



# Synchro Studio

*Getting Started and What's New in Version 12*

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# Chapter 1 – Introduction

Welcome to Version 12, the latest release of the **Synchro Studio** software applications. CUBIC Transportation Systems software suite is a complete solution for analysis, optimization and simulation of roadway networks. Using Synchro Studio, traffic professionals can easily analyze capacity and timing optimization as well as simulate, check and fine-tune traffic signal operations.

## License Options

Trafficware offers the following purchase options.

- Synchro Studio 12 (Synchro, SimTraffic, 3D Viewer)
- Synchro/SimTraffic 12
- Synchro/SimTraffic 12 Light
- 3D Viewer 12

The **Getting Started Guide** and **Synchro Studio 12 User Guide** together provide information on the full product line. Depending on your license level, you may not have access to the full features of the Studio Suite 11. Contact Trafficware for details on licensing or visit <http://www.trafficware.com/synchro-store.html>.

## Reader Versions

Upon successfully downloading and installing the software, users have the option to use a read-only version of those applications that were not purchased. The following section highlights each of the software applications.

### Synchro

The Reader version can be used to preview data and perform limited functions within the software. Managers often use this mode to review the work of their co-workers, or agencies to review the work of their consultants. Report creation is not available, and files may not be edited or saved.

### SimTraffic

The Reader version can be used to playback prerecorded history files. This allows unlicensed users to view animation files. If you would like to share a SimTraffic animation with a colleague or run an animation on a laptop, install and use Synchro and SimTraffic in the Reader mode. The Reader can view the animations but not make changes. You will need the following files to run a prerecorded SimTraffic animation:

1. The Synchro Data file (SYN)
2. The SimTraffic Parameters file (SIM)
3. The History file (HST)
4. Timing or volume data files, if data access is used.
5. The Synchro/SimTraffic download file (setup.exe).

The Reader Version of the software must be the same version number as was used to record the .hst file(s). Check installation version within the software by selecting Help>About Synchro/SimTraffic.

## Chapter 2 – Operating System and Software Prerequisites

Synchro requires a few software prerequisites to operate. This section highlights these requirements.

### Basic Requirements

This section summarizes a few requirements related to the computer 's set-up that should be reviewed prior to installing Synchro 11.

- Ensure **Admin Rights** have been allowed at the user level
- Hard drive cannot be compressed or encrypted
- Itanium drives are not supported

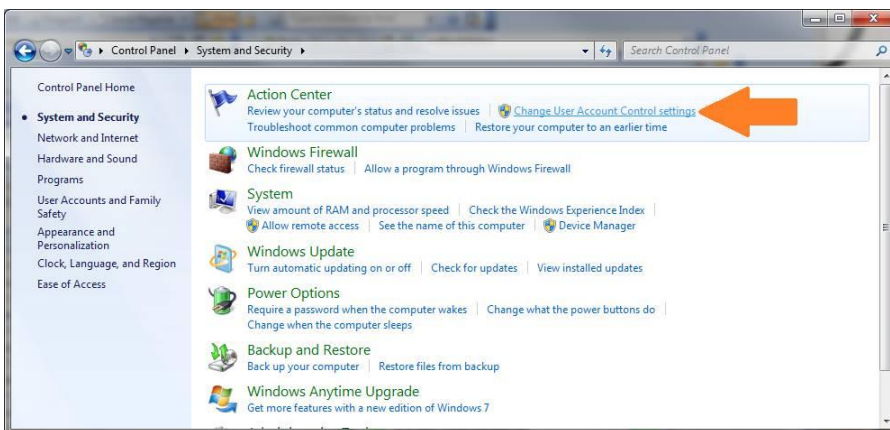
### Windows 7/8/10 Prerequisites

If you have a computer running **Windows 7, 8, or 10** operating system, please modify the UAC settings prior to installation. After installation, the UAC settings can be reverted back if desired.

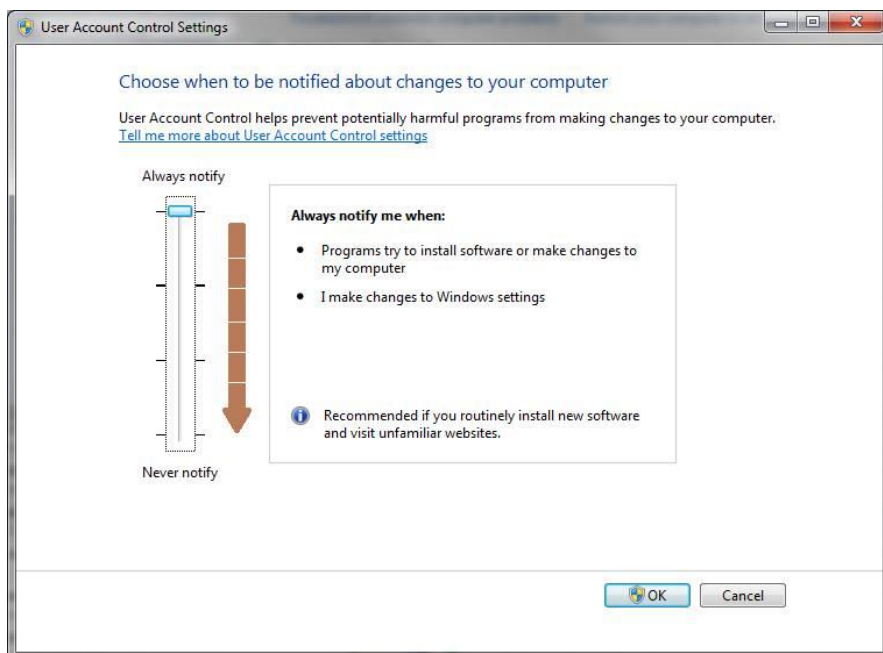
1. Go to Control Panel.
2. Select the “System and Security Icon”



3. Select the “Change User Account Control Settings” from the Action Center (or Security and Maintenance, in Windows 10).



4. Pull down the scroll bar to the bottom.



5. Click OK to close the User Account Control Settings window.
6. REBOOT to have changes to security take effect.
7. Install and Activate as directed.
8. Once installation and activation have been completed, return to the Control Panel and set your security to the highest setting, if so desired.
9. REBOOT to have changes to security take effect.

## Chapter 3 – Installing Synchro Studio 12

This section guides you through the installation process for Synchro Studio 12.



If this is an upgrade, make sure that the Synchro Studio version 11 software is installed prior to installing version 12. Please refer to the previous section regarding the UAC settings before completing the following steps.

