pennsylvania
DEPARTMENT OF TRANSPORTATION

494-17-02

DATE: May 22, 2017

SUBJECT: Changes to Publication 46 – Chapter 12: Traffic Engineering Software

TO: District Executives

FROM: Richard N. Roman, P.E., Director *for Jonathan Fleming /s/*
Bureau of Maintenance and Operations

This Strike-off Letter (SOL) is time and resource neutral and will result in the Department updating Publication 46, Chapter 12 in regards to acceptable Traffic Engineering Software. This update was completed through a one-step Clearance Transmittal Process which was available for comments between 6/23/15 to 7/25/16 and comment responses to all commenters were accepted in accordance with Publication 693, Specification Review Manual, Chapter 2 Standard Clearance Transmittal Process.

The following are updates to the specific supported software identified in Publication 46, Section 12.2 – Specific Software along with an explanation of the tool benefits:

1) **Synchro Version 10/SimTraffic Version 10 (http://www.trafficware.com/software1.html)**
   a. Purpose: A macroscopic (Synchro) and microscopic (Sim Tratfic) software to perform Highway Capacity Manual (HCM) traffic capacity analysis, modeling corridors and assisting with optimizing traffic signals. This assists with completing traffic evaluations, studies, determining mitigation solutions, and determining proposed traffic impacts.
   b. Traffic Tool Category: Optimization Tool
   c. Departments Use: PennDOT will use Synchro/Sim Traffic Version 10 as a tool to evaluate certain traffic situation. Traffic signals and corridors can be modeled in the software and output can be analyzed to determine capacity analysis as well as other outcomes. The Synchro/Simtraffic Version 10 is also used for mitigation and can be used to find the impact solution. The software use is still acceptable to be used on projects as previous versions.
   d. Training Opportunities: Synchro/Sim Traffic training is offered on an annual basis and details can be found at http://www.dotdom1.state.pa.us/ecms/ecms_training_calendar.nsf with keyword to search is Synchro.
2) **PTV Vistro (http://vision-traffic.ptvgroup.com/en-us/product/ptv-vistro/)**
   a. Purpose: A macroscopic software which can perform traffic capacity analysis, modeling corridors and assisting with optimizing traffic signals using standard methodologies such as HCM 2010 or HCM 2000. This assists with a determining mitigation solutions, determining proposed traffic impacts, the completion of traffic evaluations, and completing traffic studies.
   b. Traffic Tool Category: Optimization Tool
   c. Departments Use: PennDOT will use PTV Vistro as an alternative to performing traffic analysis. This is another option to performing HCM analysis for the department, when HCM methodologies should be followed. PTV can follow HCM 2010 or HCM 2000 as previously stated.
   d. Training Opportunities: Training for this traffic engineering software will be offered and Districts will be notified when they are offered. In addition, training for PTV Vistro training course seminar was offered regionally at King

of Prussia on 4/26/2016, Harrisburg on 4/27/2016, and Uniontown region on 4/28/16.

3) TruTraffic (http://www.tsppd.com/)

a. Purpose: TruTraffic is an optimization tool that can be used to create travel time and delay studies, and space time diagrams for traffic flow.
b. Traffic Tool Category: Optimization Tool
c. Departments Use: PennDOT will use TruTraffic software to create before and after time and delay studies. Verification and modification of updated signal timings is another function of this software. Each district has one seat license along with a GPS Bluetooth recorder so that floating car evaluations can be performed. This software can help in the setting up and calibrating traffic simulation models accurately and efficiently as well.
d. Training Opportunities: Training for this traffic engineering software will be offered and Districts will be notified when they are offered. TruTraffic seminar webinar was conducted on 9/11/15.

Information regarding these traffic engineering software's are available in this location: "P:\penndot shared\BOMO\TSOA\Public\Pub 46 Chapter 12" in PDF files or at their respective websites.

