

Optimizing signal timing in Synchro Studio 10



Overview and demonstration

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What is Synchro?

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



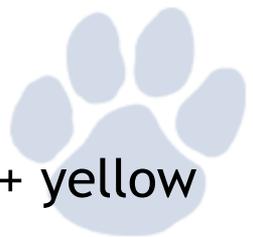
Source: <http://bikewalklee.blogspot.com>

Signal design

- Phasing
- Convert to through vehicle units
- Determine sum of critical lane volumes
- Determine yellow and all red times
- Determine lost time per cycle
- Determine appropriate cycle length
- Splitting the green
- Pedestrian requirements



Terminology-1



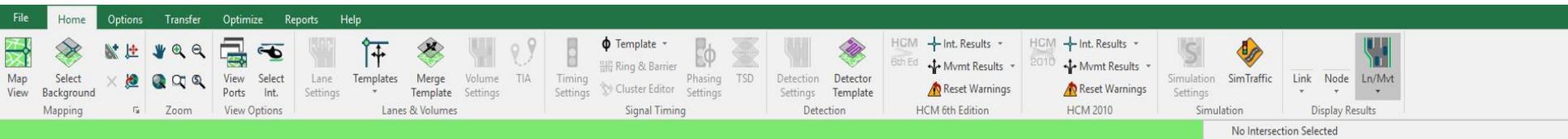
- Cycle length
 - Cycle length is the total time to complete one sequence of all movements around an intersection
- Split
 - An individual (movement) split is the sum of the green time + yellow interval + red clearance interval for a particular movement
- Actuated Traffic Control
 - Fully-actuated signals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



Educational Use Only



Ribbon Bar



The screenshot shows the ribbon bar of the HCM 6th Edition software. The ribbon is divided into several tabs: File, Home, Options, Transfer, Optimize, Reports, and Help. The Home tab is currently selected and contains the following groups of tools:

- Mapping** (Group 1): Includes icons for map, zoom, and pan.
- Zoom** (Group 2): Includes icons for zoom in, zoom out, and reset zoom.
- View Options** (Group 3): Includes icons for view options.
- Lanes & Volumes** (Group 4): Includes icons for lanes and volumes.
- Signal Timing** (Group 5): Includes icons for timing settings, cluster editor, and signal timing.
- Detection** (Group 6): Includes icons for detection.
- HCM 6th Ed** (Group 7): Includes icons for HCM 6th Edition.
- Int. Results** (Group 8): Includes icons for internal results, movement results, and reset warnings.

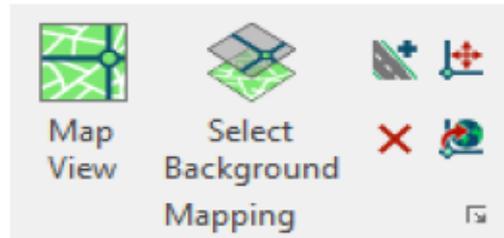
Numbered callouts (1-8) are placed over the ribbon bar to highlight specific features:

- 1: File tab
- 2: Home tab
- 3: Options tab
- 4: Signal Timing group
- 5: Mapping group
- 6: HCM 6th Ed group
- 7: Int. Results group
- 8: Simulation group



1. *File Menu:* The File menu contains the functions New, Open, Save, Save As, Save Part, Merge File, Create Report, Print Window, and Close.
2. *Quick Access Toolbar:* The Quick Access Toolbar is a customizable toolbar that may be displayed either above or below the ribbon. It is in view even when the ribbon is minimized.
3. *Tabs:* The Synchro ribbon is organized into tabs according to task. Tabs include Home, Options, Transfer, Optimize, Reports, and Help.
4. *Groups:* Each tab is divided into logical groups of buttons. Groups are separated by vertical lines.
5. *Dialog Box Launcher:* Clicking the arrow icon  opens a dialog box with additional controls. For example, pressing this icon on the Mapping group opens the Map Settings window.
6. *Arrows:* Arrows open submenus. For example, pressing the Node arrow on in the Display Results group allows you to select what type of intersection-level results to display on the Map View (Node Numbers, LOS, etc).
7. *Collapsed Group:* Groups expand and collapse when the window is resized. A partially collapsed group may display the buttons in a different layout, or a reduced number of items. A fully collapsed group only shows the group name with an arrow button that opens the group submenu.
8. *Program Window Controls:* The window controls work the same as most Windows-based programs. Clicking the minimize button  minimizes the program to the taskbar; the maximize button toggles between full-screen and reduced-size views; and clicking the  closes the program.

Mapping Group



The Mapping Group is used for initial model setup, and editing the layout of intersections.



Map View: Use this button or the [F2] key to switch to the MAP settings. Refer to Chapter 8 for details.