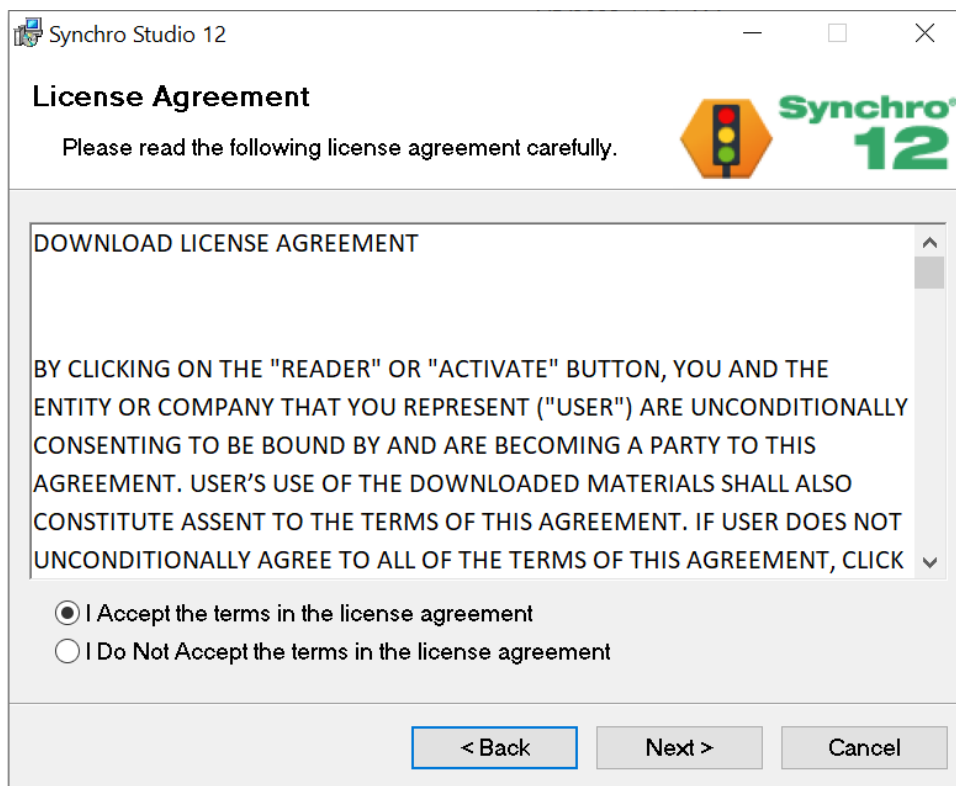
Synchro 12 can be downloaded by this link, [online.trafficware.com/downloads](https://online.trafficware.com/downloads).

The Installation Wizard will guide you through the installation process (after you download the setup file). It is recommended that you close all other applications before starting installation. Press [Next] to begin.



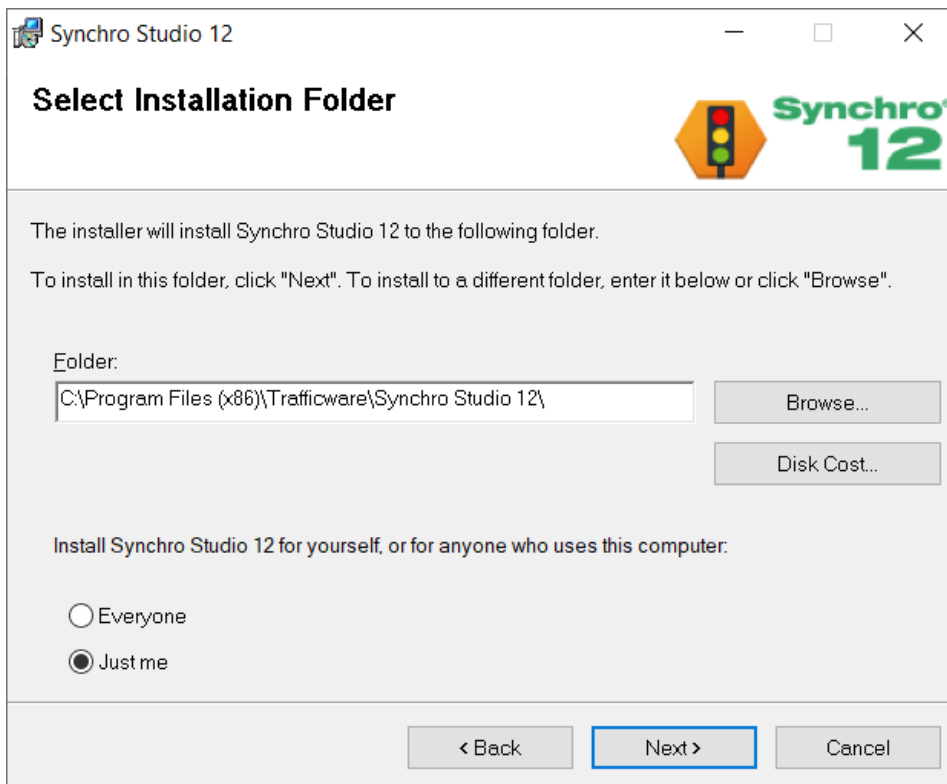


1. Read the license agreement carefully.

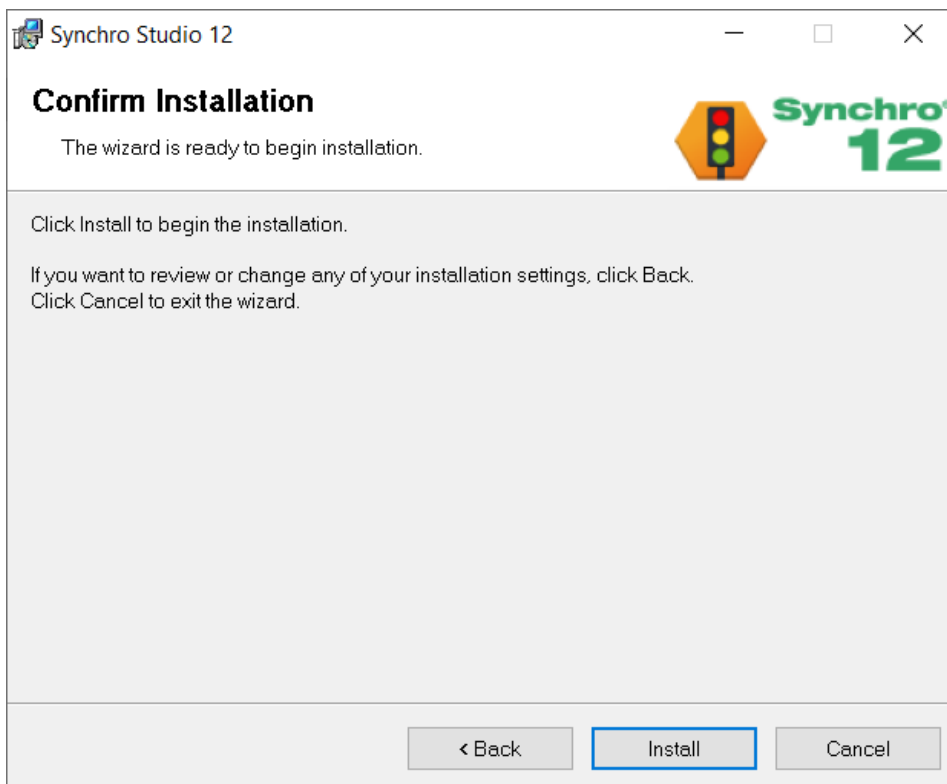


Select the [I accept] button to accept the terms of the license agreement and proceed with the installation. You must accept the license agreement to install Synchro Studio 12 and Press [Next].

