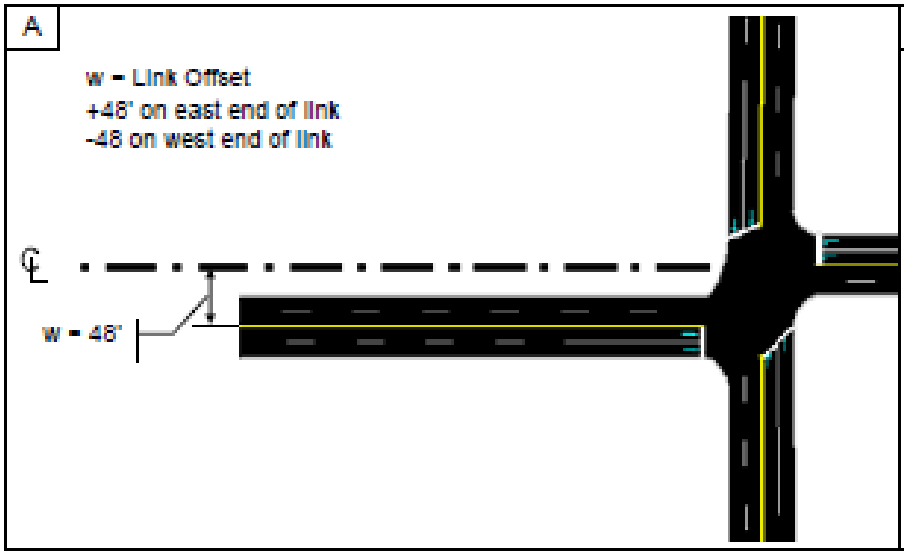
Can enter yes, no, 1, or 2 (which allows 1 or 2 vehicles to enter blocked intersection)

SIMULATION SETTINGS	EBL	EBT	EBR
Lanes and Sharing (#RL)			
Traffic Volume (vph)	300	1200	100
Storage Length (ft)	400	—	400
Storage Lanes (#)	1	—	1
Taper Length (ft)	25	—	25
Lane Alignment	Left	Left	Right
Lane Width (ft)	12	12	12
Enter Blocked Intersection	No	No	No
Median Width (ft)	—	12	—
Link Offset (ft)	—	0	—
Crosswalk Width (ft)	—	0	—
TWLTL Median	—	☐	—
Headway Factor	1.00	1.00	1.00
Turning Speed (mph)	15	—	9
Mandatory Distance (ft)	—	200	—
Positioning Distance (ft)	—	2199	—
Mandatory Distance 2 (ft)	—	1466	—
Positioning Distance 2 (ft)	—	2932	—

Simulation Settings

SIMULATION SETTINGS	EBL	EBT	EBR
Lanes and Sharing (#RL)			
Traffic Volume (vph)	300	1200	100
Storage Length (ft)	400	—	400
Storage Lanes (#)	1	—	1
Taper Length (ft)	25	—	25
Lane Alignment	Left	Left	Right
Lane Width (ft)	12	12	12
Enter Blocked Intersection	No	No	No
Median Width (ft)	—	12	—
Link Offset (ft)	—	0	—
Crosswalk Width (ft)	—	0	—
TWLTL Median	—	☐	—
Headway Factor	1.00	1.00	1.00
Turning Speed (mph)	15	—	9
Mandatory Distance (ft)	—	200	—
Positioning Distance (ft)	—	2199	—
Mandatory Distance 2 (ft)	—	1466	—
Positioning Distance 2 (ft)	—	2932	—

Simulation Settings



SIMULATION SETTINGS	EBL	EBT	EBR
Lanes and Sharing (#RL)			
Traffic Volume (vph)	300	1200	100
Storage Length (ft)	400	—	400
Storage Lanes (#)	1	—	1
Taper Length (ft)	25	—	25
Lane Alignment	Left	Left	Right
Lane Width (ft)	12	12	12
Enter Blocked Intersection	No	No	No
Median Width (ft)	—	12	—
Link Offset (ft)	—	0	—
Crosswalk Width (ft)	—	0	—
TWLTL Median	—	☐	—
Headway Factor	1.00	1.00	1.00
Turning Speed (mph)	15	—	9
Mandatory Distance (ft)	—	200	—
Positioning Distance (ft)	—	2199	—
Mandatory Distance 2 (ft)	—	1466	—
Positioning Distance 2 (ft)	—	2932	—

Simulation Settings

SIMULATION SETTINGS	EBL	EBT	EBR
Lanes and Sharing (#RL)			
Traffic Volume (vph)	300	1200	100
Storage Length (ft)	400	—	400
Storage Lanes (#)	1	—	1
Taper Length (ft)	25	—	25
Lane Alignment	Left	Left	Right
Lane Width (ft)	12	12	12
Enter Blocked Intersection	No	No	No
Median Width (ft)	—	12	—
Link Offset (ft)	—	0	—
Crosswalk Width (ft)	—	0	—
TWLTL Median	—	☐	—
Headway Factor	1.00	1.00	1.00
Turning Speed (mph)	15	—	9
Mandatory Distance (ft)	—	200	—
Positioning Distance (ft)	—	2199	—
Mandatory Distance 2 (ft)	—	1466	—
Positioning Distance 2 (ft)	—	2932	—