Select Background: Import a Map Background image. Refer to Chapter 4 for additional details.



Add Link: Select the *Add Link* button or press [A] to create a link on the MAP view. Refer to page 5-2 for additional details.



Delete Link or Node: Select this button or press [Del] to delete the selected link/node. Refer to page 5-3 for additional details.



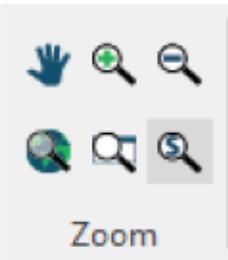
Move Node: Select this button or press [M] to move a node. Refer to page 5-4 for additional details.



Transform Map: Use this button to move, scale, or rotate the entire map. If your map was initially laid out with a different coordinate system, you can change it with this command. Refer to page 5-9 for additional details.

Zoom Group

Dreamers. Thinkers. Doers.



The Zoom Group is used to navigate around the Map View.



Drag Map: To scroll around the MAP view, choose the *Drag Map* button or press the [End] key. To deactivate, select the button again or press [Esc]. In addition, holding the mouse wheel button down will allow you to drag the map. The key pad arrows can also be used to scroll the Map view.



Zoom In: To view the map closer, choose the *Zoom In* button or press [Page Down]. It may be necessary to scroll to put the map in the center of the MAP view. The mouse scroll wheel can also be used to change the map view scale. Scrolling up will zoom in and scrolling down will zoom out.



Zoom Out: To view more of the map, choose the *Zoom Out* button or press [Page Up]. The mouse scroll wheel can also be used to change the map view scale. Scrolling up will zoom out and scrolling down will zoom in.



Zoom All: To view the entire map, choose the *Zoom All* button or press [Home].

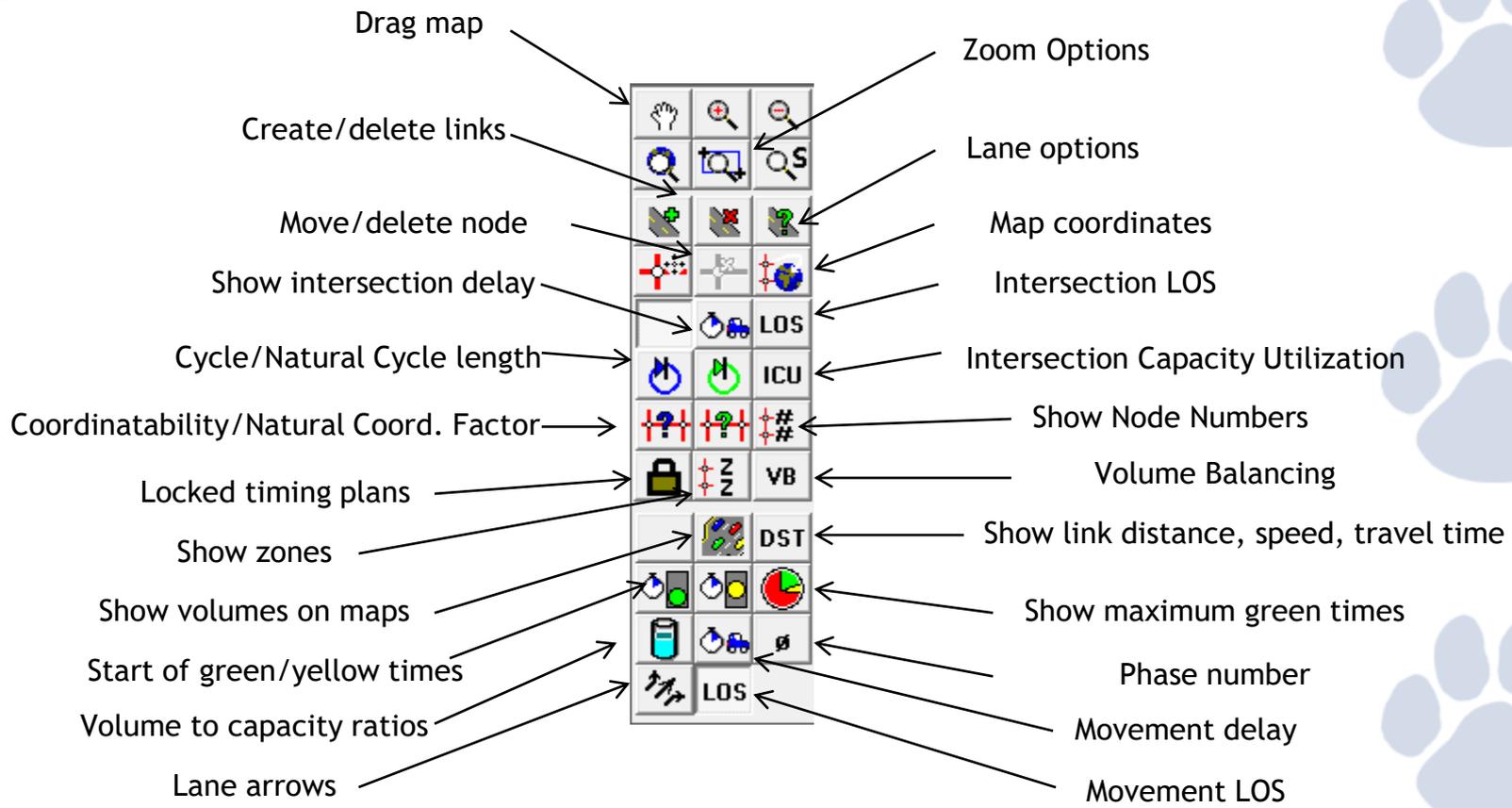
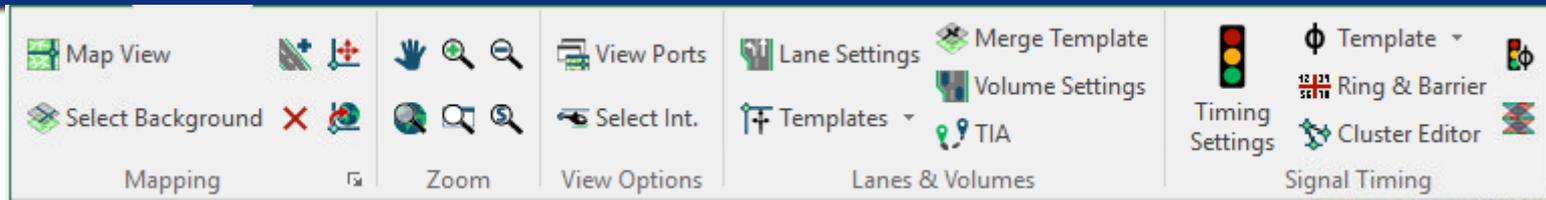