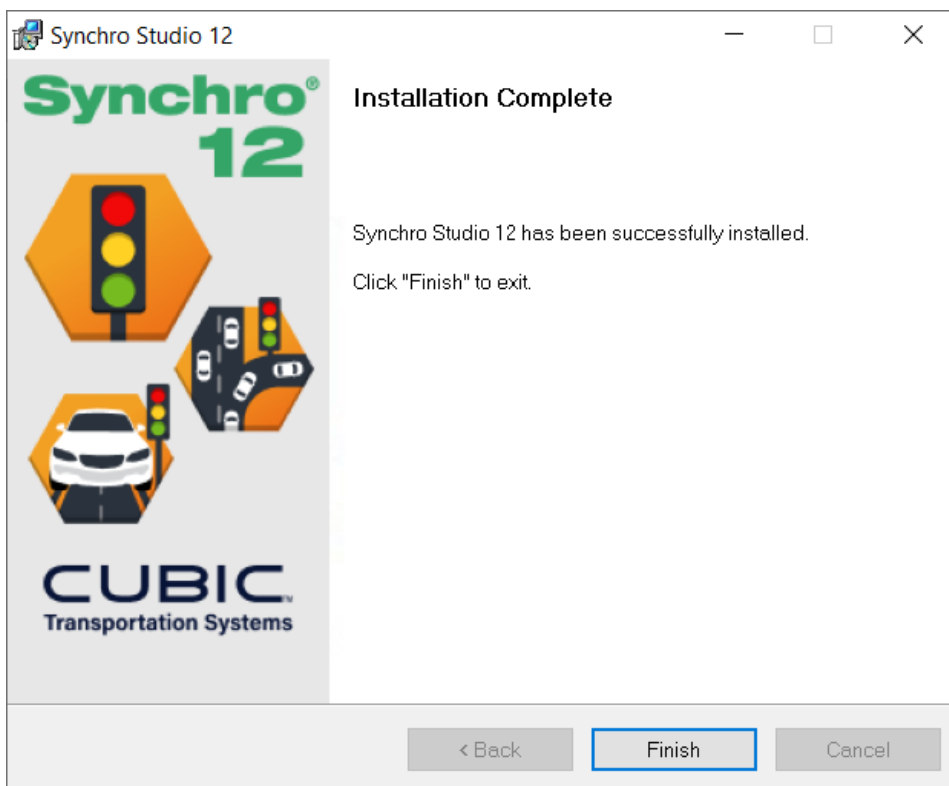
2. Choose the destination folder and Press [Next].



3. Click [Install] to begin the installation.



4. When the installation is complete, select the [Finish] button to exit the Installation Wizard.

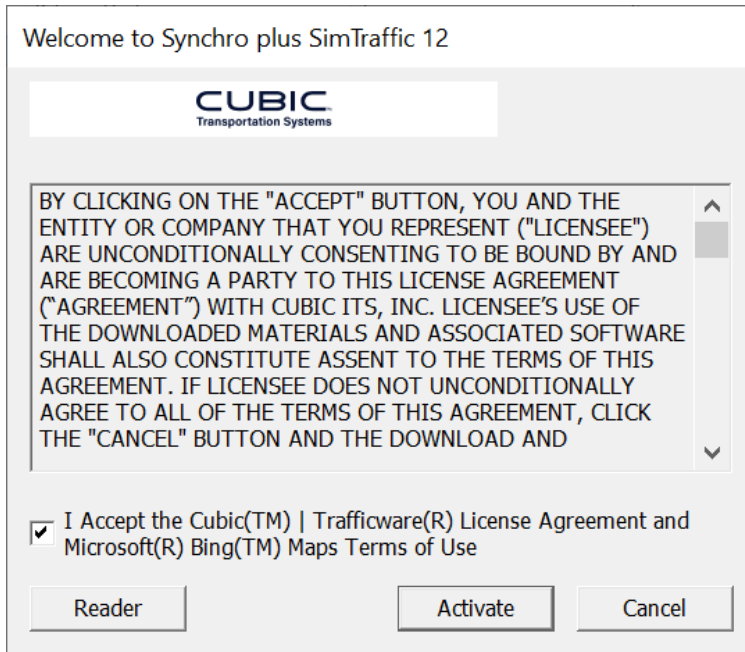


## To Activate Synchro Studio 12



When you activate Synchro Studio 12, activate under the user's profile on the laptop/PC. Log on to the laptop/PC as the User Profile of the individual that will be using Synchro Studio 12.

1. Select the Start Menu, then choose Programs→Trafficware→Synchro 12 (3D Viewer 12) or double click on the shortcut from your desktop.
2. Read the license agreement carefully.



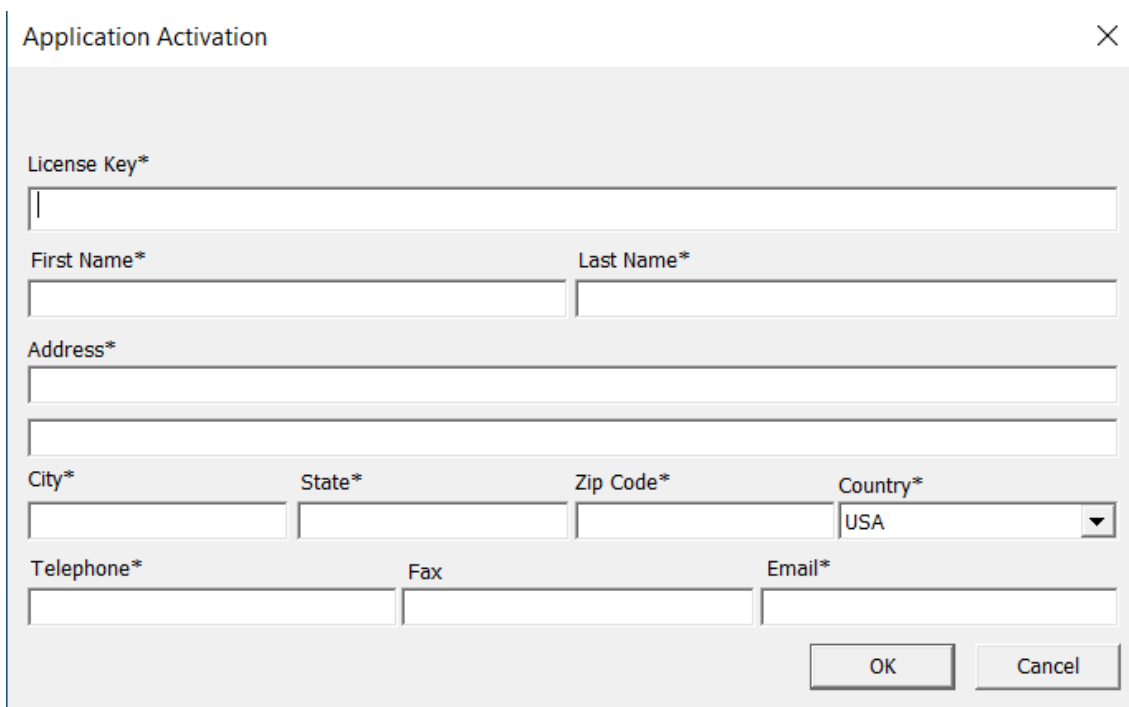
Check the 'I Accept the Trafficware® License Agreement and Microsoft ® Bing™ Maps Terms of Use' box to proceed.

Select [Activate] to proceed with the activation. Press [Reader] if you want to use the reader version. The reader version will allow you to try out the features by viewing the sample files. The sample files are located in the directory where you have installed Synchro Studio 11. You will not be able to create your own network if activated in reader mode.

3. The first-time using Synchro (3D Viewer), you will be asked to activate your software. Enter the requested information within the Application Activation dialog box shown below.



The information entered in the Application Activation dialog is used to setup the profile for online support with Cubic | Trafficware. Be sure to enter the information for the individual that will be using the software.