The traffic engineering software to be used on a project is agreed upon by project stakeholders at the project scoping meeting as previously established in the Publication 46, section 10.8 – Traffic Analysis Checklist, on page 10-31. This process should be followed when deciding what software is appropriate for the project.

Should you have any questions, please contact Daniel P. Farley, Chief of the Traffic Operations Deployment and Maintenance Section at (717) 783-0333.

4940/DPF/hmq

cc: Anthony Mento, P.E., Director of Technical Services, FHWA
Assistant District Executives – Construction
Assistant District Executives - Design
Assistant District Executives – Maintenance
Maintenance Services Executives
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Laine Heltebridle, Director, Bureau of Planning and Research
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Matthew DePaoli, Senior Civil Engineer, BOMO

12. TRAFFIC ENGINEERING SOFTWARE

12.1 General

Purpose

Various software packages are available for use by traffic engineers. Traffic analysis software packages are used to optimize traffic flows and capacity, or to simulate traffic flow. In general, the definition of simulation is the *"dynamic representation of some part of the real world achieved by building a computer model and moving it through time."*

The purpose of this chapter is to summarize the Department's position on the use of traffic engineering software.

Traffic Resources, Education, and Computing Support (TRECS) Group

The Department established the Traffic Resources, Education, and Computing Support (TRECS) Group to address computer hardware, software, and training issues as they pertain to the District Traffic Units and the Bureau of Maintenance and Operations (BOMO). In addition, the TRECS Group procures needed traffic engineering reference materials. The TRECS Group is comprised of representatives of every District Traffic Unit and BOMO. The Group meets on a regular basis, and it has dedicated funding within BOMO's budget to fulfill its responsibilities.

One of the TRECS Group's objectives is the review and evaluation of traffic engineering software packages to determine which software will be used and supported by the Department. Supported software means that the Department will continually purchase software upgrades for use by the Engineering Districts and Central Office, and that training has been, and will continue to be provided for appropriate Department personnel.

12.2 Specific Software

Supported Software

The Department supports the following traffic analysis tools, methods, and commercial software packages, which are organized according to traffic analysis tool category:

Tools / Software	Traffic Tool Category
HCM2010 Generalized Service Volume Tables	• Sketch-Planning Tool
ICU (Intersection Capacity Utilization)	• Sketch-Planning Tool
QuickZone	• Sketch-Planning Tool
PennDOT Delay Analysis Workbook (DAWB)	• Sketch-Planning Tool
FREEPLAN, ARTPLAN, and LOSPLAN	• Sketch-Planning Tool
Highway Capacity Software, 2010 (HCS2010)	• HCM-Based Tool
TRANSYT7-F	• Optimization Tool

Synchro Version 8.0, 9.0, 10.0	• Optimization Tool
SimTraffic Version 8.0, 9.0, 10.0	• Microscopic Simulation Tool
SignCAD	• Sketch-Planning Tool
Trip Generation Software	• Sketch-Planning Tool
PTV Vistro	• Optimization Tool
TruTraffic	• Optimization Tool

Traffic Analysis Tool Selection Process

Based on the recommended traffic analysis tool category or categories identified in Publication 46, Chapter 10.3, the process identified below should be used to identify the candidate software package(s) to be used when evaluating traffic capacity.

If the desired analytical or simulation software is not found within Publication 46, Chapter 12.2:

1) A written request should be sent to the appropriate Engineering District Office for consideration;

2) Within the request, the reasons why an alternative analytical or simulation software should be clearly identified along with the added benefits of using the alternative software compared to the Department supported software platforms;

3) The Engineering District Office will evaluate each request and the District Traffic Engineer should provide a written response as to whether the alternative analytical or simulation software could be used on a particular project;

4) Note that an alternative analytical or simulation software analysis should not be submitted to the Department until a written response has been received by the District Traffic Engineer; and

5) If an Engineering District Office receives an alternative analytical or simulation software then coordination with the Bureau of Maintenance and Operations, Traffic Operations Section is recommended to ensure that an appropriate way of evaluating the accuracy of the model has been determined.