Zoom Window: To view a specific section of the map, use the *Zoom Window* button or press [W]. To define the area, click on the upper-left corner of the viewing area then click in the lower-right corner of the viewing area.



Zoom Scale: To view the map at a specific scale, use the *Zoom Scale* button or press [Shift]+[S]. Enter the desired scale to view the map in feet per inch (meters per inch). This command assumes 100 pixels per inch on your screen.

Buttons

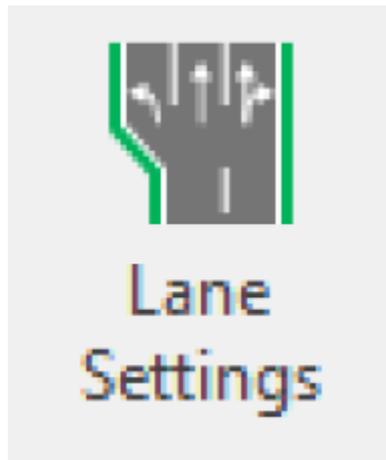




Lane Settings

LANE SETTINGS												
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lanes and Sharing (#RL)												
Traffic Volume (vph)	350	1000	150	100	700	200	150	2000	250	100	600	250
Future Volume (vph)	350	1000	150	100	700	200	150	2000	250	100	600	250
Street Name	Main Street			Main Street			3rd St			3rd St		
Link Distance (ft)	—	1407	—	—	1345	—	—	1083	—	—	1142	—
Link Speed (mph)	—	40	—	—	40	—	—	45	—	—	45	—
Set Arterial Name and Speed	—	EB	—	—	WB	—	—	NB	—	—	SB	—
Travel Time (s)	—	24.0	—	—	22.9	—	—	16.4	—	—	17.3	—
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	—	<input type="checkbox"/>	—	—	<input type="checkbox"/>	—	—	<input type="checkbox"/>	—	—	<input type="checkbox"/>	—
Storage Length (ft)	250	—	200	250	—	200	150	—	200	150	—	200
Storage Lanes (#)	2	—	1	1	—	1	1	—	1	1	—	1
Right Turn Channelized	—	—	None	—	—	None	—	—	None	—	—	None
Curb Radius (ft)	—	—	—	—	—	—	—	—	—	—	—	—
Add Lanes (#)	—	—	—	—	—	—	—	—	—	—	—	—
Lane Utilization Factor	0.97	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Right Turn Factor	1.000	1.000	0.850	1.000	1.000	0.850	1.000	1.000	0.850	1.000	1.000	0.850
Left Turn Factor (prot)	0.950	1.000	1.000	0.950	1.000	1.000	0.950	1.000	1.000	0.950	1.000	1.000
Saturated Flow Rate (prot)	3433	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Left Turn Factor (perm)	0.950	1.000	1.000	0.950	1.000	1.000	0.950	1.000	1.000	0.950	1.000	1.000
Right Ped Bike Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Left Ped Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Saturated Flow Rate (perm)	3433	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Right Turn on Red?	—	—	<input checked="" type="checkbox"/>	—	—	<input checked="" type="checkbox"/>	—	—	<input checked="" type="checkbox"/>	—	—	<input checked="" type="checkbox"/>
Saturated Flow Rate (RTOR)	0	0	134	0	0	82	0	0	82	0	0	120
Link Is Hidden	—	<input type="checkbox"/>	—	—	<input type="checkbox"/>	—	—	<input type="checkbox"/>	—	—	<input type="checkbox"/>	—
Hide Name in Node Title	—	<input type="checkbox"/>	—	—	<input type="checkbox"/>	—	—	<input type="checkbox"/>	—	—	<input type="checkbox"/>	—