The 'Application Activation' dialog box contains several input fields. At the top is a 'License Key\*' field. Below it are 'First Name\*' and 'Last Name\*' fields. Then is an 'Address\*' field. Below that are 'City\*', 'State\*', 'Zip Code\*', and 'Country\*' (a dropdown menu currently showing 'USA'). At the bottom are 'Telephone\*', 'Fax', and 'Email\*' fields. 'OK' and 'Cancel' buttons are at the bottom right.

The License Key is provided by Trafficware and will be shown on your license certificate and will be emailed to you. The License Key is in the format (Serial Number / Company Name - Product Key).

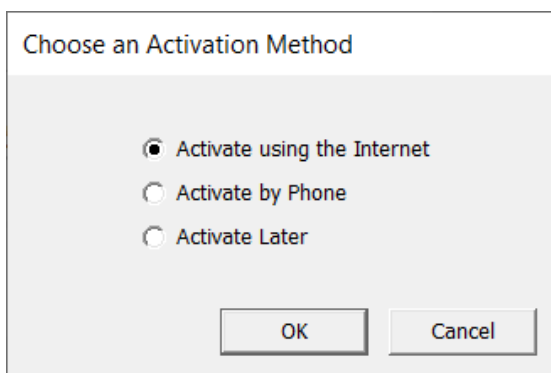


To ensure accurate entry into the Application Activation dialog, copy the entire string from your email message and paste into the License Key box.

The entries with the asterisk (\*) are required to activate the software.

After entering the necessary information, select [OK].

4. The next dialog gives you two options to activate and an option to activate later.

The 'Choose an Activation Method' dialog box has three radio button options: 'Activate using the Internet' (selected), 'Activate by Phone', and 'Activate Later'. 'OK' and 'Cancel' buttons are at the bottom.

'Activate using the Internet' is the preferred method for activating your software. Choose this option and select [OK] to automatically and quickly activate your software. Use the 'Activate Later' option to work with Synchro Studio.



The grace period is forty-five days from the date of your order. When activating via the internet, a message may appear indicating that the invoice has not been paid.

If you do not have an internet connection, use the 'Activate by Phone' option and press [OK]. Follow the instructions on the Phone Activation dialog. Before calling, make sure the invoice has been paid and have your license key

available. Trafficware staff will ask for the Machine Key listed in the Phone Activation dialog. With this information, an Activation Code will be provided.

## To Deactivate Synchro Studio 12

A Synchro license is activated to one user. You can de-activate on your primary user and move to another user.

1. Select the Start Menu, then choose Programs→Trafficware→Synchro 12 (3D Viewer) or double-click on the shortcut from your desktop.
2. From Synchro, choose Help→License Key.
3. Make a copy of your full License Key.
4. Choose the [Deactivate] button and write down the Deactivation Code.
5. Call CUBIC Transportation Systems (281) 240-7233, option 1 during business hours with the Deactivation Code. Or email the code to [TrafficwareSales@cubic.com](mailto:TrafficwareSales@cubic.com).



**BE CAREFUL**, this will deactivate your software on your machine. Once deactivated, you will need to contact CUBIC Transportation Systems to reactivate on your laptop or PC. Please be sure to time this during normal business hours of 8:30am-4:00pm (CST) M-F.

## To View Sample Files

Synchro Studio comes with sample files so that you can see how street networks are modeled. To view the sample files:

1. From Synchro, choose the **File→Open→Sample Files** command.
2. Select a file from the list.
3. Review the “Synchro Studio 12 Examples.pdf” document (installed in the Trafficware directory) to see how these files were created.

## List of Sample Files

The sample files are located in the directory: C:\Users\Public\Documents\Trafficware\Synchro Studio 12\Sample Files. The table below is a listing of the files with a brief description.

| Sample File Name              | Description  |
|-------------------------------|--|
| <b>Scenario Manager Demo</b>  | Coding elements for Scenario Manager   |
| <b>HCM_AWSC_Example</b>       | Coding elements for an All-Way Stop Control T-Intersection.  |
| <b>HCM_TWSC_Example</b>       | Coding elements for a Two-Way Stop Control intersection with flared approaches and median storage. |
| <b>HCM_TWSC Ped_ Example</b>  | Coding elements for a Two-Way-Stop-Control intersection with pedestrian analysis.                  |
| <b>Single Lane Roundabout</b> | Coding elements for single lane roundabout with bypass lanes                                       |

| Sample File Name                | Description   |
|---------------------------------|---|
| Dual Lane Roundabout            | Coding elements for dual lane roundabout without bypass lanes   |
| 99 diverging diamond3           | Diverging Diamond Interchange (DDI), also known as a Double Crossover Diamond Interchange<br><a href="http://www.fhwa.dot.gov/publications/research/safety/09054/index.cfm">www.fhwa.dot.gov/publications/research/safety/09054/index.cfm</a>                 |
| DLT Step 4 Signal Timing        | Displaced Left Turn Intersection (DLT), also known as Continuous Flow Intersection (CFI), using all four quadrants<br><a href="https://www.fhwa.dot.gov/publications/research/safety/09055/">https://www.fhwa.dot.gov/publications/research/safety/09055/</a> |
| Leading Peds                    | The EBR and WBR have a Hold phase 5, used to mimic a leading pedestrian interval  |
| Super Street, Signalized        | Example of a Super Street signalized network<br><a href="http://www.fhwa.dot.gov/publications/research/safety/04091/10.cfm#c1025">www.fhwa.dot.gov/publications/research/safety/04091/10.cfm#c1025</a>  |
| Tucson concurrent lagging lefts | Example of concurrent lagging lefts as used in Tucson, AZ   |
| 2 Inter One Controller          | Coding for grouping two intersections using one controller  |
| 6 Leg Intersection              | Example of a multiple approach intersection   |
| Basic 2P w Porkchops            | Example illustrating channelized islands  |
| Basic 2-Phase                   | Simple 4-leg intersection with basic 2-phase operation.   |
| Demo3D                          | Includes vehicle mix, buildings, etc.   |
| Diamond – Leading Alt           | A diamond interchange coding example (also known as a Texas Diamond operation)  |
| Diamond Lag Lag                 | A diamond intersection with lagging left-turns at both intersections  |
| Diamond w Front Roads           | A diamond intersection where the ramps merge onto a frontage road   |
| Dual ring                       | Example using standard NEMA phasing   |

| Sample File Name                    | Description  |
|-------------------------------------|--|
| <b>Fixed Cycle Coordination</b>     | Two coordinated arterial roadways  |
| <b>Continuous Green T no peds</b>   | Example of an intersection with a free through movement (EBT)<br><a href="http://safety.fhwa.dot.gov/intersection/innovative/others/casestudies/fhwasa09016/fhwasa09016.pdf">http://safety.fhwa.dot.gov/intersection/innovative/others/casestudies/fhwasa09016/fhwasa09016.pdf</a> |
| <b>Continuous Green T with peds</b> | Same as the above example but includes a pedestrian phase  |
| <b>Gate_Stop on Yellow</b>          | An example of a gate or a meter  |
| <b>Group Control 2</b>              | Complex coding for grouping two intersections using one controller   |
| <b>Median UTurn</b>                 | An example of a Median U-Turn (MUT) intersection, also known as a Michigan Left intersection   |
| <b>Roundabouts (for SimTraffic)</b> | An example with two roundabouts  |
| <b>Single Point</b>                 | An example of a single point urban interchange (SPUI)  |
| <b>Single Ring</b>                  | Example showing coding with one ring (instead of dual ring)  |
| <b>Spillback blocking</b>           | Example that shows the queue delay (Spillback) between adjacent intersections  |
| <b>Starvation</b>                   | Example that show the queue delay (Starvation) between adjacent intersections.   |
| <b>Two way traffic control</b>      | Example that illustrates a one-lane bridge   |



## Chapter 4 - What's New in Synchro and SimTraffic

This section summarizes the changes between Synchro version 11 and version 12. It is recommended that you review this section if you are a user of previous versions of Synchro.