Required Use by Department and Consultants

Applicable work done by the Department, or by engineering consultants making submissions for Department review and approval, including but not necessarily limited to design, operational assessments, or Highway Occupancy Permit (HOP) projects, should use the 2010 Highway Capacity Manual (5th Edition) and supporting software packages as directed in Publication 46, Chapter 10 and Chapter 12, unless directed otherwise in writing by the Department, and as dictated by a subject project's scope of work.

Unless an alternative analysis tool is used, level-of-service (LOS) calculations and resultant measures of effectiveness should be calculated using the methodologies established by the 2010 Highway Capacity Manual (HCM2010) using a supported HCM-based tool identified in Publication 46, Chapter 12.2. Currently, this means LOS calculations should be completed and reported using HCS2010.

Trafficware

Engineered by Naztec

Synchro® 10

Signal Timing & Analysis Software

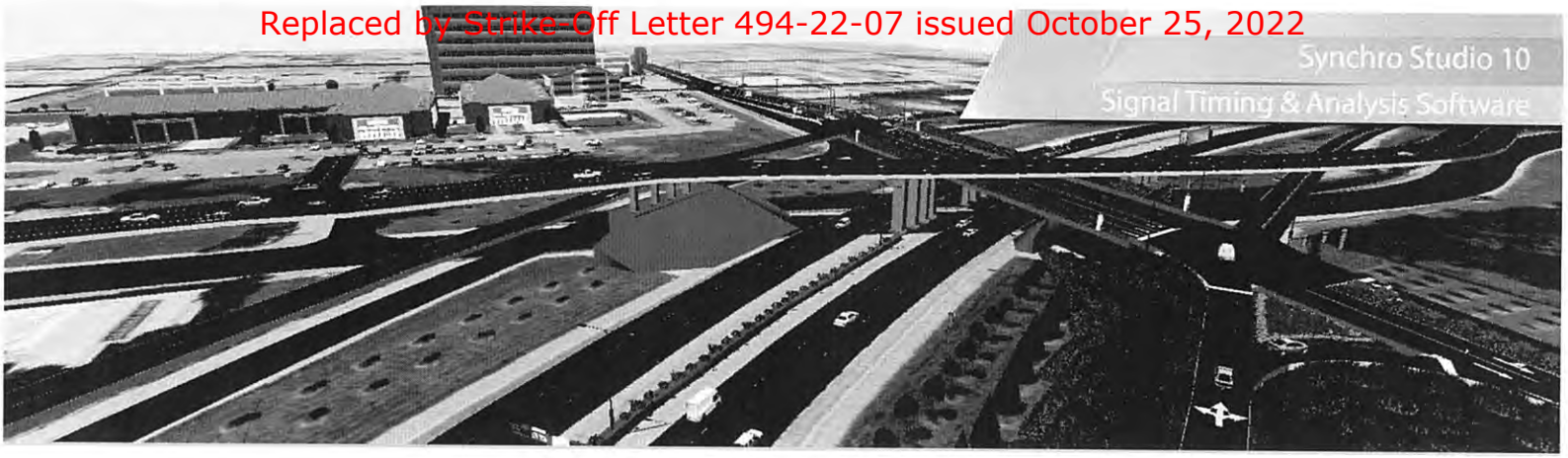
Signal Timing, Capacity Analysis, Simulation and Animation
Redefining State-of-the-Art in Signal Timing

Synchro® 10 supports the Highway Capacity Manual (HCM) 6th Edition methodology for signalized and unsignalized intersections, two-way-stop-control intersections, all-way-stop-control intersections and roundabouts.

In addition to the traditional focus on vehicular movement, the HCM 6th Edition builds on the multimodalism introduced in the HCM 2010, allowing you to assess the overall transportation experience from the user's perspective. The roundabout methodology includes an updated capacity model, following new FHWA-sponsored research.