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

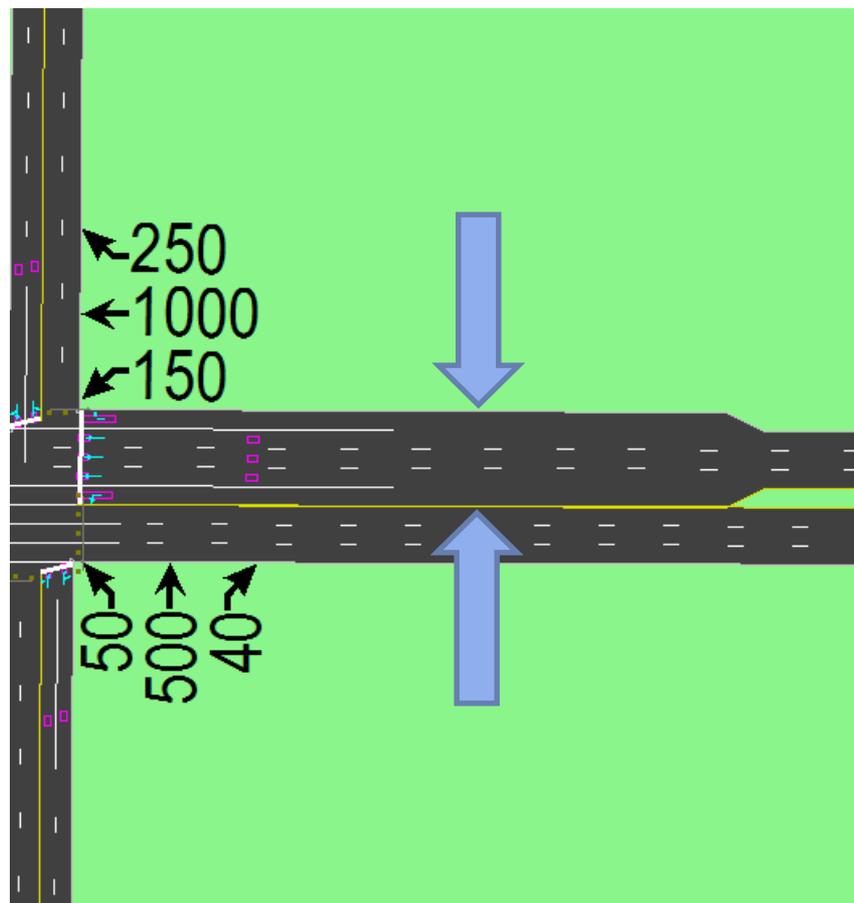
LANE SETTINGS	EBL	EBT	EBR
Lanes and Sharing (#RL)		↑↑↑	↑
Traffic Volume (vph)	300	1200	100
Street Name			
Link Distance (ft)	—	2000	—
Link Speed (mph)	—	50	—
Set Arterial Name and Speed	—	EB	—
Travel Time (s)	—	27.3	—
Ideal Satd. Flow (vphpl)	1900	1900	1900
Lane Width (ft)	12	12	12
Grade (%)	—	0	—
Area Type CBD	—	<input type="checkbox"/>	—
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?	—	—	<input checked="" type="checkbox"/>
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	—	<input type="checkbox"/>	—
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?	—	—	<input checked="" type="checkbox"/>
Saturated Flow Rate (RTOR)	0	0	118