### Enhanced Scenario Manager

Synchro 12 introduces enhanced Scenario Manager which allows user to have different geometry per scenario. Enhanced Scenario Manager allows saving multiple scenarios with different geometries, volumes & timings to a single Synchro file to efficiently manage multiple scenarios.

Enhanced Scenario Manager allows user to:

- **Save multiple scenarios to a single Synchro file:** With Scenario Manager, you can save multiple scenarios in single Synchro file which allows you to reduce the number of Synchro files needed for same network.
- **Change the timing plan for each scenario separately:** Scenario manager provides the option to change the timing plan for each scenario individually.
- **Change the volumes for each scenario separately:** Scenario manager allows you to have different volumes for each scenario
- **Change the geometries for each scenario separately:** Scenario manager allows you to have different network geometries for each scenario.

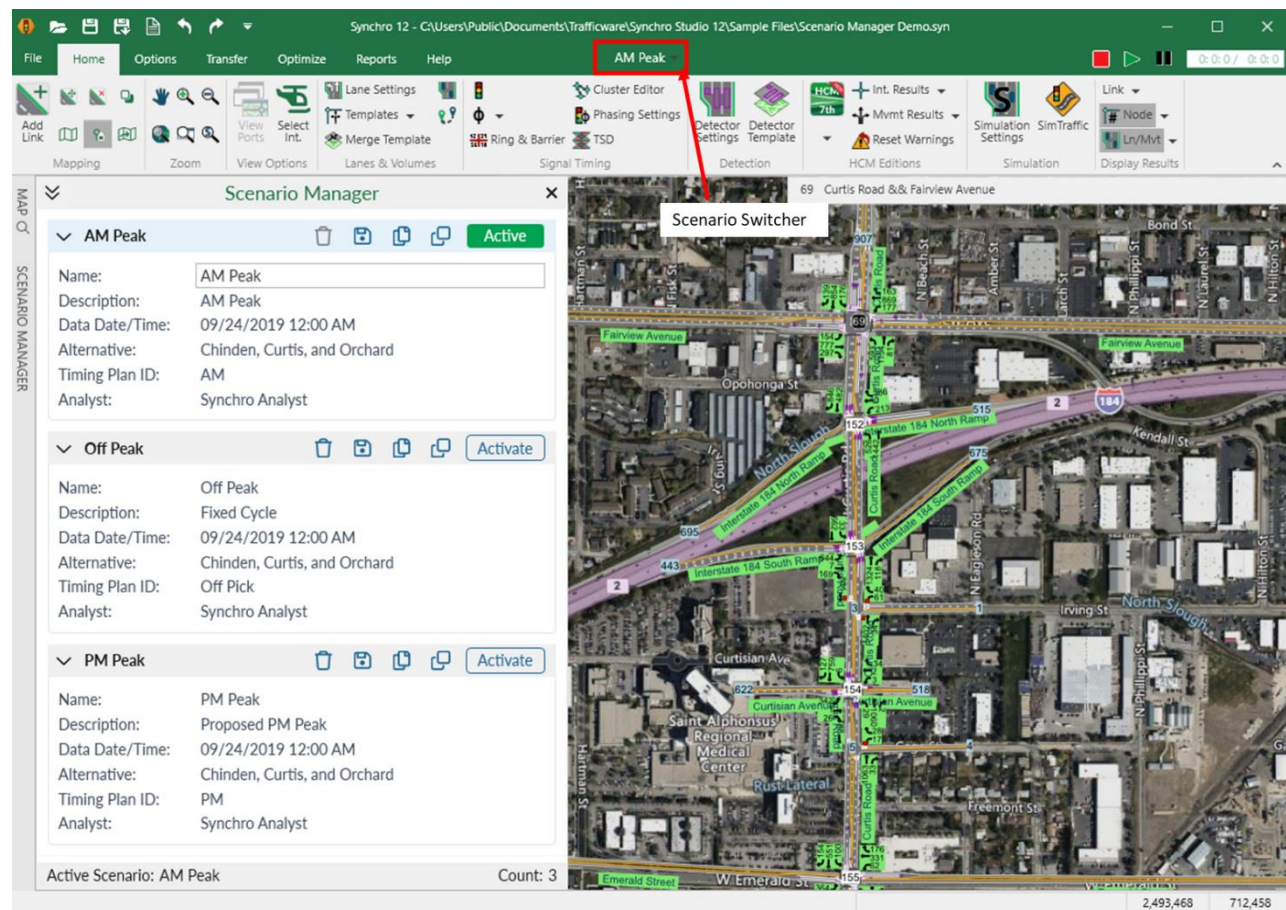


Figure 1 Synchro 12 Scenario Manager Window

## HCM 7th Edition

The organization of the HCM 7<sup>th</sup> Edition is similar to that of the HCM 6<sup>th</sup> Edition. The manual is organized into four major volumes, including an electronic-only Volume 4 that houses the supplemental chapters, example problems, a technical reference library, and various computational engines developed for several of the more complex procedures.

This document provides a high level overview of the HCM 7<sup>th</sup> Edition in Synchro 12. Additional details can be found in the the Synchro Studio 12 User Guide.

As with any operational analysis methods, there will always be a set of limitations that surround the use of the various methodologies. Most of the limitations set forth by TRB for the HCM 7<sup>th</sup> Edition are similar to those of the HCM 6<sup>th</sup> Edition.

Synchro 12 currently supports the signalized intersection, all-way stop control (AWSC), two-way stop control (TWSC), and the roundabout methods. The table below depicts a summary of the various HCM 6<sup>th</sup> Edition analysis methods and which methods have been incorporated within Synchro 12.

| HCM 7 <sup>th</sup> Edition | Description                           | Modes in HCM 7 <sup>th</sup> Edition | Modes Within Synchro 12 |                |             |             |
|-----------------------------|---------------------------------------|--------------------------------------|-------------------------|----------------|-------------|-------------|
|                             |                                       |                                      | Auto (A)                | Pedestrian (P) | Bicycle (B) | Transit (T) |
| Chapter 19                  | Signalized Intersections              | A, P, B                              | ✓                       | ✓              | ✓           | na          |
| Chapter 20                  | Two-Way Stop-Controlled Intersections | A, P                                 | ✓                       | ✓              | na          | na          |
| Chapter 21                  | All-Way Stop-Controlled Intersections | A                                    | ✓                       | na             | na          | na          |
| Chapter 22                  | Roundabouts                           | A                                    | ✓                       | na             | na          | na          |

- Notes:**
1. A = Auto, P = Pedestrian, B = Bicycle, T = Transit
  2. na = not applicable. HCM 7<sup>th</sup> Edition does not support a method at this time.
  3. ✓ = HCM 7<sup>th</sup> Edition Method included in Synchro.
  4. Coordination between intersections is based on the methods described in Chapter 18.



