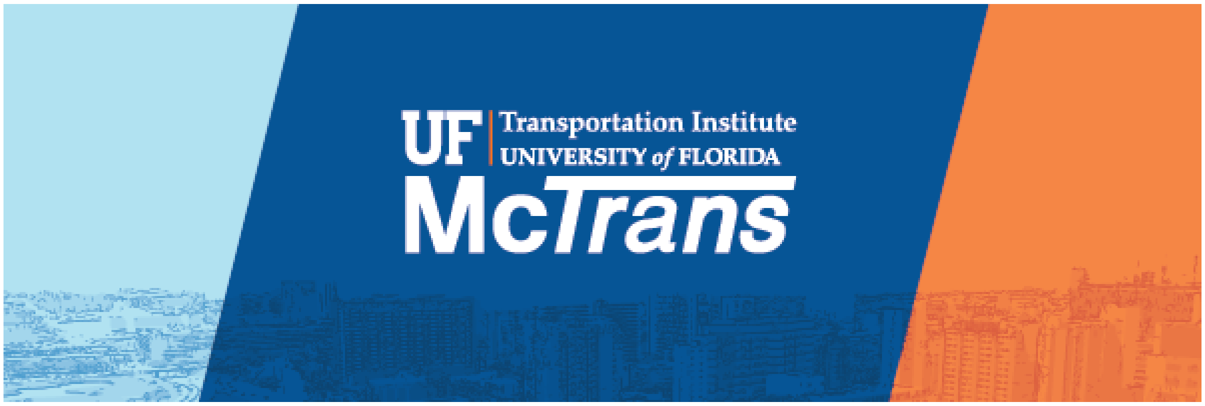
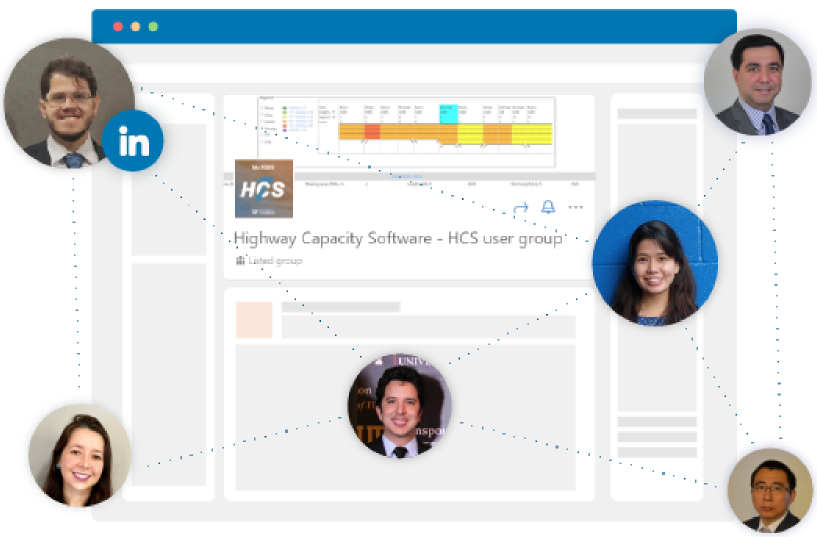
Newsletter Volume 70 | May 2021



Join the HCS users on LinkedIn

The HCS User Group is a professional group on LinkedIn that connects HCS users from around the world. Users can share their questions and valuable insights learned through the various HCS tools. It is free to join. You can join the group here.



"Peak Period" vs "Multi-Period" Analyses in HCM: Which one to pick?

Dr. Behzad Aghdashi

The past couple of Highway Capacity Manual (HCM) releases offer the multi-period analysis and the peak period analysis for both freeways and urban streets. It is essential to understand where these analysis types should be used.

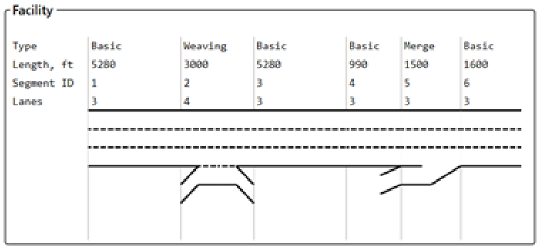
The peak period analysis measures the worst operational condition of the facilities. Typically, Peak Hour Factor (PHF) is used to estimate the peak 15-minute demands within an hour-long demand volume. The operational condition can range from free-flow (LOS A) to close to capacity (LOS E). But what if the peak period analysis report LOS F? How can we interpret the operational condition of the facility?

