

Getting Started: Synchro 8



Version 1.0

09/20/2013

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Introduction to the Synchro 8 Getting Started Guide

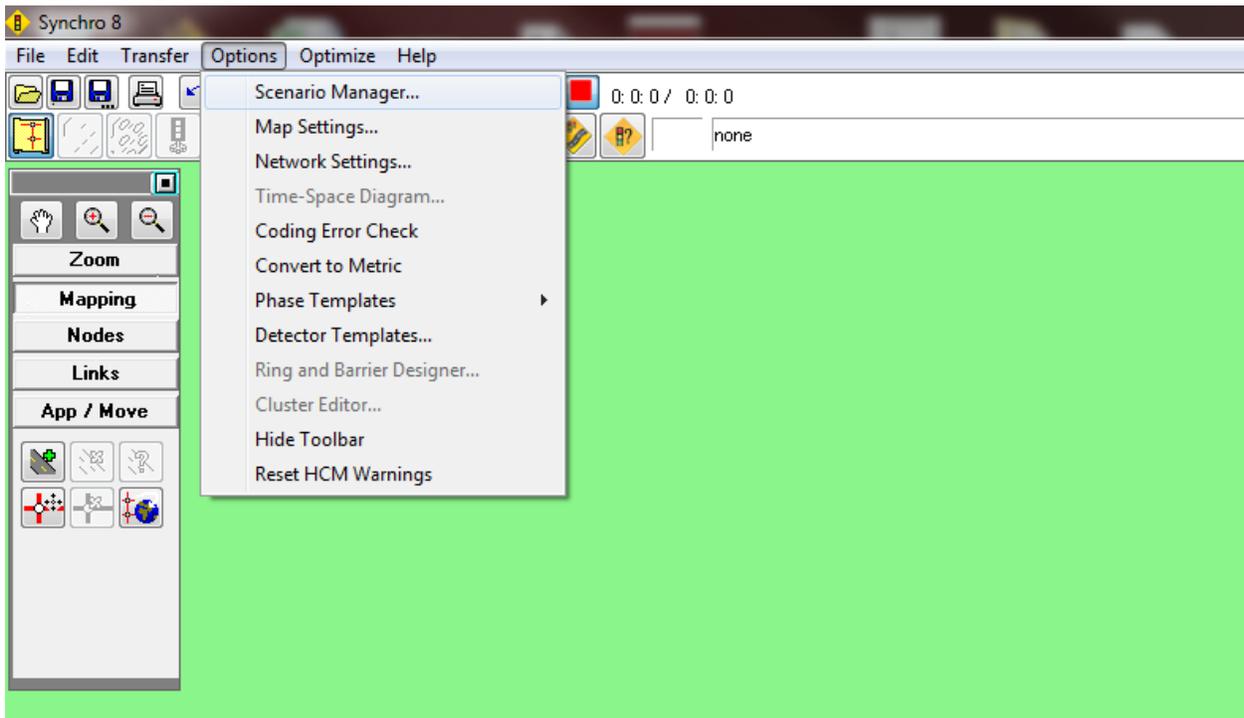
This guide will provide a basic understanding of how to use the Synchro 8 software package. This guide was designed to walk a user through the necessary steps to create a network simulation from opening the software for the first time to the printing the traffic analysis reports.

The project used in this example is a rural project in Murray County, GA. The project encompasses three types of traffic controls; two way stop, all way stop and traffic signal.

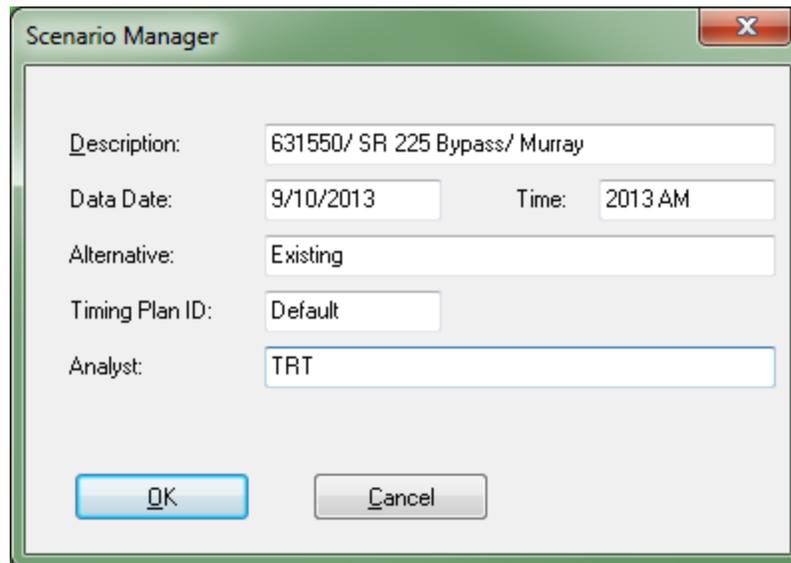
Please contact Tiffany Turner (tturner@dot.ga.gov) if you have any questions, suggestions about this guide or if you notice any errors or discrepancies in this guide.

Setting the Scenario Manager

1. Click the **Options** tab in the Menu Bar and select **Scenario Manager**

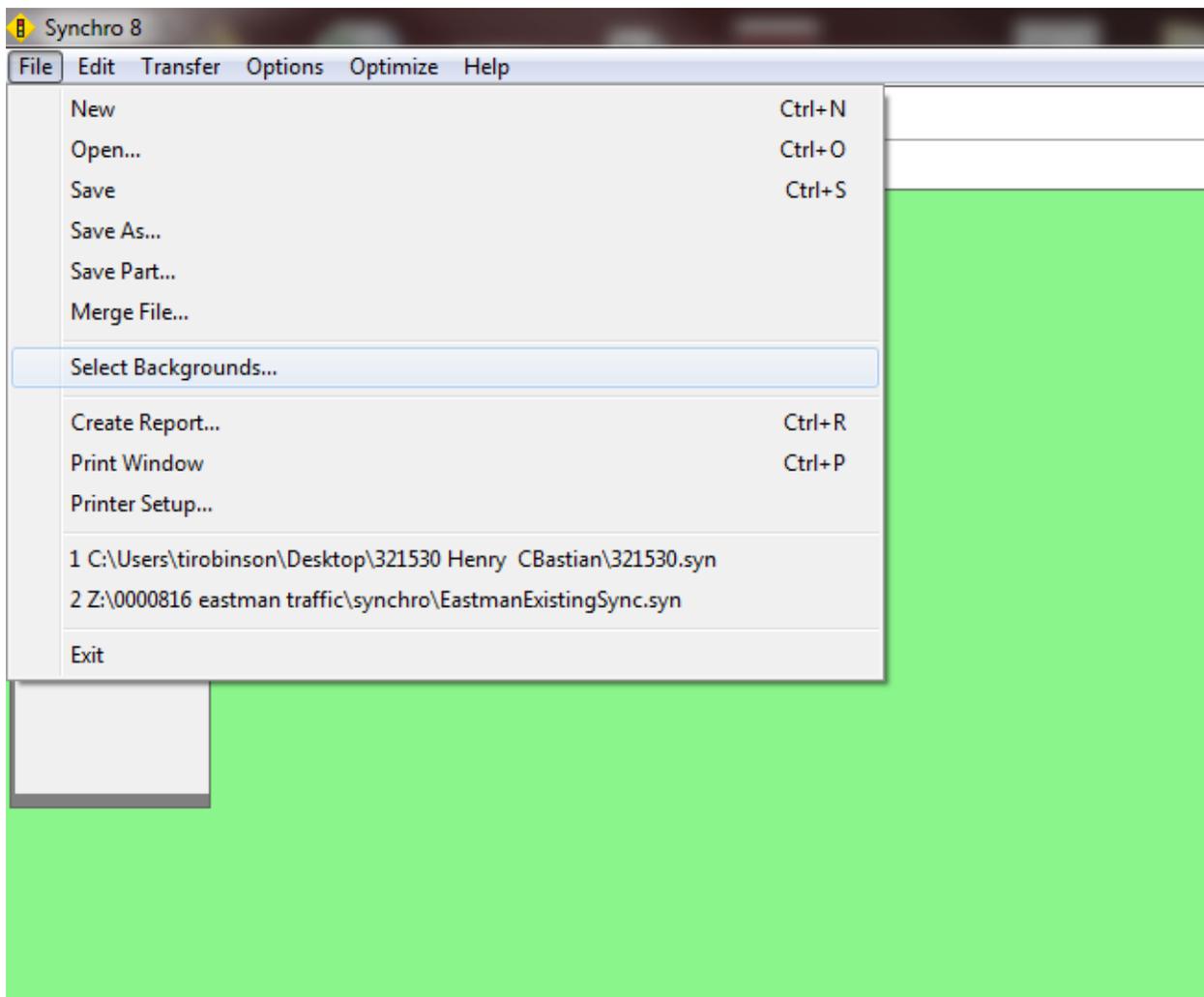


2. Enter the following
 - a. **Description** = PI/Project Name/County Data
 - b. **Date** = the date of analysis
 - c. **Time** = leave blank
 - d. **Alternative** = the alternative being analyzed (existing, no build, build, Alt B, dual lefts, etc...)
 - e. **Timing Plan** = enter the year and time for the traffic data (2013 AM, 2036PM)
 - f. **Analyst** = your name or initials
 - g. Click **OK**