Simulation Settings

- Not used for capacity calculations
- Applied to model saturated flow rates for specific lane groups

SIMULATION SETTINGS	EBL	EBT	EBR
Lanes and Sharing (#RL)			
Traffic Volume (vph)	300	1200	100
Storage Length (ft)	400	—	400
Storage Lanes (#)	1	—	1
Taper Length (ft)	25	—	25
Lane Alignment	Left	Left	Right
Lane Width (ft)	12	12	12
Enter Blocked Intersection	No	No	No
Median Width (ft)	—	12	—
Link Offset (ft)	—	0	—
Crosswalk Width (ft)	—	0	—
TWLTL Median	—	☐	—
Headway Factor	1.00	1.00	1.00
Turning Speed (mph)	15	—	9
Mandatory Distance (ft)	—	200	—
Positioning Distance (ft)	—	2199	—
Mandatory Distance 2 (ft)	—	1466	—
Positioning Distance 2 (ft)	—	2932	—

Simulation Settings

- Mandatory Distance
  - Distance back from stop bar where lane change must occur
- Positioning Distance
  - Distance from mandatory point where vehicle first attempts to change lanes
- Mandatory & Positioning Dist. 2
  - Used if second lane change is required

SIMULATION SETTINGS	EBL	EBT	EBR
Lanes and Sharing (#RL)			
Traffic Volume (vph)	300	1200	100
Storage Length (ft)	400	—	400
Storage Lanes (#)	1	—	1
Taper Length (ft)	25	—	25
Lane Alignment	Left	Left	Right
Lane Width (ft)	12	12	12
Enter Blocked Intersection	No	No	No
Median Width (ft)	—	12	—
Link Offset (ft)	—	0	—
Crosswalk Width (ft)	—	0	—
TWLTL Median	—	☐	—
Headway Factor	1.00	1.00	1.00
Turning Speed (mph)	15	—	9
Mandatory Distance (ft)	—	200	—
Positioning Distance (ft)	—	2199	—
Mandatory Distance 2 (ft)	—	1466	—
Positioning Distance 2 (ft)	—	2932	—

Detector Settings

- Three types
  - Calling – places call when phase is yellow or red
  - Extend – places call when phase is green
  - Cl+Ex – combination of two previous

DETECTOR SETTINGS	EBL	EBT	EBR
Lanes and Sharing (#RL)			
Traffic Volume (vph)	300	1200	100
Number of Detectors (#)	1	2	1
Detector Phases	7	4	4
Switch Phase	0	0	0
Leading Detector (ft)	20	100	20
Trailing Detector (ft)	0	0	0
Detector Template	Left	Thru	Right
Add/Update Template			
Detector 1 Position (ft)	0	0	0
Detector 1 Size (ft)	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channels			
Detector 1 Extend	0.0	0.0	0.0
Detector 1 Queue	0.0	0.0	0.0
Detector 1 Delay	0.0	0.0	0.0
Detector 2 Position (ft)	—	94	—
Detector 2 Size (ft)	—	6	—
Detector 2 Type	—	Cl+Ex	—
Detector 2 Channels	—		—
Detector 2 Extend	—	0.0	—

Detector Settings

- Extend
  - Extends call for *n* seconds after detection
- Queue
  - Extends phase for *n* seconds to provide queue clearance
- Delay
  - Will not place a call on red or yellow until vehicle has been there *n* seconds

DETECTOR SETTINGS	EBL	EBT	EBR
Lanes and Sharing (#RL)			
Traffic Volume (vph)	300	1200	100
Number of Detectors (#)	1	2	1
Detector Phases	7	4	4
Switch Phase	0	0	0
Leading Detector (ft)	20	100	20
Trailing Detector (ft)	0	0	0
Detector Template	Left	Thru	Right
Add/Update Template			
Detector 1 Position (ft)	0	0	0
Detector 1 Size (ft)	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channels			
Detector 1 Extend	0.0	0.0	0.0
Detector 1 Queue	0.0	0.0	0.0
Detector 1 Delay	0.0	0.0	0.0
Detector 2 Position (ft)	—	94	—
Detector 2 Size (ft)	—	6	—
Detector 2 Type	—	Cl+Ex	—
Detector 2 Channels	—		—
Detector 2 Extend	—	0.0	—

Questions?

References

Husch, D. & Albeck, J. (2006). *Synchro Studio 7 User Guide*. Sugar Land, TX: Trafficware, Ltd.