Lane Settings



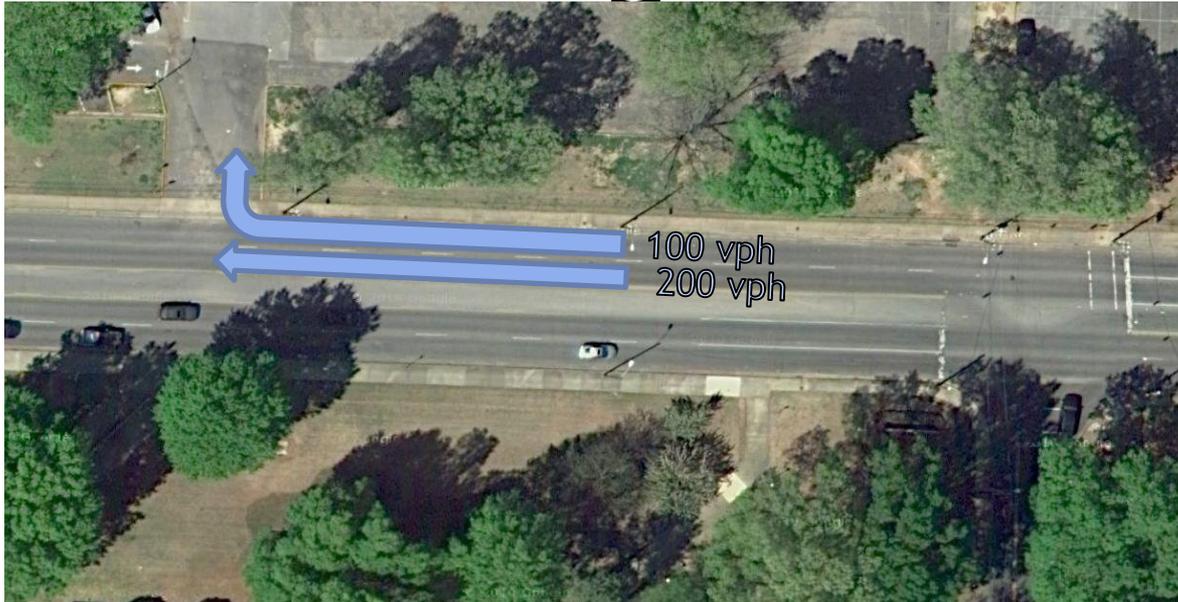
LANE SETTINGS	EBL	EBT	EBR
Lanes and Sharing (#RL)		↑↑↑	↑
Traffic Volume (vph)	300	1200	100
Street Name			
Link Distance (ft)	—	2000	—
Link Speed (mph)	—	50	—
Set Arterial Name and Speed	—	EB	—
Travel Time (s)	—	27.3	—
Ideal Satd. Flow (vphpl)	1900	1900	1900
Lane Width (ft)	12	12	12
Grade (%)	—	0	—
Area Type CBD	—	<input type="checkbox"/>	—
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?	—	—	<input checked="" type="checkbox"/>
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	—	<input type="checkbox"/>	—
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?	—	—	<input checked="" type="checkbox"/>
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)	1	3	1
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	—	<input type="checkbox"/>	—
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?	—	—	<input checked="" type="checkbox"/>
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	—	<input type="checkbox"/>	—
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?	—	—	<input checked="" type="checkbox"/>
Saturated Flow Rate (RTOR)	0	0	118

Lane Settings

- Exclusive Lane:

- $f_{LT} = 0.95$

- Shared Lane:

$$f_{LT} = 1 / (1.0 + 0.05 P_{LT}):$$

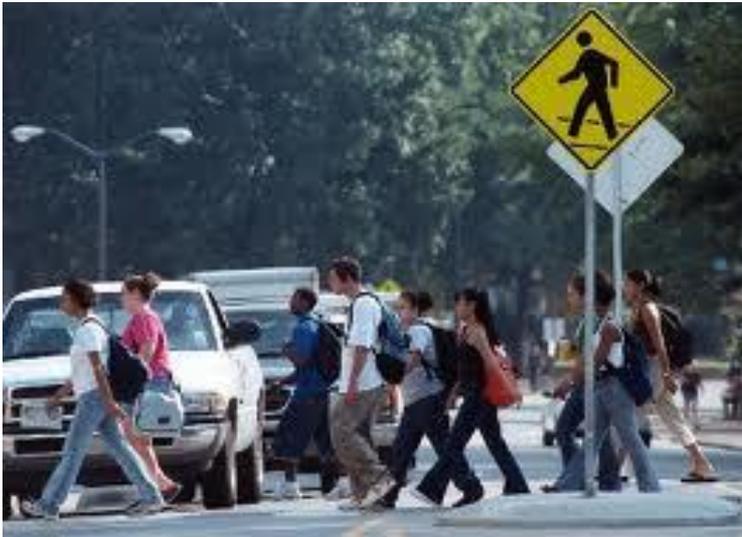
P_{LT} = Proportion of left turn traffic in lane group