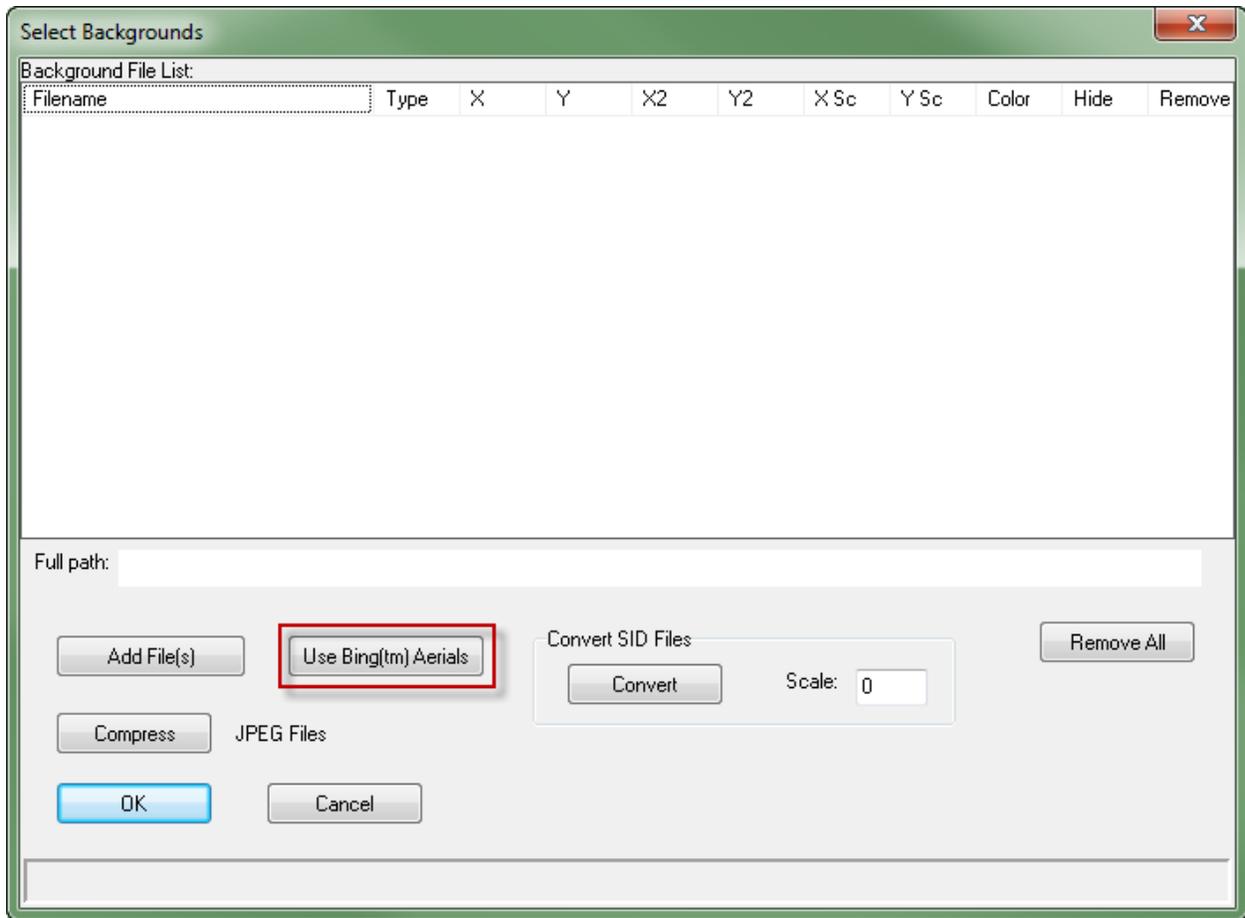


Importing the Background Image

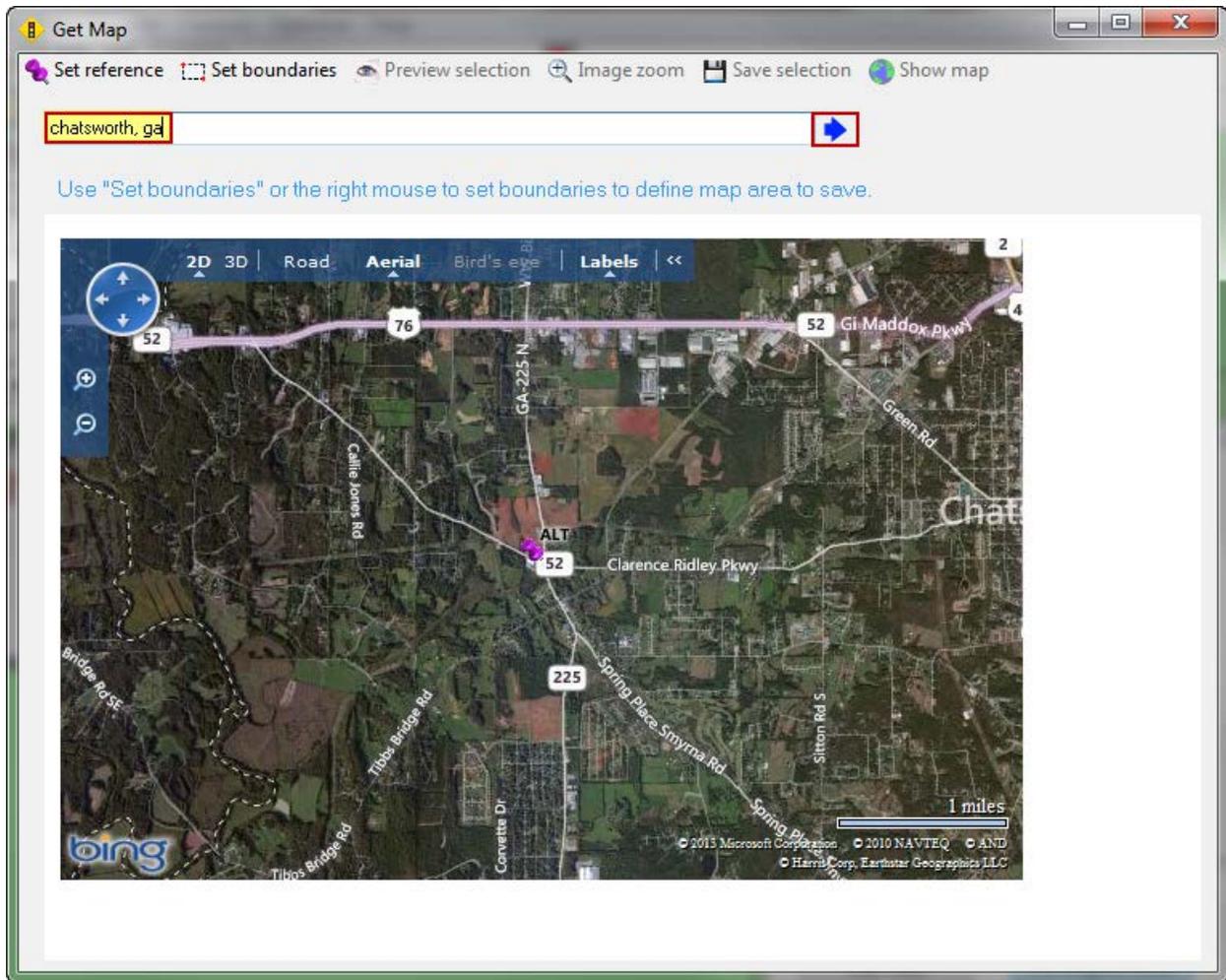
1. Select **Select Backgrounds** from the **File** tab in the Menu Bar



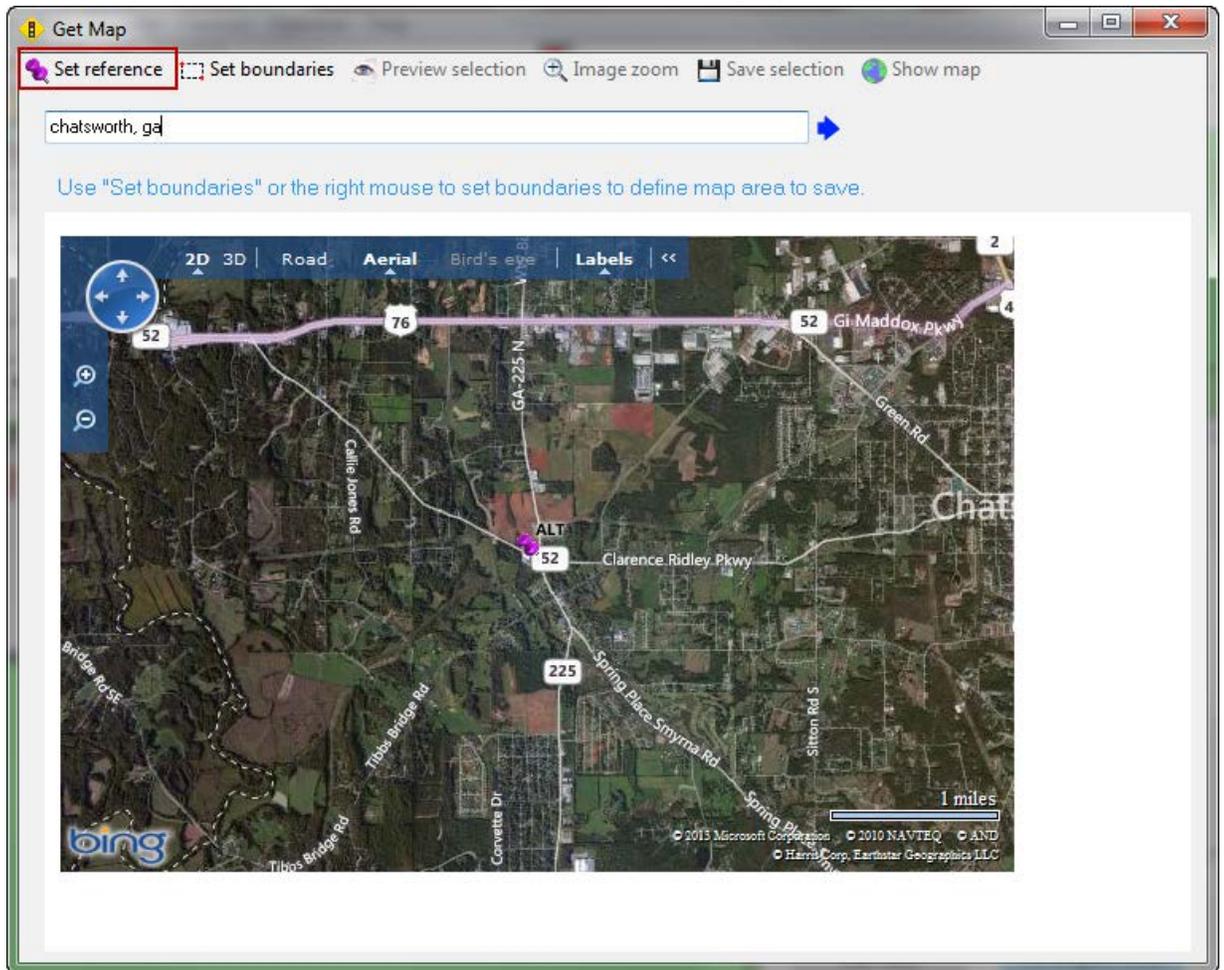
2. Click **Use Bing™ Aerials**



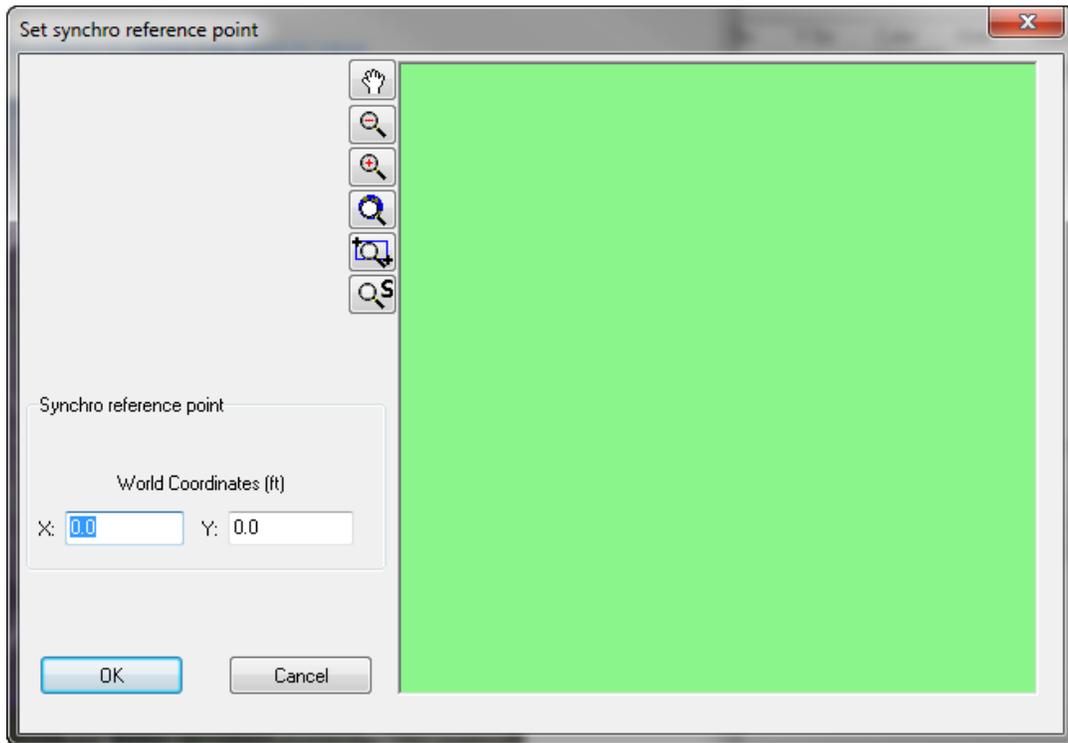
3. Enter the nearest city (or address, destination, etc...) I the search bar and click the blue arrow