Synchro 10's user interface has been updated to include convenient ribbon bar controls.

522 Gillingham | Sugar Land | Texas | 77478
For more information, call 844-664-7783 or visit www.trafficware.com.



Product Features & Capabilities

Synchro Studio is a robust, easy-to-use traffic signal timing application that helps traffic engineers and transportation planners design, model, optimize, simulate, and animate signalized and unsignalized intersections (including roundabouts).

Synchro Studio provides premier applications for traffic analysis, optimization, and simulation. The package combines the modeling capabilities of Synchro signal timing & analysis software, the micro-simulation and animation capabilities of our SimTraffic software, and our three-dimensional viewer, creating the ultimate tool kit for any traffic engineer.

Synchro Studio includes the following:

Synchro
Design, model, and optimize traffic signal infrastructure.

SimTraffic
Simulate real-world vehicular and pedestrian traffic scenarios.

3D Viewer
Convert two dimensional modes from SimTraffic to a 3D Viewer application.

Supplemental modules:

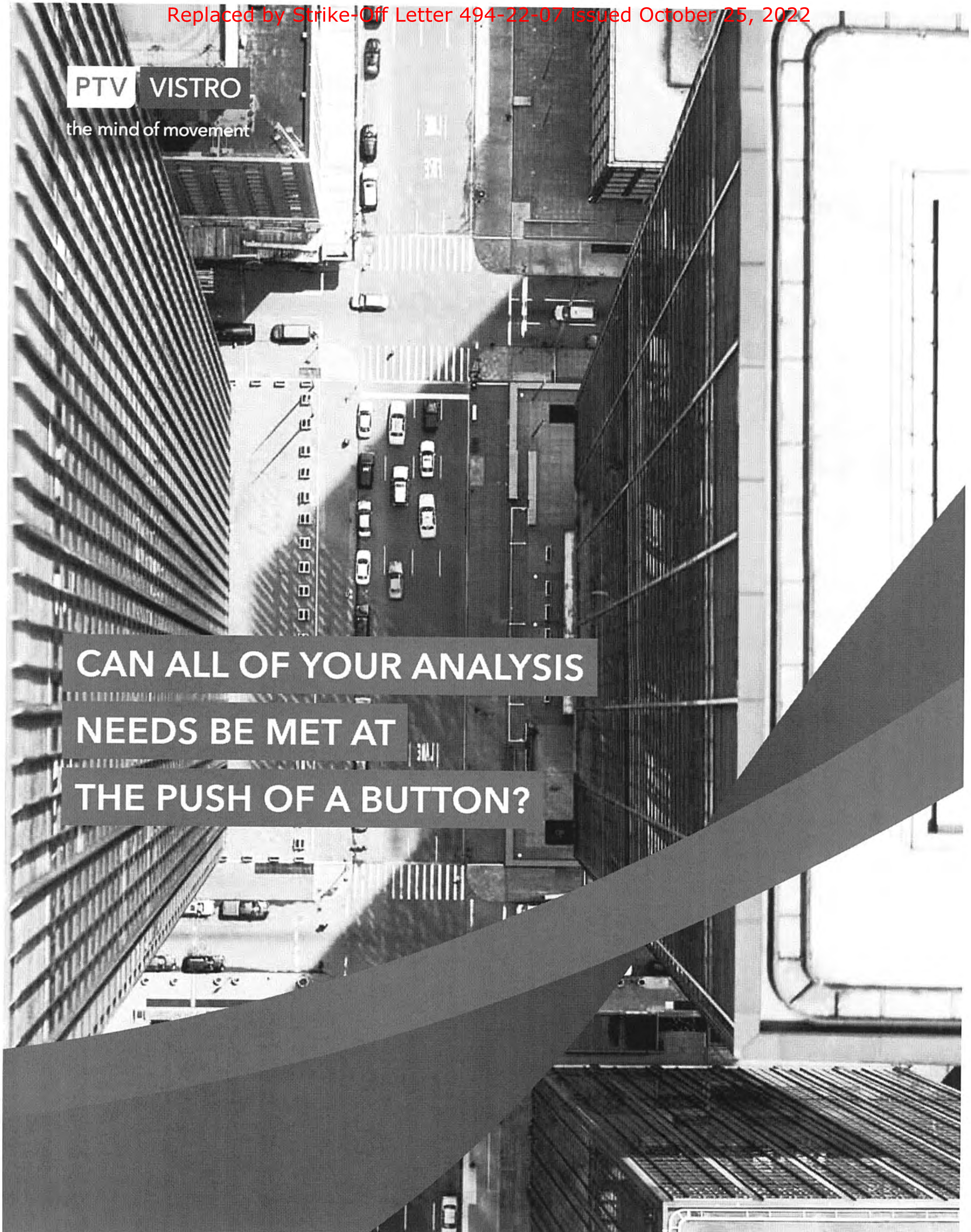
Warrants
Evaluate a network of intersections according to the Manual on Uniform Traffic Control Devices (MUTCD) standards and guidelines for signalization.