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

LANE SETTINGS	 EBL	 EBT	 EBR
Lanes and Sharing (#RL)	 1	 3	 1
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	—	<input type="checkbox"/>	—
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?	—	—	<input checked="" type="checkbox"/>
Saturated Flow Rate (RTOR)	0	0	118

Lane Settings

- These factors are calculated based upon HCM 2000 methods



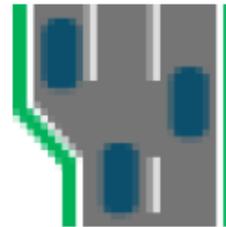
LANE SETTINGS	 EBL	 EBT	 EBR
Lanes and Sharing (#RL)			
Traffic Volume (vph)	300	1200	100
Street Name			
Link Distance (ft)	—	2000	—
Link Speed (mph)	—	50	—
Set Arterial Name and Speed	—	EB	—
Travel Time (s)	—	27.3	—
Ideal Satd. Flow (vphpl)	1900	1900	1900
Lane Width (ft)	12	12	12
Grade (%)	—	0	—
Area Type CBD	—	<input type="checkbox"/>	—
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?	—	—	<input checked="" type="checkbox"/>
Saturated Flow Rate (RTOR)	0	0	118

Lane Settings

- Right-Turn on Red (RTOR)
 - HCM does not support RTOR calculations
 - Synchro adjusts applies different formulation to calculate RTOR
 - 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	—	<input type="checkbox"/>	—
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?	—	—	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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

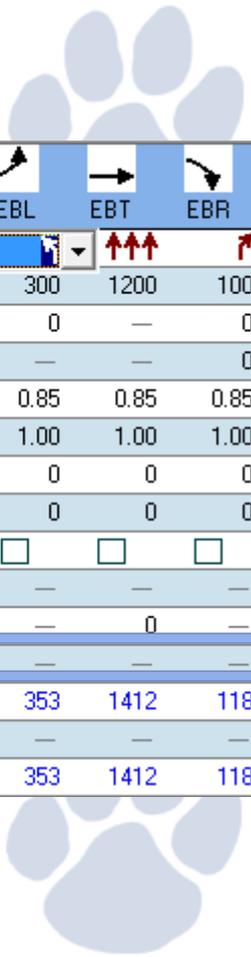
- Sources: driveways, un-modeled streets
- Synchro balances upstream & downstream traffic by adjusting mid-block traffic
- Higher values of mid-block traffic reduces the effectiveness of signal optimization

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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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 T-intersection



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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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:

Throughs: 1

Rights: 1.18

Protected Lefts: 1.05

Permitted Lefts: $1 / [0.95 * (900 - vOp)/900]$, (max 6.67)

Permitted plus protected Lefts: $2 / [0.95 + 0.95 * (900 - vOp)/900]$, (max 1.82)

vOp = through volume opposed.

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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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



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:	<input type="checkbox"/>
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:	<input type="checkbox"/>
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:	<input type="checkbox"/>
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:	<input type="checkbox"/>
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	10
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?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Allow Lead/Lag Optimize?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
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)	 3	 4	 4
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?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Allow Lead/Lag Optimize?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
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)	 3	 4	 4
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?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Allow Lead/Lag Optimize?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
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)	 1	 2	 2
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?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Allow Lead/Lag Optimize?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
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	—
TWTL Median	—	<input type="checkbox"/>	—
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	<input checked="" type="checkbox"/>
Walk Time (s)	5.0
Flash Dont Walk (s)	11.0
Pedestrian Calls (#/hr)	0
Dual Entry?	<input checked="" type="checkbox"/>
Inhibit Max?	<input checked="" type="checkbox"/>
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	<input checked="" type="checkbox"/>
Walk Time (s)	5.0
Flash Dont Walk (s)	11.0
Pedestrian Calls (#/hr)	0
Dual Entry?	<input checked="" type="checkbox"/>
Inhibit Max?	<input checked="" type="checkbox"/>
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

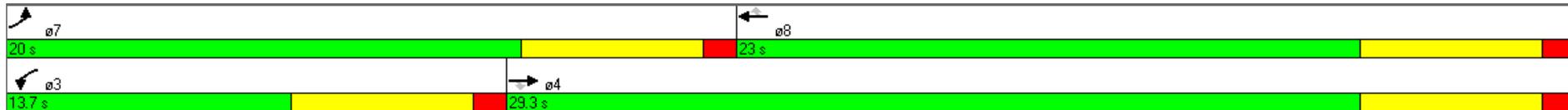
Phasing Settings

- 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	<input checked="" type="checkbox"/>
Walk Time (s)	5.0
Flash Dont Walk (s)	11.0
Pedestrian Calls (#/hr)	0
Dual Entry?	<input checked="" type="checkbox"/>
Inhibit Max?	<input checked="" type="checkbox"/>
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