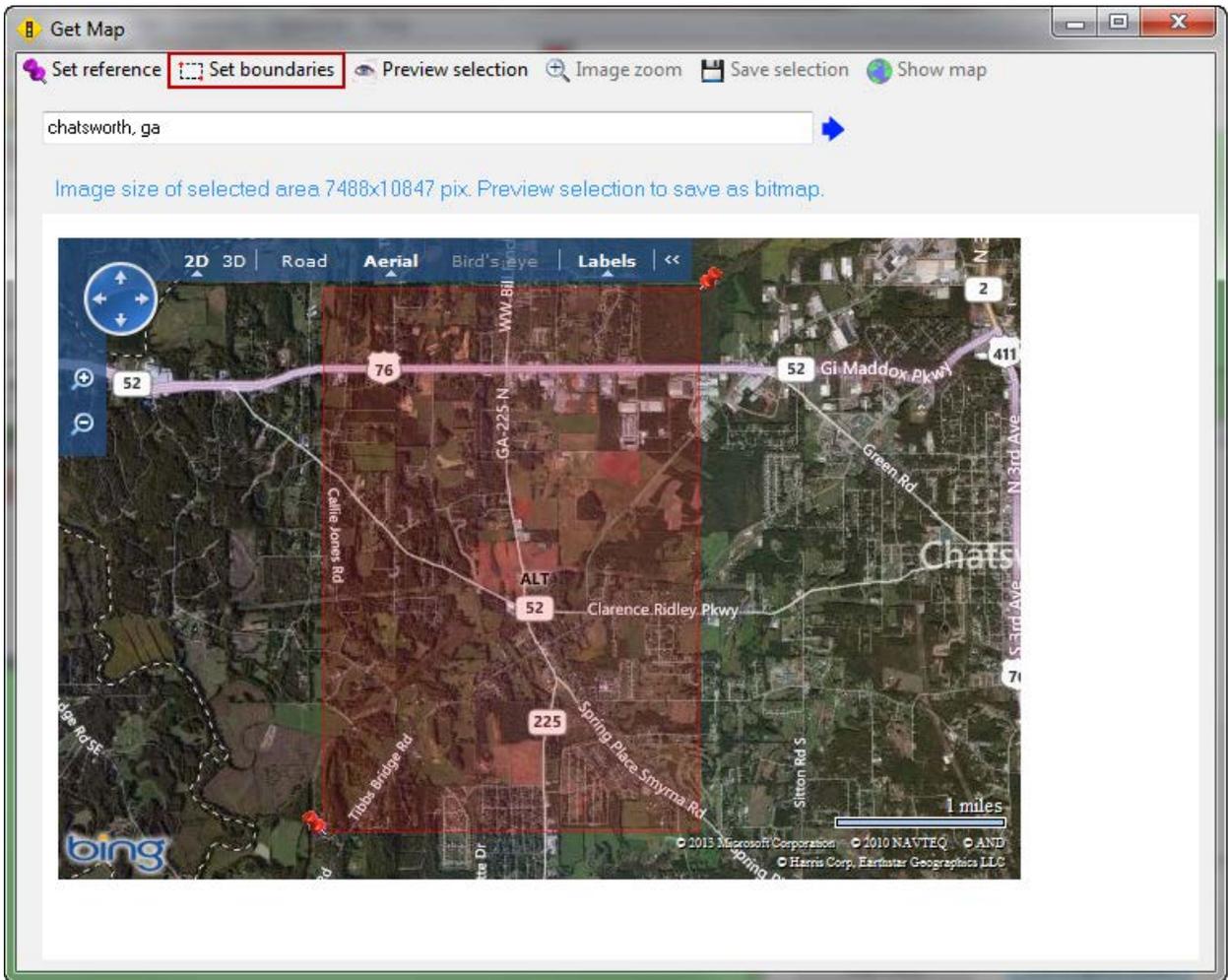
4. Use the controls within Bing to center the project area in the window.
 - a. Once complete click **Set Reference**.
 - b. Place the purple thumbnail in the lower left corner of the project area



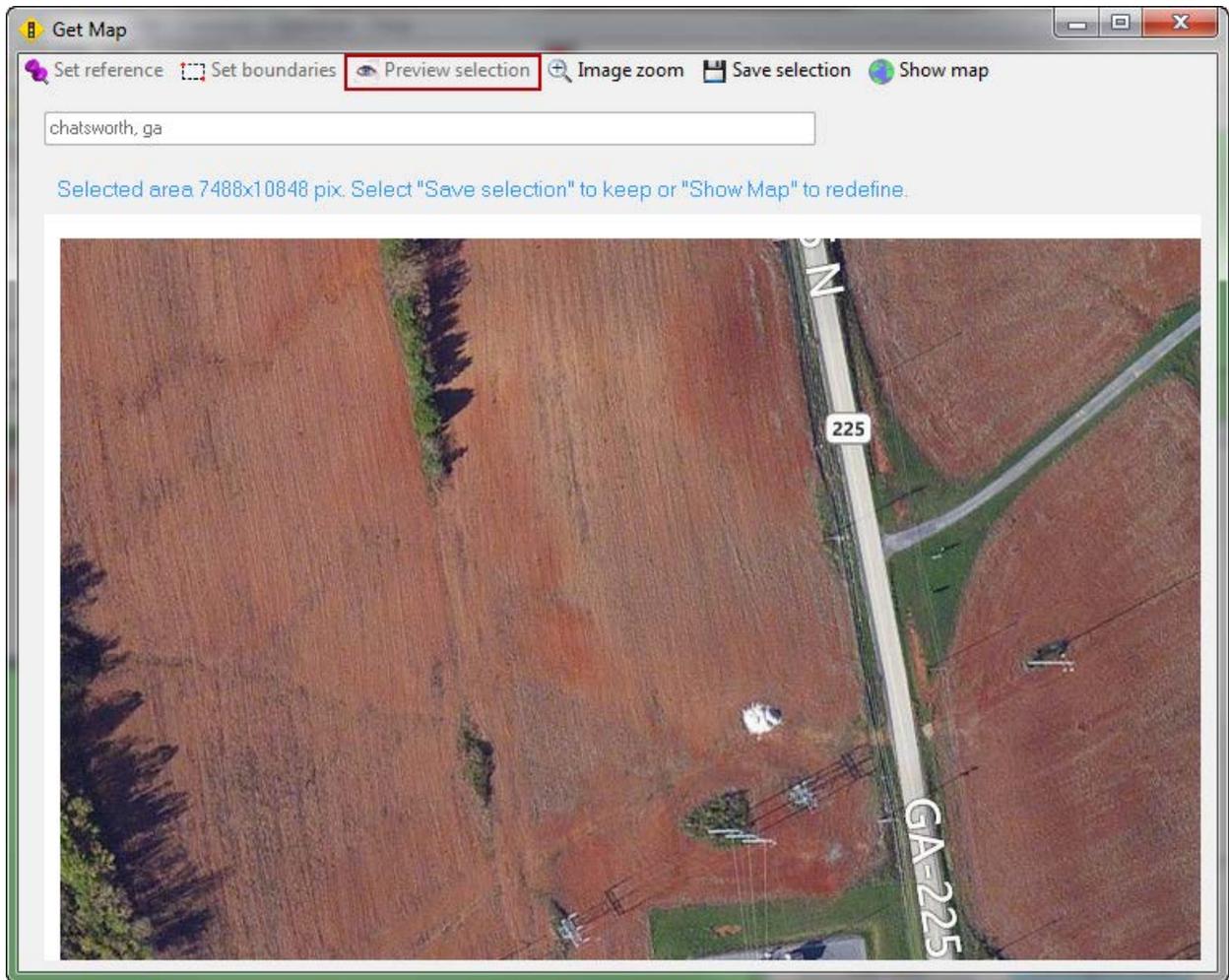
- c. Select **OK**



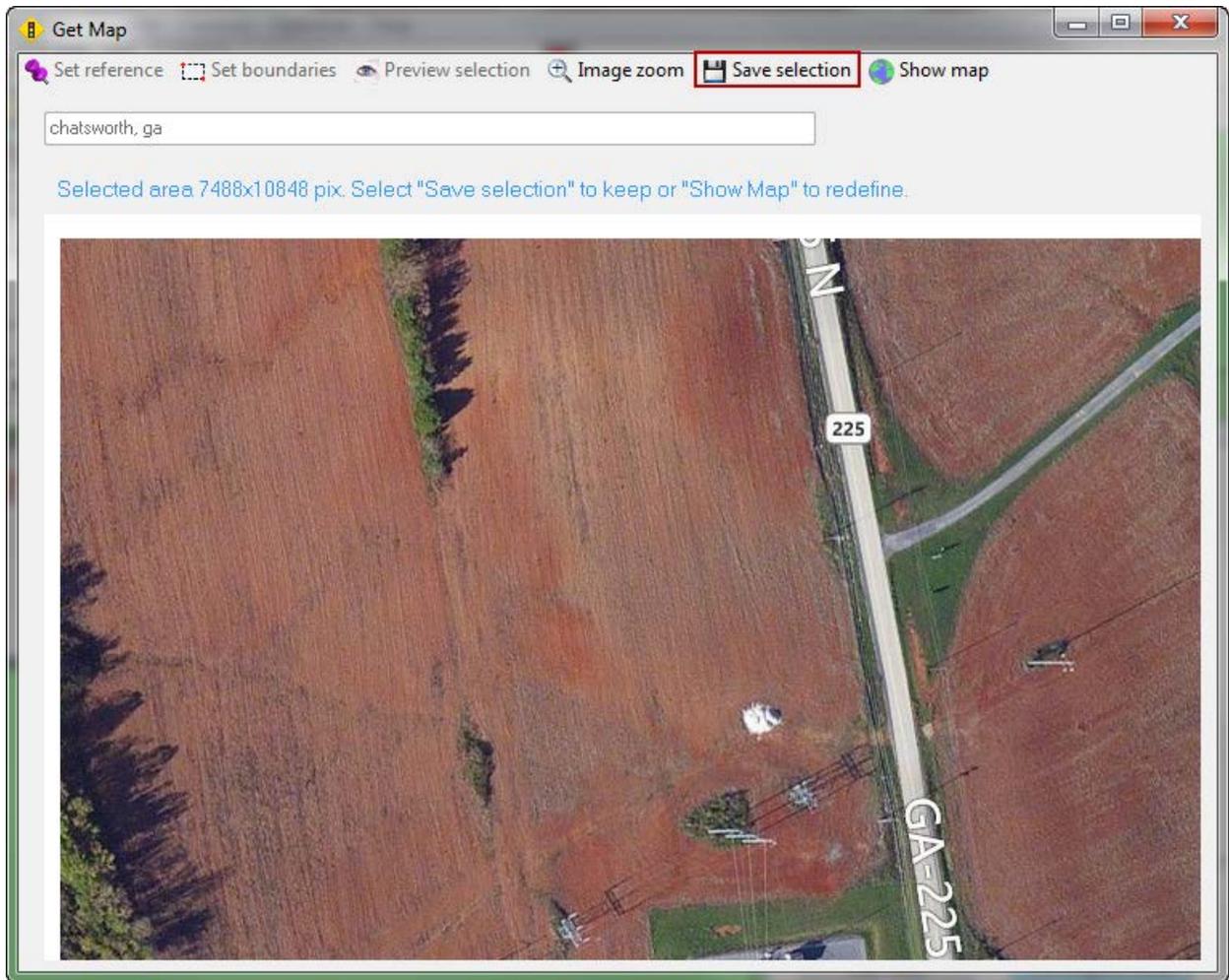
5. Click **Set Boundaries**
 - a. Click **Set 1st Boundary Point** and set a corner point.
 - b. Click **Set 2nd Boundary Point** and set the opposite corner point