When demand exceeds capacity (LOS F), the unserved demand will form queues that can last several 15 minutes analysis periods before they get cleared. However, the peak period analysis cannot measure how bad the LOS F condition will be because it does not account for the effects of queue formation and dissipations over the facility in subsequent analysis periods. As such, the "peak period" analysis should NOT be used for oversaturated conditions.

On the other hand, the multi-time period analysis focuses on several analysis periods, each being a single study period. The demand volumes are provided for all 15 minute analysis periods. Thus PHF is not needed for this approach.

The major differences between the two approaches are summarized in the following table:

	Peak Period Analysis	Multi-Period Analysis
Input demand	One value for the entire study period with PHF applied	Provided at every 15 minutes analysis period
Peak Hour Factor	Calculated as a function of busiest 15 minutes analysis period	Not needed (PHF = 1.0)
LOS output	One for the entire study period	One for every analysis period, considering oversaturation from previous periods



To better understand the difference between the two approaches when the operational conditions on the peak period are oversaturated, let's look at this example. The following speed heatmap shows the average speed (mph) of a freeway segment on the peak period. As seen, the red color code corresponds to the existence of queues:

Analysis Period	Seg. 1	Seg. 2	Seg. 3	Seg. 4	Seg. 5	Seg. 6	
18:00 - 18:15	***70.0***	***61.6***	***11.2***	***10.5***	***24.5***	***69.4***	← **Peak Period**

As discussed, the peak period cannot determine how bad the condition is in the following peak periods. The same analysis is replicated for a longer study period. The below table shows the speed heatmap for the same facility. In fact, the period after peak period will operate at the worst condition due to a large number of unserved vehicles. Other than failure in determining the worst operational condition, the peak period analysis cannot provide a complete picture of user delay costs for the peak period.

Analysis Period	Seg. 1	Seg. 2	Seg. 3	Seg. 4	Seg. 5	Seg. 6	
17:30 - 17:45	69.8	69.8	69.8	69.8	69.8	69.8	
17:45 - 18:00	70.0	70.0	70.0	65.0	64.3	69.5	
18:00 - 18:15	***70.0***	***61.6***	***11.2***	***10.5***	***24.5***	***69.4***	← **Peak Period**
18:15 - 18:30	67.5	13.3	12.3	11.4	34.4	69.5	← **Worst Condition**
18:30 - 18:45	70.0	29.3	15.3	14.1	34.4	69.5	
18:45 - 19:00	70.0	64.7	25.4	14.5	39.2	69.6	
19:00 - 19:15	70.0	70.0	70.0	70.0	70.0	70.0	
19:15 - 19:30	70.0	70.0	70.0	70.0	70.0	70.0	

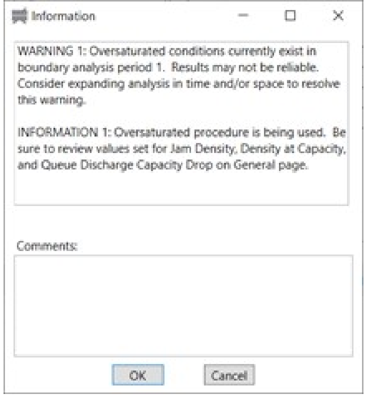
A similar condition can occur on the Urban Street analysis. As such, the multi-period analysis can account for the impact of queues while forming and dissipating, providing a comprehensive view toward facilities operational condition.

When a facility is under capacity, both peak period and multi-period analysis will report the same results! However, when traffic condition is oversaturated, peak period analysis will generate a misleading result. It is always advised to evaluate the operational condition of the analysis to determine if there are queues or not, then, based on that, pick the correct type of analysis. Of course, a multi-period analysis can always be used, regardless of traffic condition, to estimate performance measures.

In summary, the recommended analysis approach is:

- For undersaturated conditions (LOS E or better), peak period analyses provide a reasonable estimation of performance with a small amount of required effort
- For oversaturated conditions (LOS F), multi-period analyses must be used to account for the effects of queueing in freeways

The HCS will prompt a warning message when the analysis condition requires a multi-time period analysis. The following image shows an example warning message where the oversaturated condition exists in a single analysis period (peak period analysis).



STAFF SPOTLIGHT

Samantha Taningco

Software QA/QC Analyst

When I joined the McTrans team eight years ago, I was an undergraduate civil engineering student at UF. Thanks to Dr. Dimitra Michalaka, who was UF's Introduction to Transportation professor at the time, I was introduced to Bill Sampson, the director of the McTrans Center at the time. I reached out to him with the hopes of volunteering at McTrans so I could gain some experience and learn more about traffic engineering. He was kind enough to meet with me and hire me as a student employee.