TripGen
Calculate the expected number of trips based on data from the Institute of Transportation Engineer's (ITE) Trip Generation Manual.

Why do traffic agencies and consultants use Synchro Studio?

- Over twenty years of industry use, ensuring the product is tested and proven.
- Provides users with a powerful microsimulation tool.
- Pays for itself after your first traffic signal or traffic analysis project.
- Ease-of-use and adoptability, allowing engineers to analyze traffic operations in days versus weeks.
- Supports Highway Capacity Manual (HCM) 6th Edition, 2010 and 2000 best practice methodology for signalized intersections, unsignalized intersections and roundabouts.
- Implements the Intersection Capacity Utilization (ICU) Method.

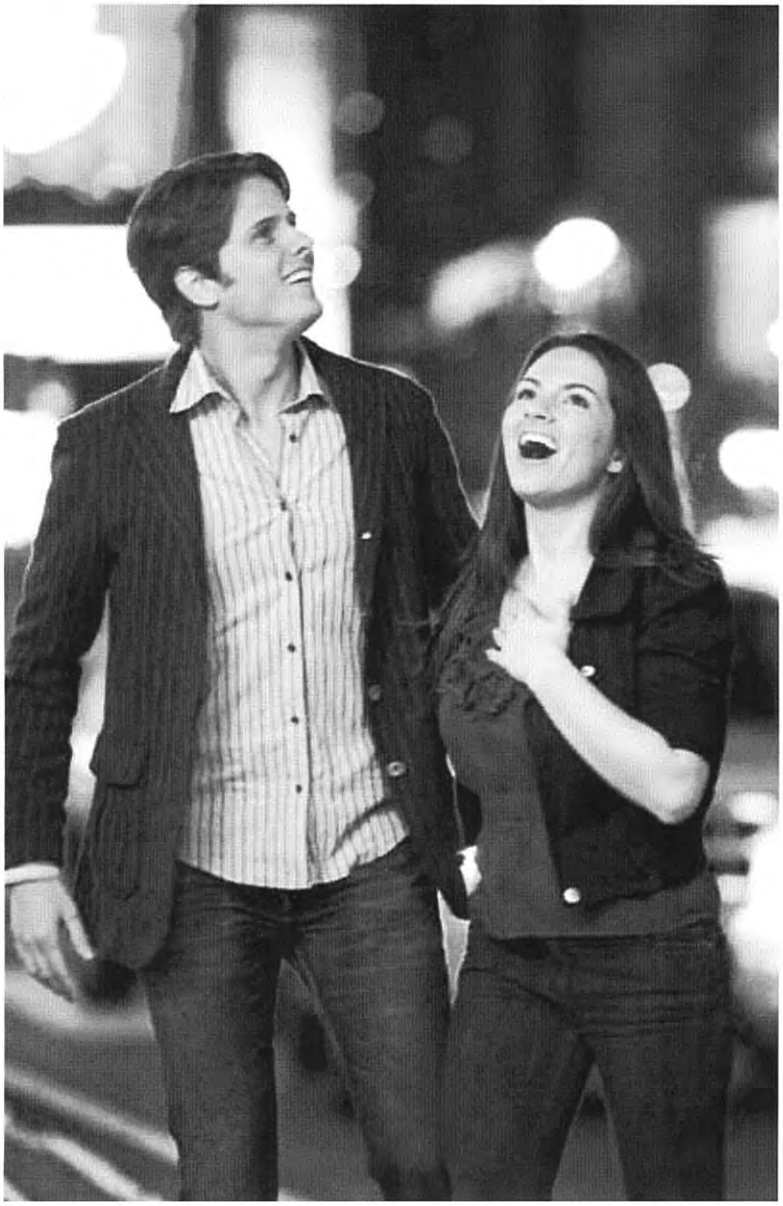
Replaced by Strike-Off Letter 494-22-07 issued October 25, 2022