HCM 7<sup>th</sup> Edition functionality in Synchro 12 operates similar to the HCM 6<sup>th</sup> implementation. To view the HCM 7<sup>th</sup> Edition results for an intersection, select the HCM Editions button shown to the left, located on the Home tab of the ribbon bar. The Intersection Results and Movement Results buttons can be used to display HCM 7<sup>th</sup> Edition delay, LOS, and v/c ratio on the Map View.

## Signalized Intersections

Similar to HCM 6<sup>th</sup> Edition, the HCM 7<sup>th</sup> Edition Settings pane includes three expandable sections: Signal Timing Details, Adjusted Flow Rate, and Ideal Saturated Flow. The most commonly used parameters are viewable with all sections collapsed, with additional details about the intersection available by expanding one or more of these section(s). This functionality is demonstrated in Figure below.

| HCM 7th Settings               | EBL                      | EBT                                 | EBR                                 | HCM 7th Settings                     | EBL  | EBT  | EBR  |
|--------------------------------|--------------------------|-------------------------------------|-------------------------------------|--------------------------------------|------|------|------|
| Lanes and Sharing (#RL)        |                          |                                     |                                     | Signal Timing Details                |      |      |      |
| Traffic Volume (vph)           | 154                      | 777                                 | 297                                 | • Passage Time (s)                   | 3.0  | 3.0  | 3.0  |
| Future Volume (vph)            | 154                      | 777                                 | 297                                 | • Minimum Green (s)                  | 4.0  | 4.0  | 4.0  |
| Turn Type                      | Prot                     | —                                   | Perm                                | • Maximum Split (s)                  | 11.0 | 44.0 | 44.0 |
| Protected Phases               | 1                        |                                     |                                     | • Maximum Green (s)                  | 6.0  | 39.0 | 39.0 |
| Permitted Phases               |                          |                                     | 6                                   | • Yellow Time (s)                    | 4.0  | 4.0  | 4.0  |
| Lagging Phase?                 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | • All-Red Time (s)                   | 1.0  | 1.0  | 1.0  |
| Opposing right-turn influence  | —                        | —                                   | —                                   | • Lost Time Adjust (s)               | 0.0  | 0.0  | 0.0  |
| > Signal Timing Details        |                          |                                     |                                     | • Startup Lost Time (s)              | 2.0  | 2.0  | 2.0  |
| Recall Mode                    | None                     | Max                                 | Max                                 | • Extension of Effect.Green Time (s) | 2.0  | 2.0  | 2.0  |
| > Adjusted Flow Rate (veh/h)   | 157                      | 793                                 | 303                                 | • Walk Time (s)                      | —    | 5.0  | 5.0  |
| Adjusted No of Lanes           | 2                        | 2                                   | 1                                   | • Flash Dont Walk (s)                | —    | 11.0 | 11.0 |
| Pedestrian volume (p/h)        | —                        | —                                   | 7                                   | • Walk+ ped. clear (s)               | —    | 16.0 | 16.0 |
| Bicycle volume (bicycles/h)    | —                        | —                                   | 0                                   | Recall Mode                          | None | Max  | Max  |
| Right Turn on Red Volume (vph) | —                        | —                                   | 0                                   | > Adjusted Flow Rate (veh/h)         | 157  | 793  | 303  |
| > Ideal Satd. Flow (vphpl)     | 1850                     | 1850                                | 1850                                | • Peak Hour Factor                   | 0.98 | 0.98 | 0.98 |
| Work zone on approach?         | —                        | <input type="checkbox"/>            | —                                   | • Growth Factor                      | 1.00 | 1.00 | 1.00 |
| Total Approach Width           | —                        | —                                   | —                                   | Adjusted No of Lanes                 | 2    | 2    | 1    |
| Lanes open during work zone    | —                        | —                                   | —                                   | Pedestrian volume (p/h)              | —    | —    | 7    |
| HCM Platoon Ratio              | 1.00                     | 1.00                                | 1.00                                | Bicycle volume (bicycles/h)          | —    | —    | 0    |
| HCM Upstream Filtering Factor  | 1.00                     | 1.00                                | 1.00                                | Right Turn on Red Volume (vph)       | —    | —    | 0    |
| Initial Queue (veh)            | 0                        | 0                                   | 0                                   | > Ideal Satd. Flow (vphpl)           | 1850 | 1850 | 1850 |
| Include Unsignalized Delay?    | —                        | —                                   | —                                   | • CAV Base Sat Flow (vphpl)          | —    | —    | —    |
| Unsig. Movement Delay (s/veh)  | —                        | —                                   | —                                   | • Percent Heavy Vehicles (%)         | 2    | 2    | 2    |
| Right Turn Channelized         | —                        | —                                   | None                                | • Lane Utilization Adj. Factor       | 0.97 | 0.95 | —    |

**Figure 2 HCM 7th Edition Signalized Intersection Window**

There are a few changes and additions to the automobile methodologies found in Chapters 19 and 31 for signalized intersections, but the overall analysis methodologies remain similar to those in HCM 6<sup>th</sup> Edition. The major changes as compared with the HCM 6<sup>th</sup> Edition includes introducing proportion of Connected Automated Vehicles (CAVs) in the traffic stream, which impacts:

- Base saturation flow rates for through movements.
- Lane width adjustment factor for through movements.
- Saturation flow adjustment factors protected & permitted left turns.