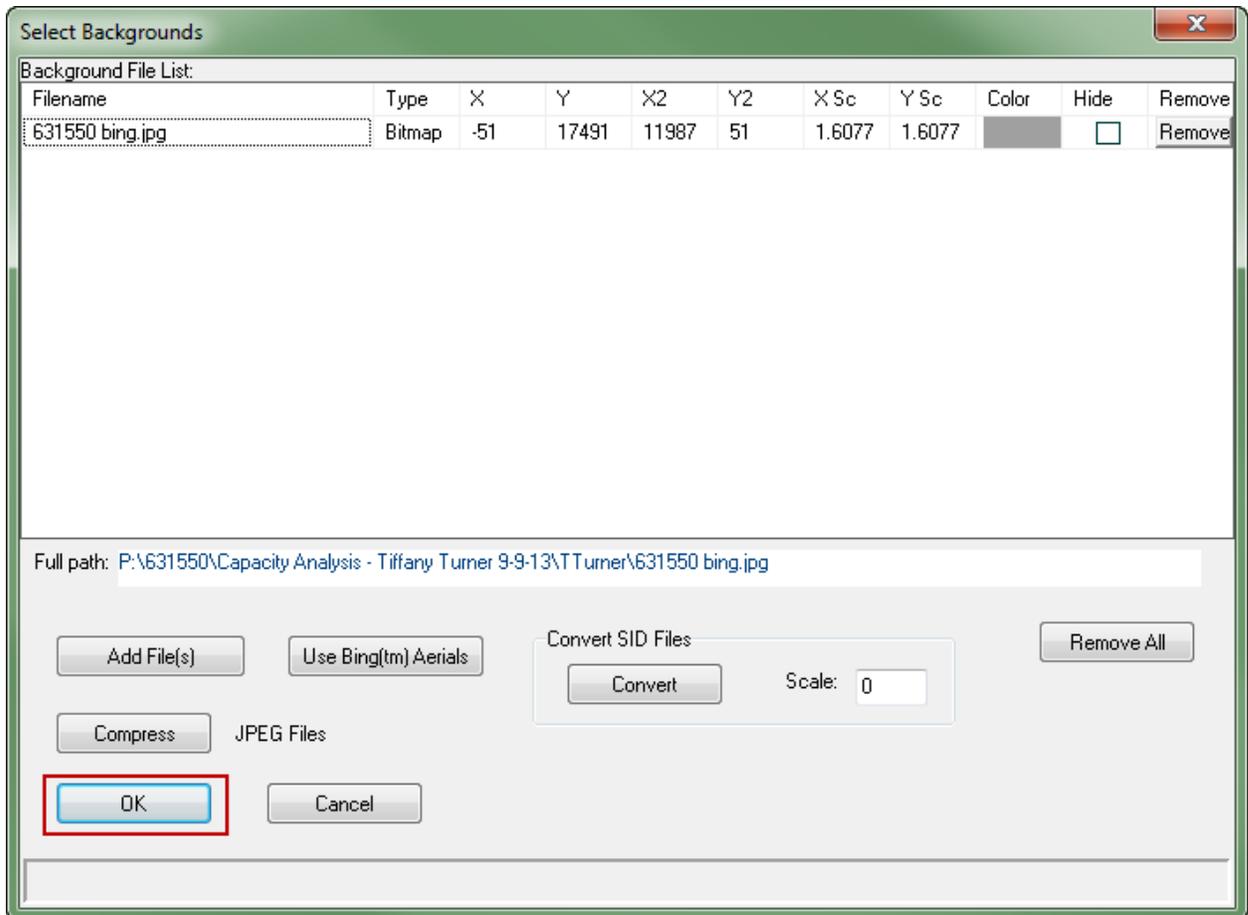
6. Click **Preview Selection**



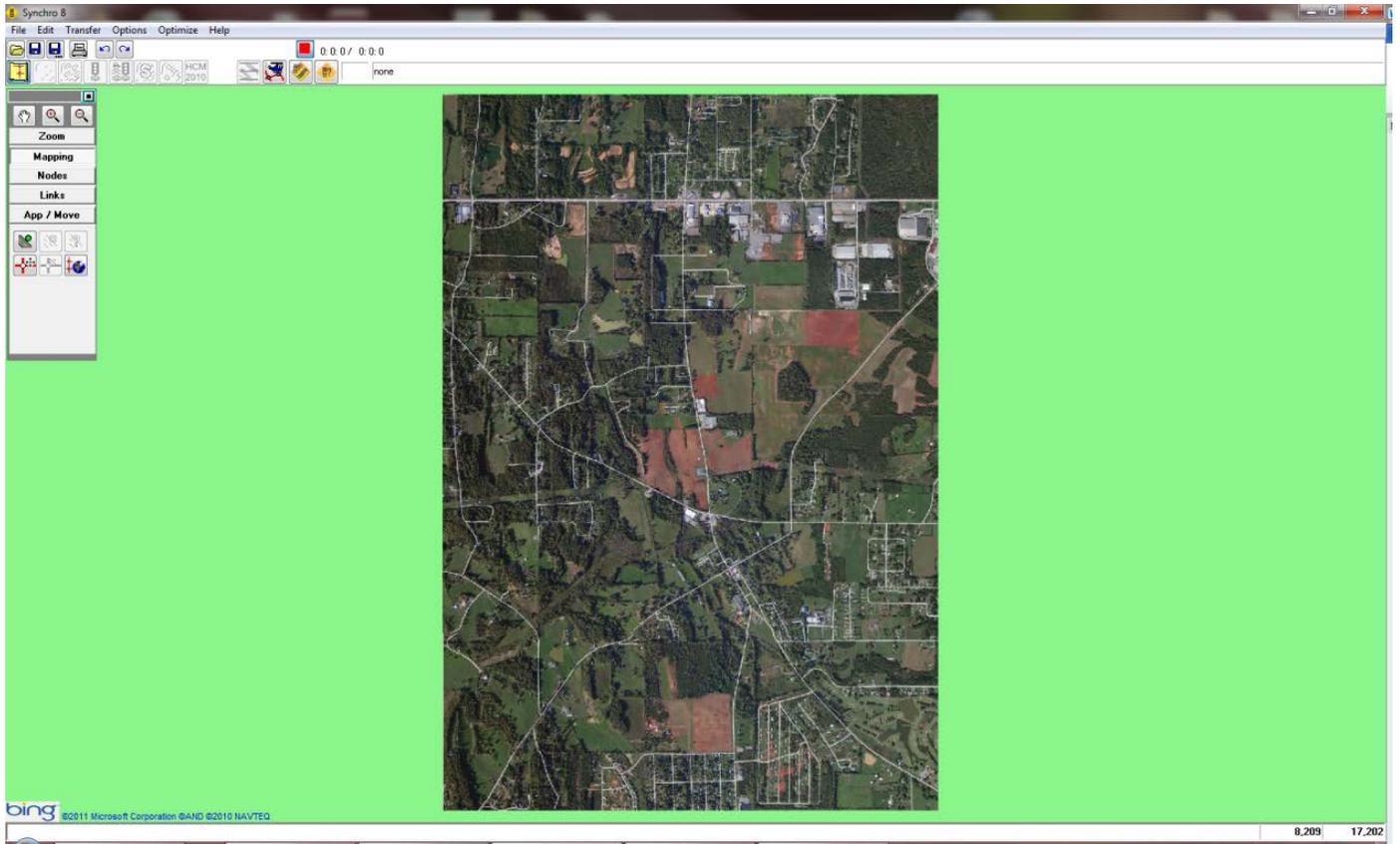
7. Click **Save selection** > **As single file**



8. Click **OK**



9. The background image is loaded



Building the Network

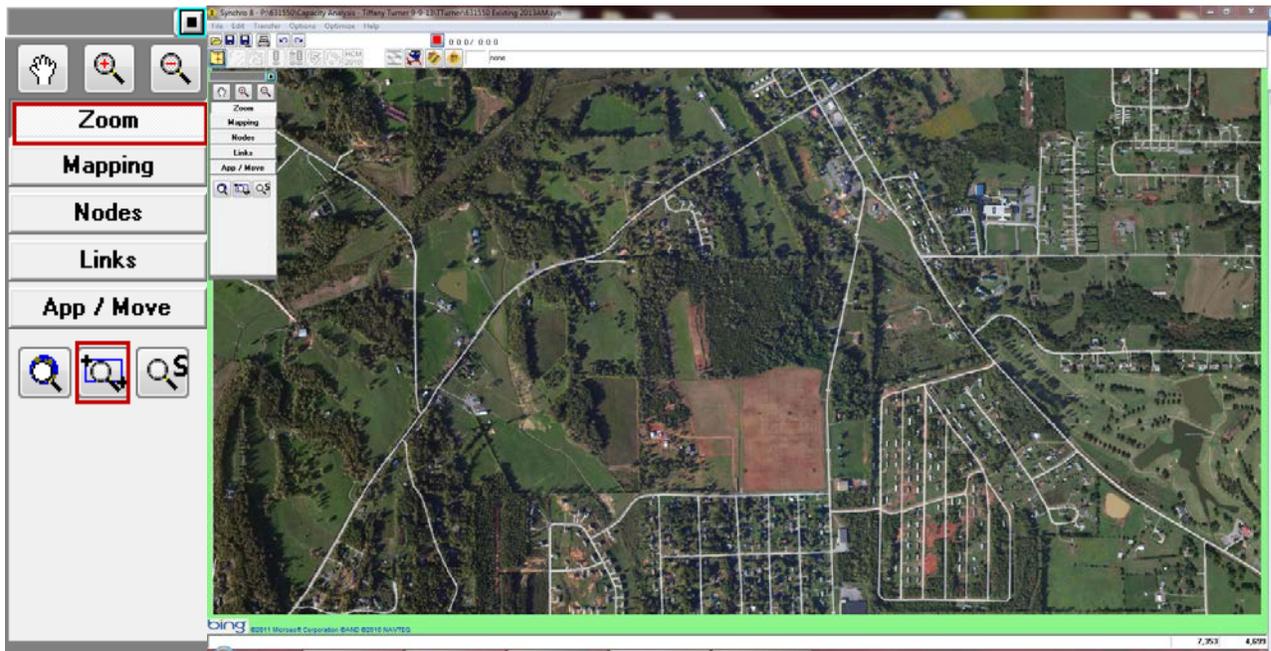
1. Draw the main line corridor.
 - a. Click the **Mapping** tab
 - b. Click the **Add a link** button
 - c. Click and hold outside of the background image and drag along the main corridor to a point outside of the image past the end of the corridor.

Note: The link will be straight. Curvature will be added later

Note: The links will not appear red in Synchro. This is for visibility in the guide



2. Click the **Zoom** Tab on the floating menu and click the **zoom area** to zoom into the area around the first intersection.