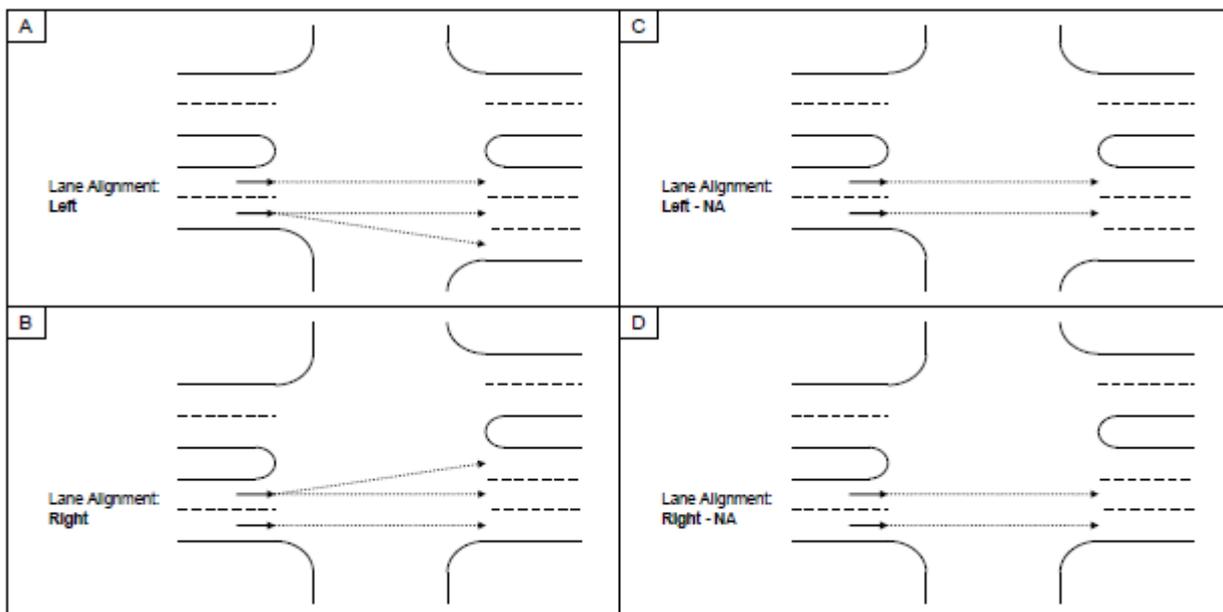
Simulation Settings



- 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	—
TWLTTL Median	—	<input type="checkbox"/>	—
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	—
TWLT Median	—	<input type="checkbox"/>	—
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)



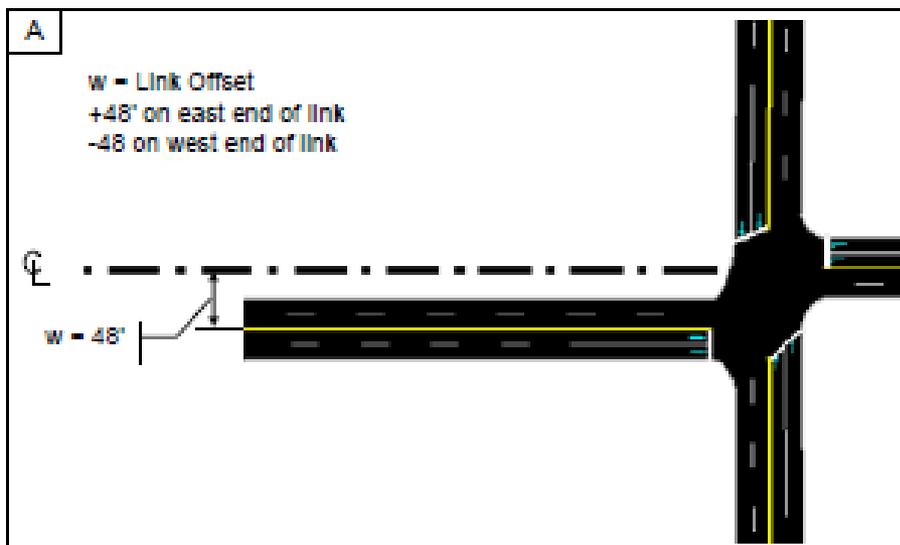
SIMULATION SETTINGS			
	EBL	EBT	EBR
Lanes and Sharing (#RL)			
Traffic Volume (vph)	300	1200	100
Storage Length (ft)	400	—	400
Storage Lanes (#)	1	—	1
Taper Length (ft)	25	—	25
Lane Alignment	Left	Left	Right
Lane Width (ft)	12	12	12
Enter Blocked Intersection	No	No	No
Median Width (ft)	—	12	—
Link Offset (ft)	—	0	—
Crosswalk Width (ft)	—	0	—
TWLT Median	—	<input type="checkbox"/>	—
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	—
TWLT Median	—	<input type="checkbox"/>	—
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	—
TWLTTL Median	—	<input type="checkbox"/>	—
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	—
TWLT Median	—	<input type="checkbox"/>	—
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	—
TWLT Median	—	<input type="checkbox"/>	—
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	—
TWLT Median	—	<input type="checkbox"/>	—
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)	—	34	—
Detector 2 Size (ft)	—	6	—
Detector 2 Type	—	Cl+Ex	—
Detector 2 Channels	—		—
Detector 2 Extend	—	0.0	—