| HCM 7th Intersection                 |                          | HCM 7th Settings                    |                                     |                                     |                                     |                                     |                                     |                          |                                     |                          |                          |                                     |                          |
|--------------------------------------|--------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|--------------------------|-------------------------------------|--------------------------|--------------------------|-------------------------------------|--------------------------|
|                                      |                          | EBL                                 | EBT                                 | EBR                                 | WBL                                 | WBT                                 | WBR                                 | NBL                      | NBT                                 | NBR                      | SBL                      | SBT                                 | SBR                      |
| Node #                               | 7                        |                                     |                                     |                                     |                                     |                                     |                                     |                          |                                     |                          |                          |                                     |                          |
| Description                          |                          |                                     |                                     |                                     |                                     |                                     |                                     |                          |                                     |                          |                          |                                     |                          |
| Control Type                         | Actd-Unctrl              |                                     |                                     |                                     |                                     |                                     |                                     |                          |                                     |                          |                          |                                     |                          |
| Cycle Length (s)                     | 117.0                    |                                     |                                     |                                     |                                     |                                     |                                     |                          |                                     |                          |                          |                                     |                          |
| Lock Timings                         | <input type="checkbox"/> |                                     |                                     |                                     |                                     |                                     |                                     |                          |                                     |                          |                          |                                     |                          |
| HCM Equilibrium Cycle(s)             | 106.8                    |                                     |                                     |                                     |                                     |                                     |                                     |                          |                                     |                          |                          |                                     |                          |
| HCM Control Delay (s/veh)            | 53.7                     |                                     |                                     |                                     |                                     |                                     |                                     |                          |                                     |                          |                          |                                     |                          |
| HCM Intersection LOS                 | D                        |                                     |                                     |                                     |                                     |                                     |                                     |                          |                                     |                          |                          |                                     |                          |
| Analysis Time Period (h)             | 0.25                     |                                     |                                     |                                     |                                     |                                     |                                     |                          |                                     |                          |                          |                                     |                          |
| Saturation Flow Rate (pc/h/ln)       | —                        |                                     |                                     |                                     |                                     |                                     |                                     |                          |                                     |                          |                          |                                     |                          |
| Use Saturation Flow Rate             | <input type="checkbox"/> |                                     |                                     |                                     |                                     |                                     |                                     |                          |                                     |                          |                          |                                     |                          |
| Proportion of CAVs (%)               | 15                       |                                     |                                     |                                     |                                     |                                     |                                     |                          |                                     |                          |                          |                                     |                          |
| Sneakers Per Cycle (veh)             | 2.0                      |                                     |                                     |                                     |                                     |                                     |                                     |                          |                                     |                          |                          |                                     |                          |
| Stored Passenger Car Length (ft)     | 25                       |                                     |                                     |                                     |                                     |                                     |                                     |                          |                                     |                          |                          |                                     |                          |
| Stored Heavy Vehicle Length (ft)     | 45                       |                                     |                                     |                                     |                                     |                                     |                                     |                          |                                     |                          |                          |                                     |                          |
| Number of Calc. Iterations           | 35                       |                                     |                                     |                                     |                                     |                                     |                                     |                          |                                     |                          |                          |                                     |                          |
| Deceleration Rate (ft/s/s)           | 4.00                     |                                     |                                     |                                     |                                     |                                     |                                     |                          |                                     |                          |                          |                                     |                          |
| Acceleration Rate (ft/s/s)           | 3.50                     |                                     |                                     |                                     |                                     |                                     |                                     |                          |                                     |                          |                          |                                     |                          |
| Distance Between Stored Cars (ft)    | 8.00                     |                                     |                                     |                                     |                                     |                                     |                                     |                          |                                     |                          |                          |                                     |                          |
| Probability Peds. Pushing Button     | 1.00                     |                                     |                                     |                                     |                                     |                                     |                                     |                          |                                     |                          |                          |                                     |                          |
| Queue Length Percentile              | 50                       |                                     |                                     |                                     |                                     |                                     |                                     |                          |                                     |                          |                          |                                     |                          |
| Left-Turn Equivalency Factor         | 1.05                     |                                     |                                     |                                     |                                     |                                     |                                     |                          |                                     |                          |                          |                                     |                          |
| Right-Turn Equivalency Factor        | 1.18                     |                                     |                                     |                                     |                                     |                                     |                                     |                          |                                     |                          |                          |                                     |                          |
| Heavy Veh Equivalency Factor         | 2.00                     |                                     |                                     |                                     |                                     |                                     |                                     |                          |                                     |                          |                          |                                     |                          |
| Critical Gap for Perm. Left Turn (s) | 4.5                      |                                     |                                     |                                     |                                     |                                     |                                     |                          |                                     |                          |                          |                                     |                          |
| Follow-up Time Perm Excl Left (s)    | 2.5                      |                                     |                                     |                                     |                                     |                                     |                                     |                          |                                     |                          |                          |                                     |                          |
| Stop Threshold Speed (mph)           | 5.0                      |                                     |                                     |                                     |                                     |                                     |                                     |                          |                                     |                          |                          |                                     |                          |
| Lanes and Sharing (#RL)              |                          | 1                                   | 1                                   | 1                                   | 1                                   | 1                                   | 1                                   | 1                        | 1                                   | 1                        | 1                        | 1                                   | 1                        |
| Traffic Volume (vph)                 |                          | 71                                  | 318                                 | 106                                 | 118                                 | 600                                 | 24                                  | 133                      | 1644                                | 111                      | 194                      | 933                                 | 111                      |
| Future Volume (vph)                  |                          | 71                                  | 318                                 | 106                                 | 118                                 | 600                                 | 24                                  | 133                      | 1644                                | 111                      | 194                      | 933                                 | 111                      |
| Turn Type                            |                          | Perm                                | —                                   | —                                   | Perm                                | —                                   | —                                   | Prot                     | —                                   | —                        | Prot                     | —                                   | —                        |
| Protected Phases                     |                          | —                                   | 2                                   | —                                   | —                                   | 6                                   | —                                   | 3                        | 8                                   | —                        | 7                        | 4                                   | —                        |
| Permitted Phases                     |                          | 2                                   | —                                   | —                                   | 6                                   | —                                   | —                                   | —                        | —                                   | —                        | —                        | —                                   | —                        |
| Lagging Phase?                       |                          | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | —                                   | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | —                                   | <input type="checkbox"/> | <input checked="" type="checkbox"/> | —                        | <input type="checkbox"/> | <input checked="" type="checkbox"/> | —                        |
| Opposing right-turn influence        |                          | Yes                                 | —                                   | —                                   | Yes                                 | —                                   | —                                   | —                        | —                                   | —                        | —                        | —                                   | —                        |
| Signal Timing Details                |                          |                                     |                                     |                                     |                                     |                                     |                                     |                          |                                     |                          |                          |                                     |                          |
| Recall Mode                          |                          | None                                | None                                | —                                   | None                                | None                                | —                                   | None                     | None                                | —                        | None                     | None                                | —                        |
| Adjusted Flow Rate (veh/h)           |                          | 71                                  | 318                                 | 106                                 | 118                                 | 600                                 | 24                                  | 133                      | 1644                                | 111                      | 194                      | 933                                 | 111                      |
| Adjusted No. of Lanes                |                          | 1                                   | 2                                   | 0                                   | 1                                   | 2                                   | 0                                   | 1                        | 2                                   | 0                        | 1                        | 2                                   | 0                        |
| Pedestrian volume (p/h)              |                          | —                                   | —                                   | 120                                 | —                                   | —                                   | 120                                 | —                        | —                                   | 40                       | —                        | —                                   | 40                       |
| Bicycle volume (bicycles/h)          |                          | —                                   | —                                   | 0                                   | —                                   | —                                   | 0                                   | —                        | —                                   | 0                        | —                        | —                                   | 0                        |
| Right Turn on Red Volume (vph)       |                          | —                                   | —                                   | 0                                   | —                                   | —                                   | 0                                   | —                        | —                                   | 0                        | —                        | —                                   | 0                        |
| Ideal Satd. Flow (vphpl)             |                          | 1900                                | —                                   | —                                   | 1900                                | —                                   | —                                   | 1900                     | —                                   | —                        | 1900                     | —                                   | —                        |
| CAV Base Sat Flow (vphpl)            |                          | —                                   | 1975                                | 1975                                | —                                   | 1975                                | 1975                                | —                        | 1975                                | 1975                     | —                        | 1975                                | 1975                     |
| Percent Heavy Vehicles (%)           |                          | 5                                   | 5                                   | 0                                   | 5                                   | 5                                   | 0                                   | 2                        | 2                                   | 0                        | 2                        | 2                                   | 0                        |
| Lane Utilization Adj. Factor         |                          | —                                   | 1.00                                | —                                   | —                                   | 1.00                                | —                                   | —                        | 1.00                                | —                        | —                        | 1.00                                | —                        |
| Lane Width (ft)                      |                          | 10                                  | 10                                  | 10                                  | 10                                  | 10                                  | 10                                  | 12                       | 12                                  | 12                       | 12                       | 12                                  | 12                       |
| Lane Width Adj. Factor               |                          | —                                   | —                                   | —                                   | —                                   | —                                   | —                                   | —                        | —                                   | —                        | —                        | —                                   | —                        |
| Parking present?                     |                          | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Parking Maneuvers (#/hr)             |                          | —                                   | —                                   | 5                                   | —                                   | —                                   | 5                                   | —                        | —                                   | —                        | —                        | —                                   | —                        |
| Bus Stopping Rate (#/hr)             |                          | 0                                   | 0                                   | 0                                   | 0                                   | 0                                   | 0                                   | 0                        | 0                                   | 0                        | 0                        | 0                                   | 0                        |
| CAV Protected Left Turn Lane Adj.    |                          | —                                   | —                                   | —                                   | —                                   | —                                   | —                                   | 1.01                     | —                                   | —                        | 1.01                     | —                                   | —                        |
| CAV Permitted Left Turn Lane Adj.    |                          | 1.02                                | —                                   | —                                   | 1.08                                | —                                   | —                                   | —                        | —                                   | —                        | —                        | —                                   | —                        |
| Work zone on approach?               |                          | —                                   | <input type="checkbox"/>            | —                                   | —                                   | <input type="checkbox"/>            | —                                   | —                        | <input type="checkbox"/>            | —                        | —                        | <input type="checkbox"/>            | —                        |