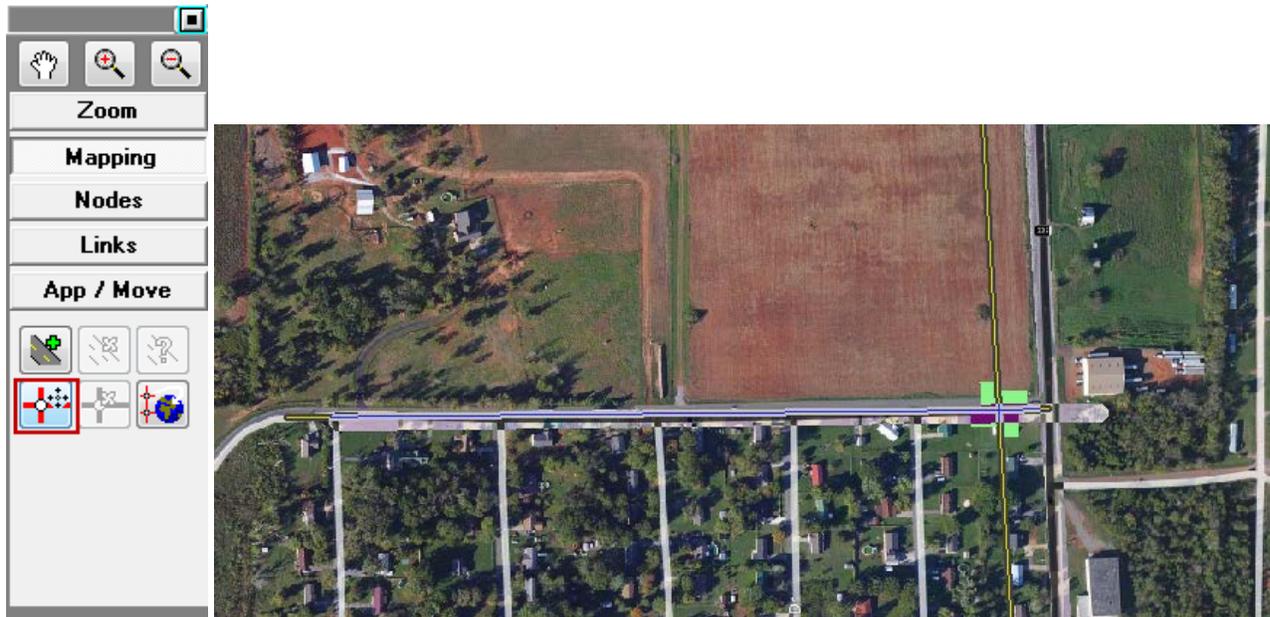


3. Click **Mapping** > **Add a link** to add the cross street. (repeat the click/hold/drag process)

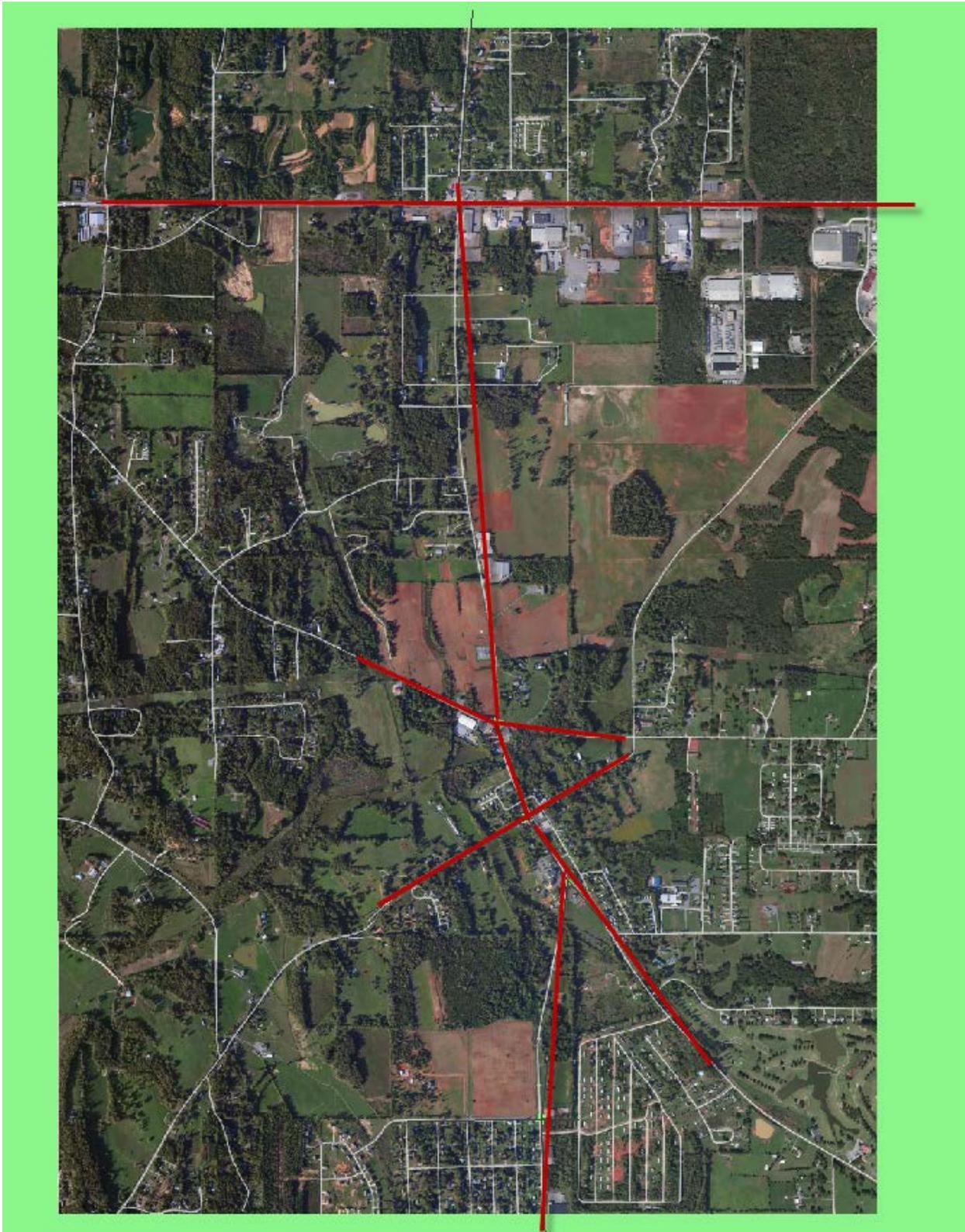


An intersection is created when you drag one link over another link. (notice the green squares at each corner).

4. Move this intersection to match the background by selecting **Mapping > Move Node**



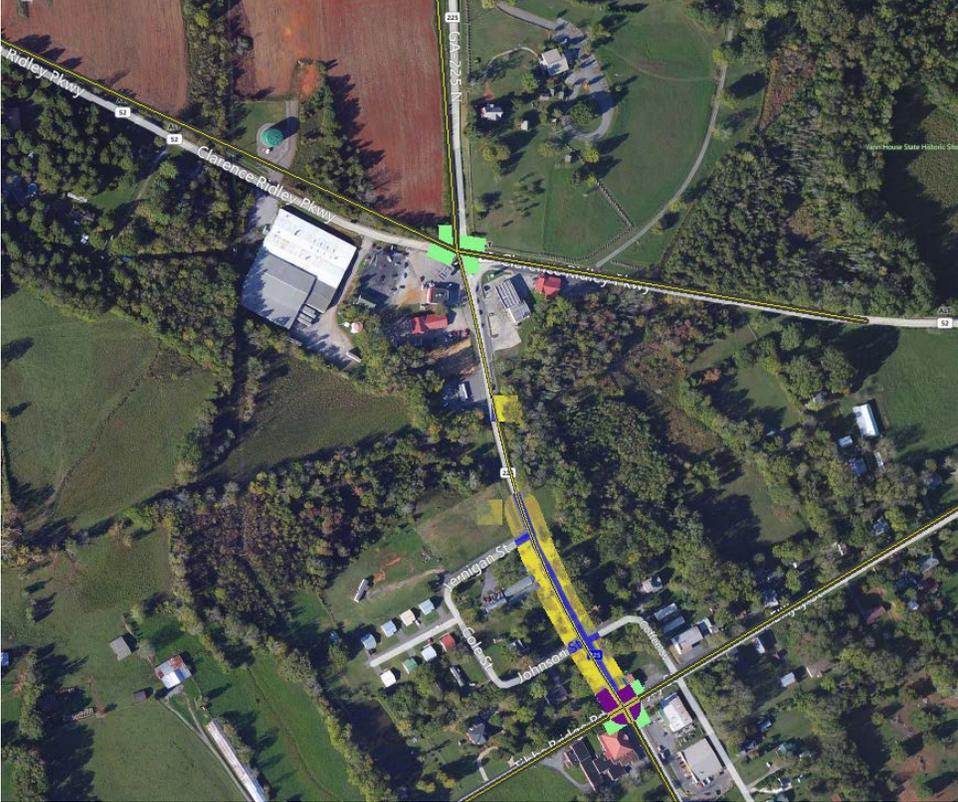
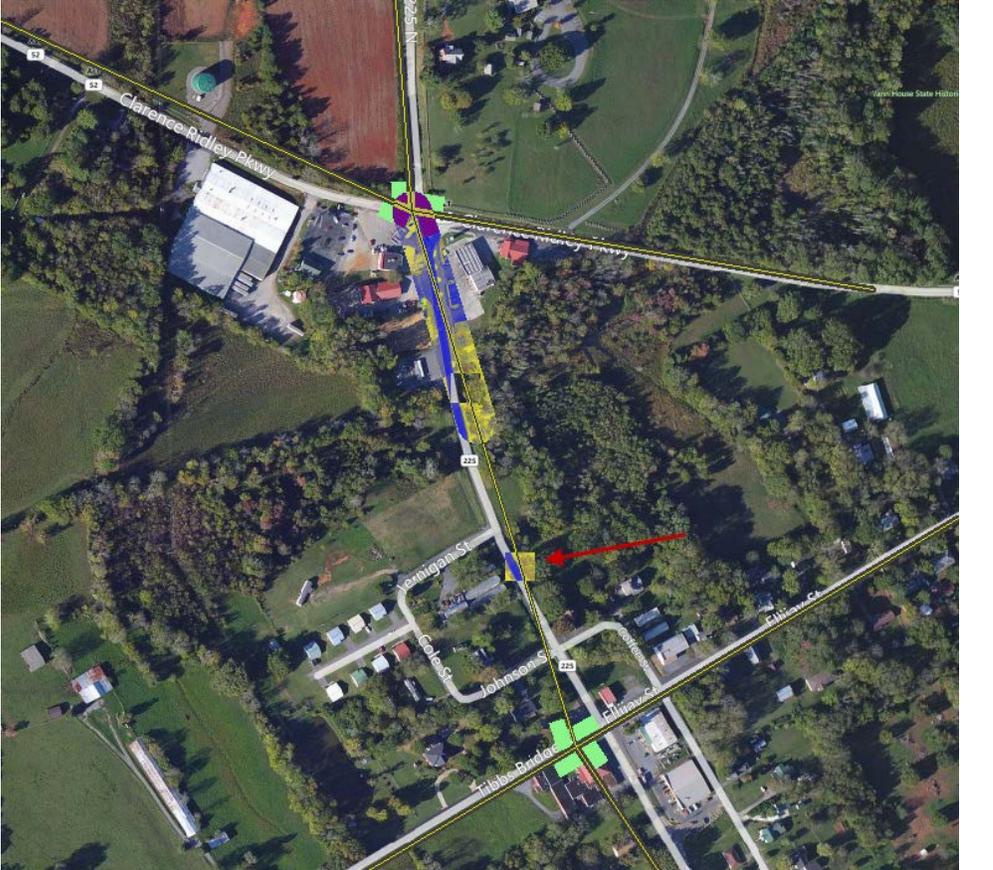
- Repeat steps 3 & 4 to create the entire network



6. To add curvature
 - a. Right click on the link and select **Add Curvature**



- b. Click and hold the square and drag to match the link to the existing alignment



7. Repeat Step 6 wherever curvature is needed

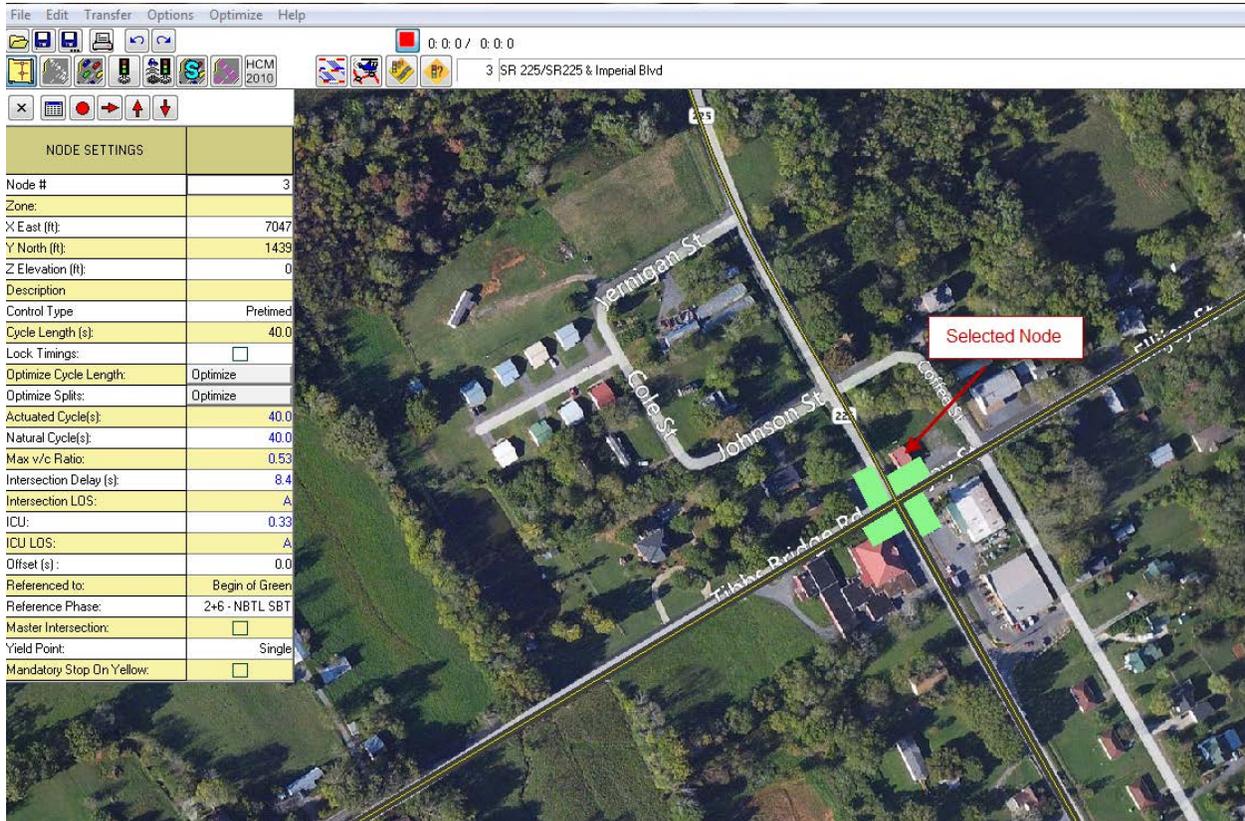
Edit a Node

I. Complete the Node Window

1. Double click the Node (intersection) and Select the **Node** Button



2. Select the **Screen** Button



The screenshot shows the Synchro 8 software interface. The top menu bar includes File, Edit, Transfer, Options, Optimize, and Help. Below the menu bar is a toolbar with various icons. The main window displays an aerial view of a residential area with several streets labeled: Yennigan St, Johnson St, Cole St, and Trilabe Drive. A red arrow points to a specific intersection, which is highlighted with a green square and labeled "Selected Node". On the left side of the interface, there is a "NODE SETTINGS" panel with the following fields:

NODE SETTINGS	
Node #	3
Zone:	
X East (ft)	7047
Y North (ft)	1439
Z Elevation (ft)	0
Description	
Control Type	Pretimed
Cycle Length (s)	40.0
Lock Timings:	<input type="checkbox"/>
Optimize Cycle Length:	Optimize
Optimize Splits:	Optimize
Actuated Cycle(s):	40.0
Natural Cycle(s):	40.0
Max v/c Ratio:	0.53
Intersection Delay (s):	8.4
Intersection LDS:	A
ICU:	0.33
ICU LDS:	A
Offset (s):	0.0
Referenced to:	Begin of Green
Reference Phase:	2+6 - NBTL SBT
Master Intersection:	<input type="checkbox"/>
Yield Point:	Single
Mandatory Stop On Yellow:	<input type="checkbox"/>

3. For **Unsignalized** intersections
 - a. **Description:** Intersection Name
 - b. **Control Type**
 - i. **Unsig**
 - stop or yield control of one or all approaches
 - ii. **Roundabouts**
 - based on HCM 2010 method. Models single and multi-lane roundabouts and calculates delays and queues
 - use the HCM 2010 setting

NODE SETTINGS	
Node #	8
Zone:	
X East (ft):	6913
Y North (ft):	5925
Z Elevation (ft):	0
Description	
Control Type	Unsig
Max v/c Ratio:	0.00
Intersection Delay (s):	0.0
Intersection LOS:	A
ICU:	0.00
ICU LOS:	A

4. For **Signalized intersections**
 - a. **Description:** enter intersection name
 - b. **Control Type**
 - i. **Pretimed**
 - runs a fixed cycle with no detectors
 - *use for isolated intersections where the minor road volume is low*
 - ii. **Semi-Actuated-Uncoordinated**
 - detectors located on minor approach. Recalls the main street through phases to max values and services the minor road when a vehicle is detected. Not coordinated because the cycle length can vary each cycle.
 - *use for isolated higher volume intersections where the minor road traffic is moderate*
 - iii. **Actuated uncoordinated**
 - detectors located on all approaches, fully actuated. All phases have a minimum green time but are serviced when a vehicle is detected, no recall maximums are set. The cycle length may vary each cycle.
 - *Use for an isolated intersection where the major and minor roads have similar traffic volumes*
 - iv. **Actuated coordinated**
 - All phases except for the assigned coordinated phases are fully actuated. The signal operates on a fixed cycle length allowing any unused time in the cycle to be given back to the main line

NODE SETTINGS	
Node #	3
Zone:	
X East (ft):	7047
Y North (ft):	1439
Z Elevation (ft):	0
Description	
Control Type	Pretimed
Cycle Length (s):	40.0
Lock Timings:	<input type="checkbox"/>
Optimize Cycle Length:	Optimize
Optimize Splits:	Optimize
Actuated Cycle(s):	40.0
Natural Cycle(s):	40.0
Max v/c Ratio:	0.53
Intersection Delay (s):	8.4
Intersection LOS:	A
ICU:	0.33
ICU LOS:	A
Offset (s) :	0.0
Referenced to:	Begin of Green
Reference Phase:	2+6 - NBTL SBT
Master Intersection:	<input type="checkbox"/>
Yield Point:	Single
Mandatory Stop On Yellow:	<input type="checkbox"/>

- Use for an intersection that is connected in a series where the major and minor roads have similar traffic volumes

II. Select and complete the Lane Window



1. **Lanes and Sharing:** select the configuration of each approach. If a turn lane is shared select it from the through lane drop-down.
2. **Traffic Volume:** enter the DHV for the movement
3. **Street Name:** enter the street name for the selected approach
4. **Link Distance:** **DO NOT CHANGE***
5. **Link speed:** enter the speed limit
6. **Lane Width:** enter lane width
7. **Grade %:** enter once per approach (use – {neg} for downslopes)
8. **Storage Length:** enter the storage length in feet for turn bays. If the lane extends to the previous intersection enter “0”
9. **Storage Lane #:** this should be populated by the lanes and sharing input, however it is good to check this field. (if the lanes extends to previous intersection the field will have a “0”)
10. **Right Turn Channelized:** ONLY change if you have a channelized right turn lane (not just a striped median)
 - None: no right turn channelization
 - Yield: no phase is assigned. RTOR only
 - Stop: same as yield
 - Free: 100% green time
 - Signal: movement is controlled by the signal

Repeat for all approaches by selecting the arrows



LANE SETTINGS				
		EBL	EBT	EBR
Lanes and Sharing (#RL)				
Traffic Volume (vph)		0	0	0
Street Name				
Link Distance (ft)		—	2592	—
Link Speed (mph)		—	30	—
Set Arterial Name and Speed		—	EB	—
Travel Time (s)		—	58.9	—
Ideal Satd. Flow (vphpl)		1900	1900	1900
Lane Width (ft)		12	12	12
Grade (%)		—	0	—
Area Type CBD		—	<input type="checkbox"/>	—
Storage Length (ft)		0	—	0
Storage Lanes (#)		—	—	—
Right Turn Channelized		—	—	None
Curb Radius (ft)		—	—	—
Add Lanes (#)		—	—	—
Lane Utilization Factor		1.00	1.00	1.00
Right Turn Factor		—	—	—
Left Turn Factor (prot)		—	—	—
Saturated Flow Rate (prot)		—	—	—
Left Turn Factor (perm)		—	—	—
Right Ped Bike Factor		—	—	—
Left Ped Factor		—	—	—
Saturated Flow Rate (perm)		—	—	—
Right Turn on Red?		<input checked="" type="checkbox"/>	—	<input checked="" type="checkbox"/>
Saturated Flow Rate (RTOR)		—	—	—
Link Is Hidden		—	<input type="checkbox"/>	—
Hide Name in Node Title		—	<input type="checkbox"/>	—

*If the link length here is incorrect, check the scale of the background image. If a background image was not used adjust the length by lengthening the link graphic on the map screen.

III. Select and complete the **Volumes Settings** Window



1. **Lanes and Sharing:** already entered in Lane Window
2. **Traffic Volume:** already entered in Lane Window
3. **Peak Hour Factor:**
 - a. 0.92 for urban
 - b. 0.88 for rural
4. **Heavy Vehicles:** enter % heavy vehicles

Repeat for all approaches by selecting the arrows



VOLUME SETTINGS			
	EBL	EBT	EBR
Lanes and Sharing (#RL)			
Traffic Volume (vph)	0	0	0
Conflicting Peds. (#/hr)	0	—	0
Conflicting Bicycles (#/hr)	—	—	0
Peak Hour Factor	0.92	0.92	0.92
Growth Factor	1.00	1.00	1.00
Heavy Vehicles (%)	2	2	2
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)	0	0	0
Traffic in shared lane (%)	—	—	—
Lane Group Flow (vph)	0	0	0

IV. Select and complete the **Signing Window**



(FOR UNSIGNALIZED ONLY)

1. Sign Control

- a. select stop or yield for the minor street
- b. select free for the major street (unless it's a four way stop)

2. Median width:

- a. used for two-stage gap acceptance calculations.
The median storage is determined by the median width divided by the vehicle length
- b. if a value is enter the median is assumed to be raised unless the TWLTL box is checked
- c. this is applied to the minor leg (the traffic that will NOT the leg the median is on)

3. TWLTL Median

- a. check the box if there is a TWLTL
- b. the assumed storage is 2 vehicles

4. Right Turn Channelized: keep at none

SIGNING SETTINGS			
	EBL	EBT	EBR
Lanes and Sharing (#RL)			
Traffic Volume (vph)	0	0	0
Sign Control	—	Stop	—
Median Width (ft)	—	0	—
TWLTL 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)	—	—	—
Approach Delay (s)	—	0.0	—
Approach LOS	—	A	—

V. Select and complete the **Timing Window**



(for signalized intersections only)

TIMING SETTINGS														
Lanes and Sharing (#RL)													—	—
Traffic Volume (vph)	120	430	20	35	755	70	20	120	60	105	130	205	—	—
Turn Type	Prot	—	—	Prot	—	—	Perm	—	Perm	Perm	—	Perm	—	—
Protected Phases	7	4	—	3	8	—	—	2	—	—	6	—	—	—
Permitted Phases	—	—	—	—	—	—	2	—	2	—	6	—	6	—
Detector Phases	7	4	—	3	8	—	2	2	2	—	6	—	6	—
Switch Phase	0	0	—	0	0	—	0	0	0	—	0	—	0	—
Leading Detector (ft)	20	100	—	20	100	—	—	100	20	—	100	20	—	—
Trailing Detector (ft)	0	0	—	0	0	—	—	0	0	—	0	0	—	—
Minimum Initial (s)	4.0	4.0	—	4.0	4.0	—	4.0	4.0	4.0	4.0	4.0	4.0	—	—
Minimum Split (s)	8.0	20.0	—	8.0	20.0	—	20.0	20.0	20.0	20.0	20.0	20.0	—	—
Total Split (s)	10.0	21.0	—	9.0	20.0	—	20.0	20.0	20.0	20.0	20.0	20.0	—	—
Yellow Time (s)	3.5	3.5	—	3.5	3.5	—	3.5	3.5	3.5	3.5	3.5	3.5	—	—
All-Red Time (s)	0.5	0.5	—	0.5	0.5	—	0.5	0.5	0.5	0.5	0.5	0.5	—	—
Lost Time Adjust (s)	0.0	0.0	—	0.0	0.0	—	—	0.0	0.0	—	0.0	0.0	—	—
Lagging Phase?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	—	<input type="checkbox"/>	<input checked="" type="checkbox"/>	—	—	—	—	—	—	—	—	—
Allow Lead/Lag Optimize?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	—	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	—	—	—	—	—	—	—	—	—
Recall Mode	Max	Max	—	Max	Max	—	Min	Min	Min	Min	Min	Min	—	—
Speed limit (mph)	—	30	—	—	30	—	—	55	—	—	55	—	—	—
Actuated Effct. Green (s)	6.0	17.1	—	5.0	16.1	—	—	12.7	12.7	—	12.7	12.7	—	—
Actuated g/C Ratio	0.13	0.36	—	0.11	0.34	—	—	0.27	0.27	—	0.27	0.27	—	—
Volume to Capacity Ratio	0.60	0.40	—	0.21	0.77	—	—	0.34	0.13	—	0.68	0.39	—	—
Control Delay (s)	34.9	12.7	—	23.4	20.4	—	—	15.5	2.2	—	24.5	4.5	—	—
Queue Delay (s)	0.0	0.0	—	0.0	0.0	—	—	0.0	0.0	—	0.0	0.0	—	—
Total Delay (s)	34.9	12.7	—	23.4	20.4	—	—	15.5	2.2	—	24.5	4.5	—	—
Level of Service	C	B	—	C	C	—	—	B	A	—	C	A	—	—
Approach Delay (s)	—	17.3	—	—	20.5	—	—	11.5	—	—	15.2	—	—	—
Approach LOS	—	B	—	—	C	—	—	B	—	—	B	—	—	—
Queue Length 50th (ft)	36	52	—	10	116	—	—	34	0	—	64	0	—	—
Queue Length 95th (ft)	#100	89	—	33	#212	—	—	69	10	—	121	34	—	—
Stops (vph)	101	306	—	36	647	—	—	100	5	—	195	30	—	—
Fuel Used (g/hr)	7	25	—	2	47	—	—	9	3	—	9	5	—	—
Dilemma Vehicles (#/hr)	0	0	—	0	0	—	—	12	0	—	23	0	—	—