Optimization

- Intersection Cycle Length
- Intersection Splits
- Intersection Offsets
- Network Cycle Length
 - Can be done for each “Zone”
- Network Offsets



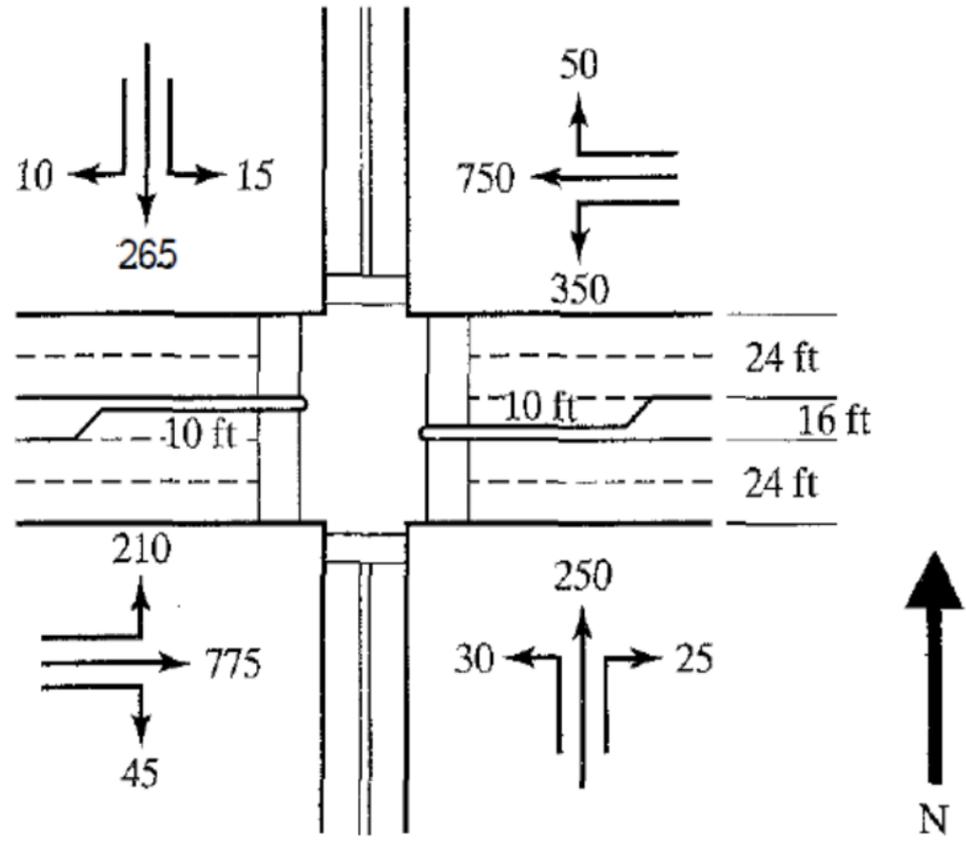
Additional

- **Simulation**
 - SimTraffic
- **Time-Space Diagram**
 - Analyzing a corridor
 - To visualize the progression



EXAMPLE

2. What should be your recommended phasing and cycle length for the following intersection?



$PHF = 0.98$
 Target v/c ratio = 0.95
 Moderate pedestrian activity
 Speed limits:
 30 mi/h N-S
 40 mi/h E-W
 Crosswalk widths = 10 ft

Signal design

- Phasing
- Convert to through vehicle units
- Determine sum of critical lane volumes
- Determine yellow and all red times
- Determine lost time per cycle
- Determine appropriate cycle length
- Splitting the green
- Pedestrian requirements



Questions?



References

Trafficware LLC. (2006), *Synchro Studio 10 User Guide*. Sugar Land, TX. Retrieved from: http://www.trafficware.com/uploads/2/2/2/5/22256874/synchro_10.1_user_guide.pdf

Anurag P. (2007, December 7), *Synchro Tutorial* [Video file]. Retrieved from <https://www.youtube.com/watch?v=hVTc3GPUVV8>