COMPLETE SIGNAL OPTIMIZATION AND TRAFFIC IMPACT ANALYSIS

Imagine a single software solution that optimizes signal timing, evaluates development impacts, seamlessly manages multiple scenarios and produces report-ready figures and tables at the push of a button.

The future of traffic analysis software has arrived.



FEATURES AND CAPABILITIES:

PTV Vistro is the ideal tool for all your traffic analysis needs. Its intuitive user interface places all functions at your fingertips so that you can keep traffic flowing at the touch of a button. PTV Vistro allows you to:

- compute intersection level of service
- optimize traffic signal timing
- forecast new development impacts
- evaluate mitigation options
- manage multiple scenarios
- create comprehensive reports

USE CASES:

CONDUCTING SIGNAL TIMING AND SYSTEM EVALUATIONS

PTV Vistro expedites the analysis of signal systems operations and re-timing studies:

- intersection, corridor, and network optimization
- seamless transition to PTV Vissim for microsimulation

PERFORMING CORRIDOR STUDIES

Use PTV Vistro for quick and easy analysis of corridors, including:

- re-design of facilities
- identifying proper traffic control devices
- evaluating future mitigation needs

CONDUCTING TRAFFIC IMPACT ANALYSES (TIA)

Evaluate the impacts of proposed future developments on the transportation network:

- trip generation, distribution, and assignment of development traffic
- multiple scenario management
- mitigation testing and evaluation
- comprehensive, report-ready tables and figures
- preview future development traffic with the integrated PTV Vissim viewer

DEVELOPING TRANSPORTATION MASTER PLANS

- efficient data entry and storage
- integration with PTV Visum for incorporation of long-range forecasting data

ADVANTAGES:

- One tool for signal optimization, traffic impact analysis and corridor studies
- Intuitive, modern user interface
- Fully integrated into the Vision Traffic Suite for easy transitions from regional planning to simulation
- Transparent results
- Meets common industry standards