1. Turn Type

a. For left turns

- i. Perm(permitted): turn are permitted after yielding to conflicting movements *green ball*
- ii. Prot(protected): movement is protected by a dedicated signal phase *green arrow*
- iii. Permitted+Protected (pm+pt)- movement is protected during a portion of the phase and permitted during the rest of the phase *green arrow followed by green ball*
- iv. Split – left and thru traffic share a protected phase. Usually when there's a left/thru lane
- v. Dallas Permitted (D. Pm) – **ignore**
- vi. Dallas Permitted plus protected (D.P+P) – **ignore**
- vii. N/A – **ignore**
- viii. Custom – **ignore**

b. For right turns

- i. Permitted (Perm) –must yield to pedestrians *green ball*
- ii. Protected (Prot) – movement is protected (no pedestrian conflict) *green arrow*
- iii. Overlap(over) – movement is given a green arrow during the compatible left turn movement of the intersecting street
- iv. Permitted + Protected (pm+ov) – movement must yield to pedestrians during the thru phase but is protected during the compatible left turn phase.
- v. Protected + Overlap (pt+ov) – movement is protected. the green arrow overlaps from the thru phase into the compatible left phase
- vi. Free – only to be used when the free turn lane has an acceleration lane downstream and is not controlled by the signal

2. Yellow Time

Calculate using the following equation

$$y = 1.0 + \frac{1.47 * V}{(20 + 64.4g)} \quad \text{where } V = \text{approach speed (mph)} \\ \text{and } g = \text{grade (ex. } -3\% = -.03)$$

3. Red time

Calculate using the following equation

$$R = \frac{W + 20}{1.47 * V} \quad \text{where } W = \text{width of the stop line to far side no-conflict point (ft) and} \\ V = \text{speed of vehicle, mph}$$

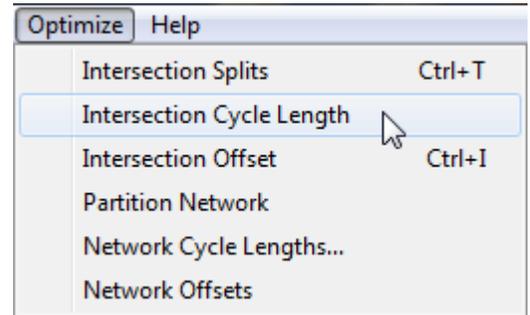
Optimize the Network

1. Optimize Each Intersection

- a. Double click on a node to select it
- b. Go to **Optimize> Intersection Splits**
- c. Go to **Optimize> Intersection Cycle Length**

2. Optimize the Network

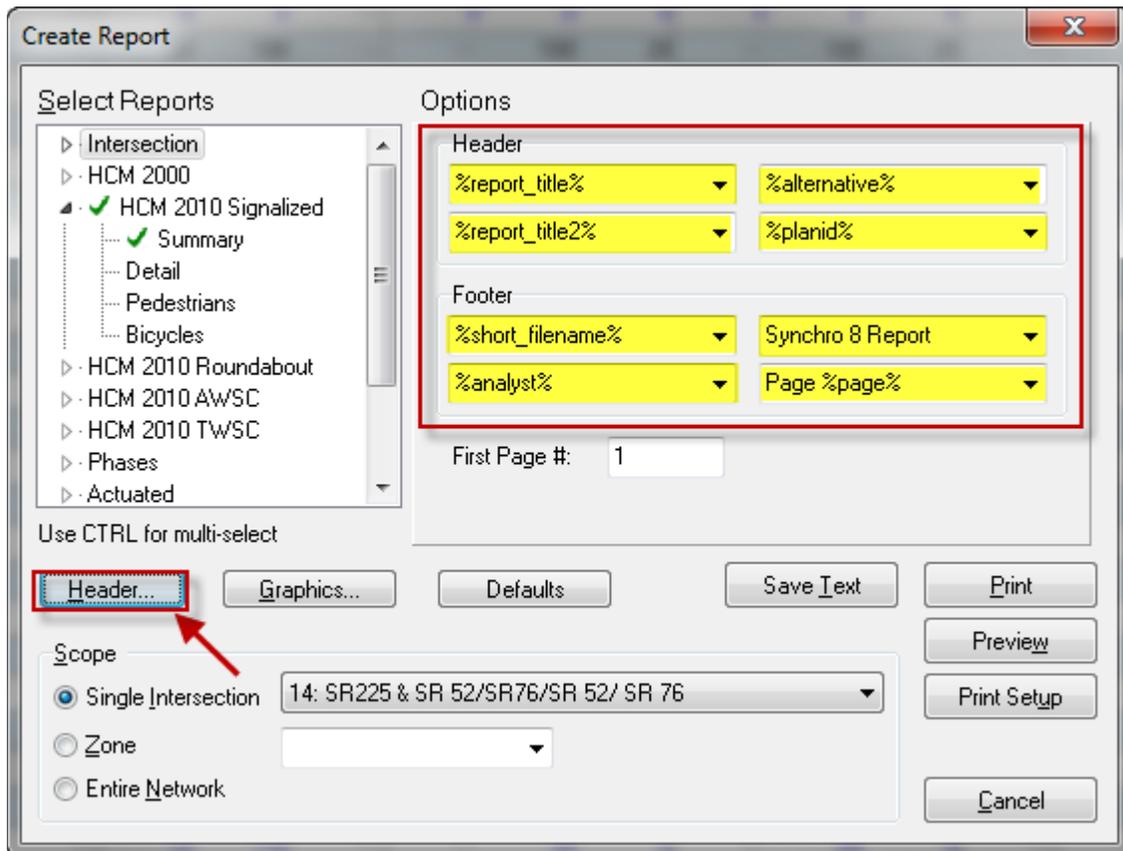
- a. Go to **Optimize> Network Cycle Lengths**
- b. Go to **Optimize> Network Cycle Offset**



Reporting

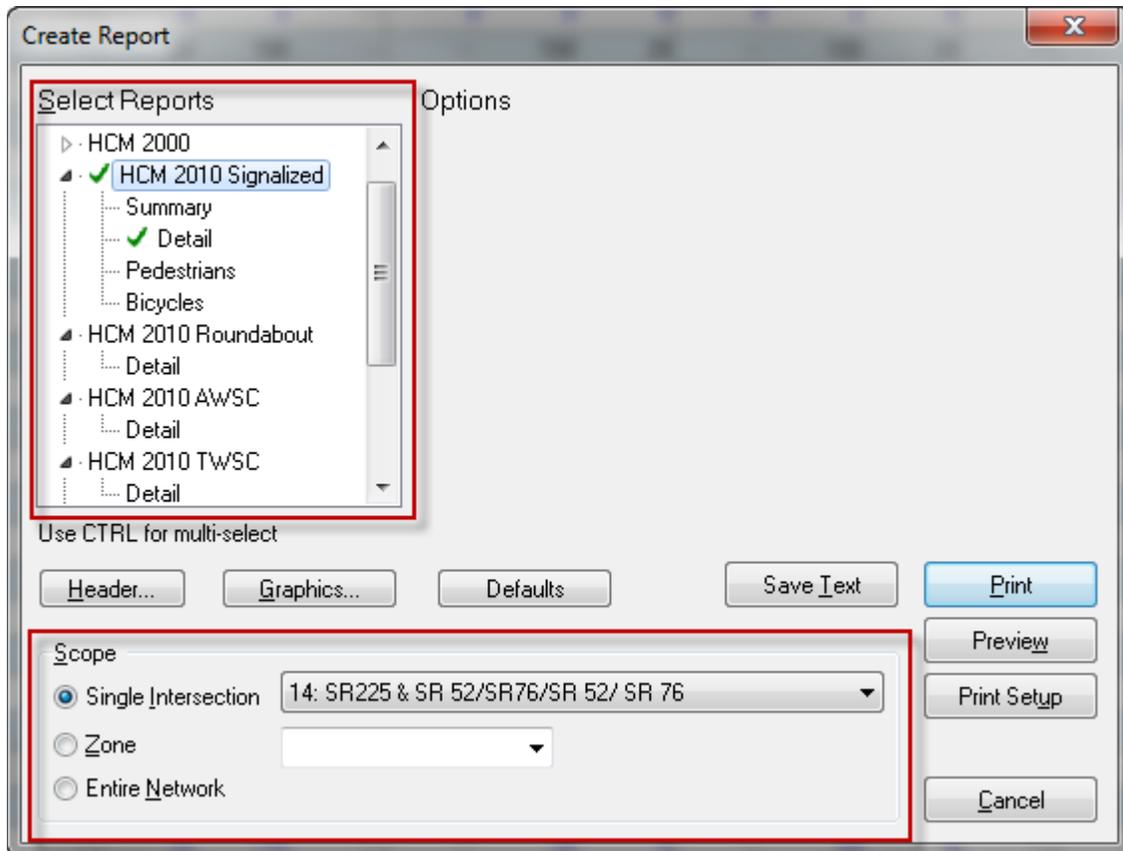
In order to more easily identify the reports after printing it is helpful to set up a useful header

1. Go to **File > Create Report** (or Ctrl-R)
2. Click the **Header** Button
3. Set up the **Header/Footer** by selecting the fields from the drop down

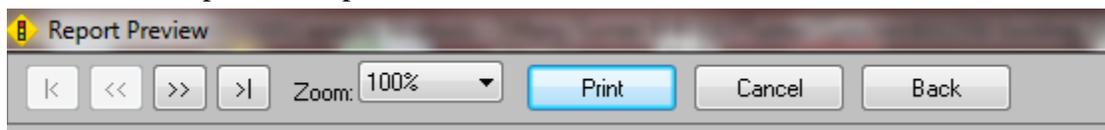


For Reports

1. Go to **File > Create Report** (Ctrl R)



2. Select **Reports**
 - a. For Signals > **HCM 2010 Signalized** > Summary
 - b. For Roundabouts > **HCM2010 Roundabout** > Detail
 - c. For All way stop control > **HCM2010 AWSC** > Detail
 - d. For Two way stop control > **HCM2010 TWSC** > Detail
3. Select a **Scope**
 - a. **Single Intersection** > produces the report for a select intersection
 - b. **Zone** > ignore
 - c. **Entire Network** > produces the report for all the applicable intersections in the network
4. Select **Preview** to view the report
5. Select **Print** to print the report



For Two Way Stop Control intersections

1. Select **HCM 2010 TWSC** report
2. Choose either **Single Intersection** or **Entire Network**
3. Double check input data in the **Movement** section
 - a. Volume
 - b. Peak Hour Factor
 - c. Heavy Vehicles %
4. Review the **Intersection Delay**
5. Review **Approach Results**
 - a. HCM Control Delay (s)
 - b. HCM LOS
6. Review **Lane Results**
 - a. HCM Lane VC Ratio
 - b. HCM Control Delay (s)
 - c. HCM Lane LOS
 - d. HCM 95th percentile queue (veh)

Notes:

- There is **not** an overall Intersection LOS (see the HCM 2010 for the reasoning)
- **Confirm** that the Queue Length does not exceed the provided storage length or back into the upstream intersection.
- Consider the delay and LOS for each movement not just the minor leg approach. The major left turns can impact the mainline through traffic.