Throughout my time as a student, I learned about HCS and the HCM. I learned what it was like to work on an interdisciplinary team, what it takes to put out commercial software, and what interaction with customers is like. I was able to see how the academic world and the consulting world blend together. During graduate school, I was offered a graduate assistantship, which allowed me to be a teaching assistant in addition to working at McTrans. Helping with teaching courses reinforced the fundamentals of traffic engineering, the concepts of the HCM, and gave more hands-on experience with HCS. This provided synergy between academic activities and the core business of McTrans. After graduate school, I stayed on as a full-time staff employee, and was afforded the opportunity to attend conferences in the transportation field and given more experience in contributions to product design, QA/QC, and customer support.

What I enjoy most about my job is the flexibility and the collaboration. Although large teams have its benefits, working alongside a smaller team has catered a more personable environment and allowed for greater involvement in key decisions. It has also helped with communication and transparency when it comes to finishing work on projects.

I have been able to adapt well with the COVID-19 restrictions as the type of work I do at McTrans allows me to be productive while working from home. We also have a growing team who works well together. I look forward to when we are all able to meet safely and collaborate in person. With everything happening in the world today, I am very thankful to be able to continue to work. I will also forever be grateful to McTrans for giving me the opportunity to learn and grow in both my academic life and professional career, but also for connecting me to so many great people, some of with whom I will have lifelong friendships.

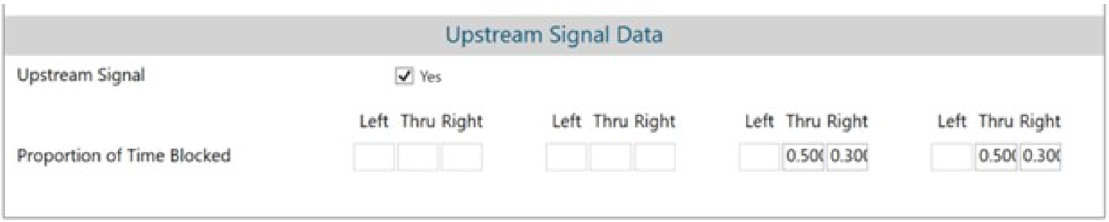
The Effect of Signal Coordination on TWSC Intersections in HCS

Dr. Gustavo de Andrade

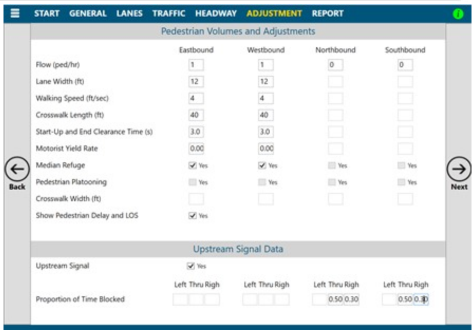
The basic principle of traffic signal coordination is to organize vehicles in platoons, which can be efficiently served by signal phases. While it is widely known this can promote smooth progression and coordination along signalized intersections, it is also true that such a scheme can also be beneficial to Two-Way STOP-Controlled intersections (TWSC) on the corridor.

The greater the number of vehicles arriving in platoons at a TWSC intersection, the higher the minor-street capacity for a given opposing flow because there is a greater proportion of large gap sizes that can be used by more than one minor-street vehicle.

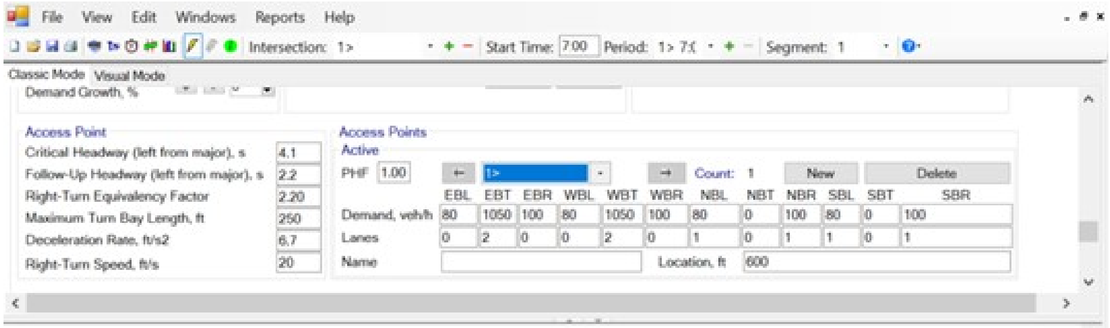
The proportion of time that each movement (major street left turns and minor street movements) at a TWSC intersection is effectively blocked by a platoon coming from the upstream signal can be provided into the HCM/HCS methodology by using the “Proportion of Time Blocked” input (ranging between 0 and 1) shown on the figure below:



To estimate the values for this input, the HCM Urban Street Segments methodology (Chapter 18) implemented in the HCS Streets module can be used. In order to do so, a Streets file with two intersections is created. The TWSC is modeled as an access point under “Detailed Input Data.”



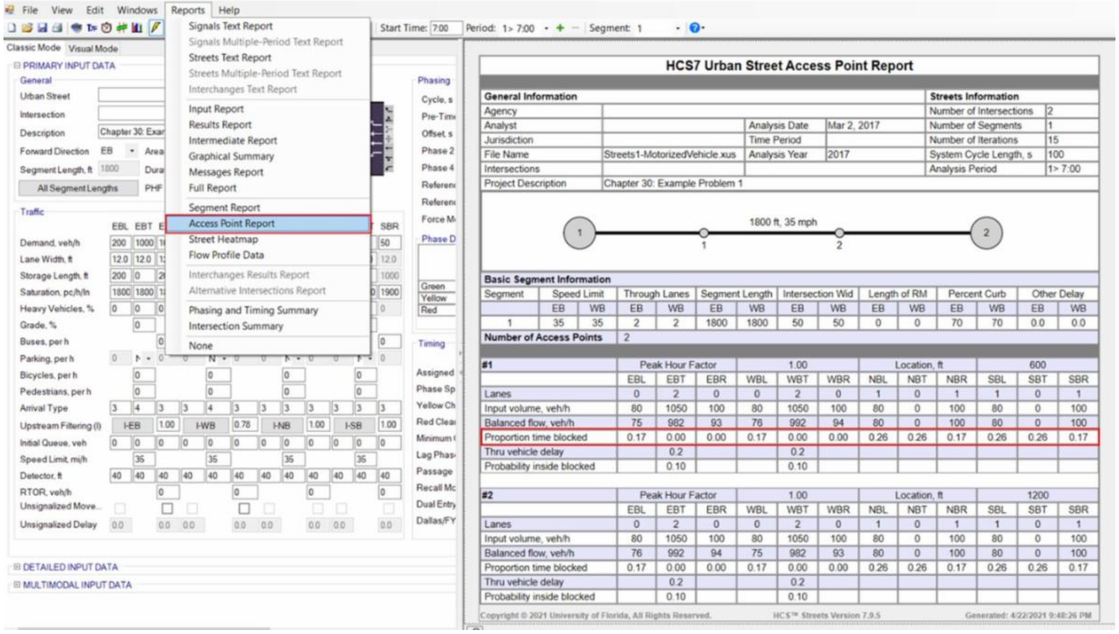
Input Screen



The Access Point report for the segment between the two intersections will then show the Proportion of Blocked Time for each direction on the access point (TWSC intersection), which can be simply plugged into the TWSC module for analysis.

In effect, fine-tuning this parameter in HCS is highly recommended, as it can significantly impact a stop-controlled intersection analysis, leading to better or worse performance on a case-by-case basis. In an example, an increase in the Proportion of Blocked Time on one minor approach from 30% to 50% could reduce the control delay at a standard TWSC intersection by over 40%, resulting in up to two levels of service improvement (ex: F to D).

Formatted Report



New Training Series

Hands-on Experience using the Highway Capacity Software

This new training series is developed for engineering and planning professionals with basic knowledge of highway capacity analysis and traffic engineering concepts who want to develop hands-on experience with HCS.

REGISTER HERE

Have questions?

For more information, click here.
Send inquiries to mctrans@ce.ufl.edu.

Date: Jun 21 - 22, 2021
Time: 1:00 to 5:00 PM ET

Training Webinars

Ready to Register?

McTrans offers training for transportation professionals throughout the year.
For additional information about courses, click here.
Have questions or want more information? Send us an email at mctrans@ce.ufl.edu

---

Stay Connected With Us!

Tel: 1-800-226-1013 | **Email:** mctrans@ce.ufl.edu | **Website:** https://mctrans.ce.ufl.edu