**Figure 3** HCM 7th Edition Proportion of CAVs in Signalized Intersection

As seen in the above figure, you have the option whether or not to include the proportion of CAVs for signalized intersections. If you enter the proportion of CAVs at the intersection, Base saturation flow rates for through movements and Saturation flow adjustment factors protected & permitted left turns will be calculated to account for the proportion of CAVs. If CAVs are present at the intersection, but user doesn't include it as data entry, no changes will be considered for Base saturation flow rates for through movements and Saturation flow adjustment factors protected & permitted left into the calculation of Approach Delay or Intersection Delay. This is consistent to the methodology presented in HCM 6<sup>th</sup> Edition.

## All-Way Stop Control (AWSC) Intersections

The HCM 7<sup>th</sup> Edition method for AWSC intersections is very similar to the HCM 6<sup>th</sup> Edition method. Refer to the Synchro Studio 12 User Guide for details on the interface in Synchro.

## Two-Way Stop Control (TWSC) Intersections

The HCM 7<sup>th</sup> Edition method for TWSC intersections is updated to match with HCM 7<sup>th</sup> Edition method. Some of the major modifications as compared with the HCM 6<sup>th</sup> Edition includes:

- The equation for calculating Minor-Street Left-Turn Movements.
- Control Delay & Rank 4 Capacity for One-Stage Movements equations.
- New equation to model Compute Flared Minor-Street Lane Effects.
- Calculation of Effect of Major-Street Shared Through and Left-Turn Lane and Potential Capacity, accounting for the effect of platooning.



## Roundabouts

The HCM 7<sup>th</sup> Edition includes introducing proportion of Connected Automated Vehicles (CAVs) in the traffic stream.

| HCM 7th Roundabout          |                          | HCM 7th Roundabout           |  |                          |  |                 |  |                              |  |                         |  |
|-----------------------------|--------------------------|------------------------------|--|--------------------------|--|-----------------|--|------------------------------|--|-------------------------|--|
| Node #                      | 3                        | EB                           |  | WB                       |  | NB              |  | SB                           |  |                         |  |
| Zone:                       |                          | Entry Lanes                  |  | Conflicting Circle Lanes |  | Exit Lanes      |  | Adjusted Approach Flow (vph) |  | Demand Flow Rate (pc/h) |  |
| X East (ft):                | 1000                     | — 2 —                        |  | — 1 —                    |  | — 2 —           |  | — 1 —                        |  | — 242 —                 |  |
| Y North (ft):               | 1000                     | — 2 —                        |  | — 1 —                    |  | — 2 —           |  | — 1 —                        |  | — 247 —                 |  |
| Z Elevation (ft):           | 0                        | — 768 —                      |  | — 806 —                  |  | — 779 —         |  | — 818 —                      |  | — 737 —                 |  |
| Description                 |                          | — 764 —                      |  | — 372 —                  |  | — 976 —         |  | — 751 —                      |  | — 772 —                 |  |
| Max v/c Ratio:              | 0.58                     | — 759 —                      |  | — 851 —                  |  | — 594 —         |  | — 418 —                      |  |                         |  |
| Intersection Delay (s/veh): | 11.5                     | — 0 —                        |  | — 0 —                    |  | — 0 —           |  | — 0 —                        |  |                         |  |
| Intersection LOS:           | B                        | — 1.000 —                    |  | — 1.000 —                |  | — 1.000 —       |  | — 1.000 —                    |  |                         |  |
| ICU:                        | 0.86                     | — 13.9 —                     |  | — 7.8 —                  |  | — 11.3 —        |  | — 12.8 —                     |  |                         |  |
| ICU LOS:                    | E                        | — B —                        |  | — A —                    |  | — B —           |  | — B —                        |  |                         |  |
| Proportion of CAVs (%):     | 15                       | Lane                         |  | Left Right               |  | Left Right      |  | Left Right                   |  | Left Right              |  |
| Inside Radius (ft):         | 28                       | Follow-Up Headway (s)        |  | — —                      |  | — —             |  | — —                          |  | — —                     |  |
| Outside Radius (ft):        | 52                       | Critical Headway (s)         |  | — —                      |  | — —             |  | — —                          |  | — —                     |  |
| Roundabout Lanes (#):       | 2                        | A                            |  | 1420 1420                |  | 1420 1420       |  | 1420 —                       |  | 1350 1420               |  |
| Circle Speed (mph):         | 18                       | B                            |  | 9.10e-4 9.10e-4          |  | 9.10e-4 9.10e-4 |  | 8.50e-4 —                    |  | 9.20e-4 8.50e-4         |  |
| Inside Color:               |                          | A Adjustment Factor for CAVs |  | 1.038 1.038              |  | 1.038 1.038     |  | 1.023 —                      |  | 1.023 1.038             |  |
| Transparent Circle:         | <input type="checkbox"/> | B Adjustment Factor for CAVs |  | 0.993 0.993              |  | 0.993 0.993     |  | 0.993 —                      |  | 0.993 0.970             |  |
|                             |                          | Designated Moves             |  | LT TR                    |  | LT TR           |  | LTR —                        |  | LT R                    |  |

**Figure 4** HCM 7th Edition Proportion of CAVs in Roundabout

As seen in the above figure, you have the option whether or not to include the proportion of CAVs for roundabouts. If you enter the proportion of CAVs at the intersection, new set of intercept parameters (A) and slope parameters (B) as well as the capacity adjustment factors will be calculated. to account for the proportion of CAVs. If CAVs are present at the roundabout, but user doesn't include it as data entry, no changes will be considered for intercept parameters, slope parameters and the capacity adjustment factor into the calculation of Delay. This is consistent to the methodology presented in HCM 6<sup>th</sup> Edition.

## User Interface Changes

The user interface is updated introducing a fresh look and feel with easy-to-use controls of different tool bars & data entry grids.

### Ribbon Bars

The Synchro user interface has been updated, featuring new buttons with easy-to-use ribbon bar controls.

- Buttons under mapping groups were reorganized
- A new group was introduced to combine all HCM methodologies under one group and an HCM 7<sup>th</sup> Edition button was added as well
- All icons in Synchro, SimTraffic, and 3D Viewer have been modernized

### Data Entry Grids

The data entry grids in Synchro & SimTraffic were updated to exhibit a modern look & feel with easy-to-use controls.