HCM 2010 TWSC							Existing 2013 AM	
3: SR225 & Imperial Blvd							2013 AM	
Intersection								
Intersection Delay, s/veh	1.2							
Movement								
	EBL	EBR	NBL	NBT	SBT	SBR		
Vol, veh/h	55	5	5	360	35	265		
Conflicting Peds, #/hr	0	0	0	0	0	0		
Sign Control	Stop	Stop	Free	Free	Free	Free		
RT Channelized	-	None	-	None	-	None		
Storage Length	0	-	-	-	-	-		
Veh in Median Storage, #	0	-	-	0	0	-		
Grade, %	0	-	-	0	0	-		
Peak Hour Factor	88	88	88	88	88	88		
Heavy Vehicles, %	2	2	2	2	2	2		
Mvmt Flow	62	6	6	409	40	301		
Major/Minor								
	Minor2		Major1		Major2			
Conflicting Flow All	610	190	341	0	-	0		
Stage 1	190	-	-	-	-	-		
Stage 2	420	-	-	-	-	-		
Follow-up Headway	3.518	3.318	2.218	-	-	-		
Pot Capacity-1 Maneuver	458	852	1218	-	-	-		
Stage 1	842	-	-	-	-	-		
Stage 2	663	-	-	-	-	-		
Time blocked-Platoon, %	-	-	-	-	-	-		
Mov Capacity-1 Maneuver	455	852	1218	-	-	-		
Mov Capacity-2 Maneuver	455	-	-	-	-	-		
Stage 1	842	-	-	-	-	-		
Stage 2	659	-	-	-	-	-		
Approach								
	EB		NB		SB			
HCM Control Delay, s	13.9		0.1		0			
HCM LOS	B							
Minor Lane / Major Mvmt								
	NBL	NBT	EBLn1	SBT	SBR			
Capacity (veh/h)	1218	-	473	-	-			
HCM Lane VIC Ratio	0.005	-	0.144	-	-			
HCM Control Delay (s)	7.97	0	13.9	-	-			
HCM Lane LOS	A	A	B	-	-			
HCM 95 th %tile Q(veh)	0.014	-	0.5	-	-			
Notes								
~: Volume Exceeds Capacity; \$: Delay Exceeds 300 Seconds; Error: Computation Not Defined								
631550 Existing 2013AM.syn							Synchro 8 Report	
TRT							Page 1	

For All Way Stop Control intersections

7. Select **HCM 2010 AWSC** report
8. Choose either **Single Intersection** or **Entire Network**
9. Double check input data in the **Movement** section
 - a. Volume
 - b. Peak Hour Factor
 - c. Heavy Vehicles %

10. Review the **Intersection Results**
 - a. Intersection Delay
 - b. Intersection LOS

11. Review **Approach Results**
 - a. HCM Control Delay (s)
 - b. HCM LOS
12. Review **Lane Results**
 - a. HCM Lane VC Ratio
 - b. HCM Control Delay (s)
 - c. HCM Lane LOS
 - d. HCM 95th percentile queue (veh)

Notes:

- If the v/c ratio is of a lane is greater than one the LOS will be a F regardless of delay
- The LOS on the approach and intersection level is based solely on delay
- **Confirm** that the Queue Length does not exceed the provided storage length or back into the upstream intersection.
- Consider the delay and LOS for each movement not just the minor leg approach. The major left turns can impact the mainline through traffic.

HCM 2010 AWSC												Existing 2013 AM	
11: SR225 & SR 52 Alt												2013 AM	
Intersection													
Intersection Delay, s/veh	40.3												
Intersection LOS	E												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Vol, veh/h	15	105	100	130	160	20	260	145	145	15	160	10	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2	
Mvmt Flow	17	119	114	148	182	23	295	165	165	17	182	11	
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0	
Approach	EB			WB			NB			SB			
Opposing Approach	WB			EB			SB			NB			
Opposing Lanes	1			1			1			1			
Conflicting Approach Left	SB			NB			EB			WB			
Conflicting Lanes Left	1			1			1			1			
Conflicting Approach Right	NB			SB			WB			EB			
Conflicting Lanes Right	1			1			1			1			
HCM Control Delay	17.9			26.6			65			16.6			
HCM LOS	C			D			F			C			
Lane	NBLn1	EBLn1	WBLn1	SBLn1									
Vol Left, %	47%	7%	42%	8%									
Vol Thru, %	26%	48%	52%	86%									
Vol Right, %	26%	45%	6%	5%									
Sign Control	Stop	Stop	Stop	Stop									
Traffic Vol by Lane	550	220	310	185									
LT Vol	145	105	160	160									
Through Vol	145	100	20	10									
RT Vol	260	15	130	15									
Lane Flow Rate	625	250	352	210									
Geometry Grp	1	1	1	1									
Degree of Util (X)	1	0.511	0.714	0.444									
Departure Headway (Hd)	6.72	7.363	7.301	7.602									
Convergence, Y/N	Yes	Yes	Yes	Yes									
Cap	538	490	497	473									
Service Time	4.781	5.408	5.34	5.654									
HCM Lane V/C Ratio	1.162	0.51	0.708	0.444									
HCM Control Delay	65	17.9	26.6	16.6									
HCM Lane LOS	F	C	D	C									
HCM 95th-ile Q	14.1	2.9	5.7	2.2									
Notes													
~ : Volume Exceeds Capacity; \$: Delay Exceeds 300 Seconds; Error : Computation Not Defined													

For Signalized intersections

1. Select **HCM 2010 Signalized** report (select summary)
2. Choose either **Single Intersection** or **Entire Network**
3. Double check input data in **Movement** section
 - a. Lane Configurations
 - b. Volume
4. Review the lane and approach output in the **Movement** section
 - a. Lane Group Delay
 - b. Lane Group LOS
 - c. Approach Delay
 - d. Approach LOS
5. Review the **Intersection Summary**
 - a. HCM 2010 Control Delay
 - b. HCM 2010 LOS

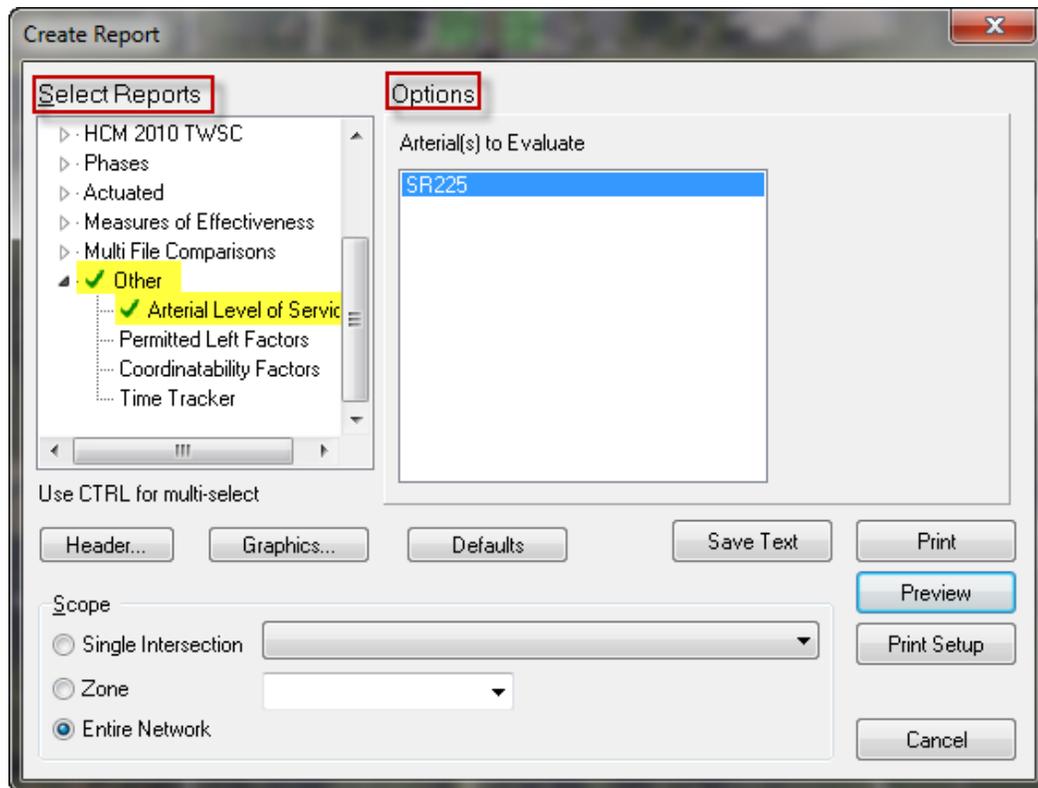
Notes:

- Consider the delay and LOS for each movement and not just the overall intersection. An overall “good” LOS/delay does not mean that the delay is well balanced.
- Check the Cycle Length to make sure it is not excessive (<180s)

HCM 2010 Signalized Intersection Summary											Existing 2013 AM	
14: SR225 & SR 52/SR76/SR 52/ SR 76											2013 AM	
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↕	↔	↔	↕	↕	↔	↕	↔	↔	↕	↕
Volume (veh/h)	120	430	20	35	755	70	20	120	60	105	130	205
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow(veh/hln)	186.3	186.3	190.0	186.3	186.3	190.0	190.0	186.3	186.3	190.0	186.3	186.3
Lanes	1	2	0	1	2	0	0	1	1	0	1	1
Cap. veh/h	213	1200	56	177	1074	100	82	314	507	104	92	507
Arrive On Green	0.12	0.34	0.34	0.10	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
Sat Flow, veh/h	1774	3530	166	1774	3357	313	0	982	1583	0	287	1583
Grp Volume(v), veh/h	136	258	254	40	476	462	159	0	68	267	0	233
Grp Sat Flow(s), veh/hln	1774	1863	1833	1774	1863	1808	982	0	1583	287	0	1583
Q Serve(g_s), s	3.7	5.3	5.3	1.0	11.7	11.7	0.0	0.0	1.5	0.0	0.0	5.9
Cycle Q Clear(q_c), s	3.7	5.3	5.3	1.0	11.7	11.7	16.0	0.0	1.5	16.0	0.0	5.9
Prop In Lane	1.00		0.09	1.00		0.17	0.14		1.00	0.45		1.00
Lane Grp Cap(c), veh/h	213	633	623	177	596	578	397	0	507	196	0	507
W/C Ratio(X)	0.64	0.41	0.41	0.23	0.80	0.80	0.40	0.00	0.13	1.36	0.00	0.46
Avail Cap(c_a), veh/h	213	633	623	177	596	578	397	0	507	196	0	507
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	21.0	12.6	12.6	20.7	15.5	15.5	13.2	0.0	12.1	18.1	0.0	13.6
Incr Delay (d2), s/veh	13.8	1.9	2.0	2.9	10.7	11.0	0.7	0.0	0.1	192.5	0.0	0.7
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	2.3	2.5	2.5	0.6	6.5	6.4	1.2	0.0	0.5	11.8	0.0	2.1
Lane Grp Delay (d), s/veh	34.8	14.6	14.6	23.6	26.2	26.5	13.9	0.0	12.2	210.6	0.0	14.2
Lane Grp LOS	C	B	B	C	C	C	B		B	F		B
Approach Vol, veh/h	648			978			227			500		
Approach Delay, s/veh	18.8			26.3			13.4			119.1		
Approach LOS	B			C			B			F		
Timer												
Assigned Phs	7	4		3	8			2				6
Phs Duration (G+Y+Rc), s	10.0	21.0		9.0	20.0			20.0				20.0
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0			4.0				4.0
Max Green Setting (Gmax), s	6.0	17.0		5.0	16.0			16.0				16.0
Max Q Clear Time (g_c+I1), s	5.7	7.3		3.0	13.7			18.0				18.0
Green Ext Time (p_c), s	0.0	6.0		0.0	1.8			0.0				0.0
Intersection Summary												
HCM 2010 Ctrl Delay	42.7											
HCM 2010 LOS	D											
Notes												

For Arterials:

1. Select **Other** > **Arterial Level of Service** from **Select Reports**
2. Select an arterial under **Options**



3. Review the Output

- a. Flow speed = free flow speed (speed limit)
- b. Running Time = the time it would take to drive the segment
- c. Signal Delay = the Synchro delay for the through lane group (will match control delay for the intersection)
- d. Travel Time = the running time plus the signal delay
- e. Arterial Speed = the distance divided by travel time
- f. Arterial LOS = based on speed and arterial class

Arterial Level of Service								
								1/23/2006
Arterial Level of Service: EB Main Street								
Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
1st St	II	40	10.9	30.2	41.1	0.09	8.8	F
2nd St	II	40	34.4	11.2	45.6	0.35	27.4	C
3rd St	II	40	29.3	75.2	104.5	0.27	9.2	F
4th St	II	40	28.0	15.0	44.0	0.25	20.8	D
5th St	II	40	16.2	8.9	25.1	0.14	20.2	D
6th St	II	40	16.2	21.2	37.4	0.14	13.6	E
Total	II		135.0	162.7	297.7	1.25	15.1	E
Arterial Level of Service: WB Main Street								
Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
6th St	II	40	17.5	23.2	40.7	0.15	13.4	E
5th St	II	40	16.2	5.0	22.2	0.14	22.9	C
4th St	II	40	16.2	10.7	26.9	0.14	18.9	D
3rd St	II	40	28.0	45.6	74.6	0.25	12.3	F
2nd St	II	40	29.3	12.8	41.9	0.27	22.9	C
1st St	II	40	34.4	8.0	42.4	0.35	29.5	B
Total	II		141.6	107.1	248.7	1.30	18.9	D

Notes:

- The arterial LOS report is based on information in the HCM 2000.
- Only works with signalized arterials. The arterial can contain stop controls but will not work with arterials that do not contain signals. Works best with arterials that begin and end with signals.
- Focus on the Arterial Speed and the Travel Time as indicators of how the arterial is operating.