PTV VISTRO

the mind of movement

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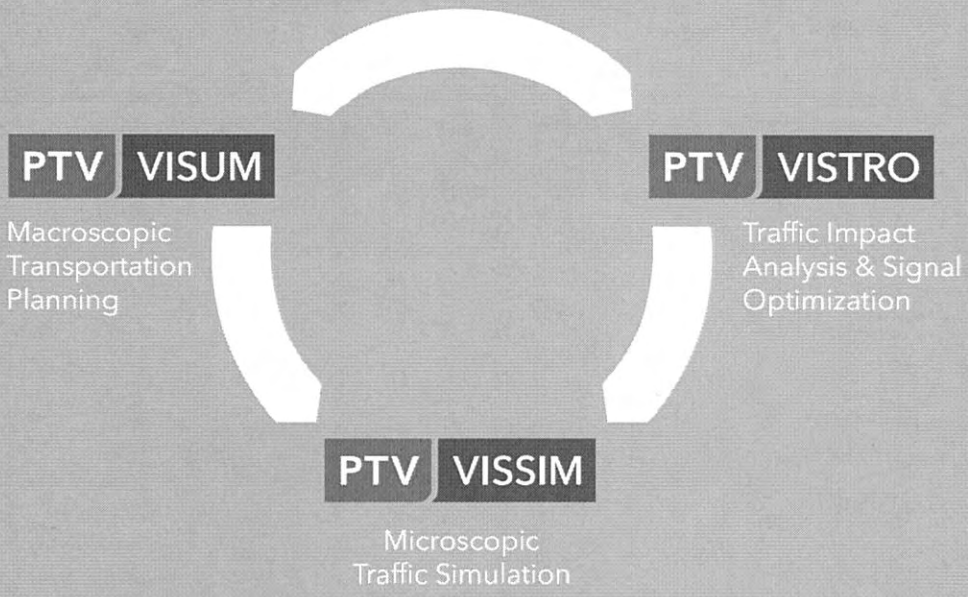
HOW DOES PTV VISTRO FIT INTO THE VISION TRAFFIC SUITE?



(formerly TS/PP-Draft)

Be Your City's Traffic Superhero!

- **Deliver Quality-Assured Traffic Signal Coordination**
- **Draft Arterial Timings Diagrams**
- **Perform Travel Time & Delay Studies (with GPS receiver)**

Tools for Every Traffic Engineer

***New!* in Version 9.0**

Supports High-Fidelity, Modal Emissions Models! (e.g., CMEM for CO, HC, NO_x, CO_2, etc.)
Color-coded Links on Network View show Actual, Average or Median Link Speed!

- Interactive signal coordination
- Signalized networks
- Multiple signal timing plans
- Green bands from cross-street turning movements
- Right- or Left-hand drive rule
- Leading, lagging, & lead-lag left turns
- Double green arrows
- Permitted/protected phases
- Harmonic cycling, (2×, 1/2×, 2/3×, 3/2×, 1/3×, 3×, 1/4×, 3/4×, 4/3×, and 4×)
- Time-Space, Platoon-Progression, or Time-Location diagrams
- Linkable offsets, signal timings, or bands
- Pedestrian phases
- Nine offset reference points
- Yellow, All-Red, FDW, and Advance Warning Flasher clearance intervals
- Stop, start, continue, taper, or clip green bands
- Curved links in the Network View
- Timing plan-specific annotations on diagrams or Network View
- Fixed or variable splits
- Varying speeds along artery
- Track current position & speed with a GPS receiver
- Trip Logs plotted as trajectories on the diagram
- Speed-Distance plots from Trip Logs
- Playback Trip Logs as movies
- Create Trip Log movies
- Improved Travel Time and Delay Reports with user-defined formulas and new styling options
- Compatible with Google Earth and MS Bing Maps
- Easy collection of geographic coordinates
- Import/Export GPX, KML, or GIS shapefiles
- Remote control or Voice command control for GPS data collection
- Filter spurious readings from Trip Logs
- Integrates with TEAPAC
- Acceleration curve on bands from side-street turns
- Zoom on selected arterial segments
- Optimize cycle length, offsets, & phase sequences
- Fine-tune offsets
- Save Timing Reports as .pdf or .html files
- HCM Ch. 9 saturation flows
- Synchro compatibile UTDF files, ver. 2006 or 2.1
- Many styling options for diagrams

	Predict whether you will arrive at the next signal during the green time, and
	• Record Trip Logs of travel along the artery. Trip Logs can be
	  ◦ Plotted as trajectories on the diagram windows, graphically showing where delay occurs, which signals you're stopped at, and where you enter or leave the green bands. Before and after trip logs may be recorded in the same diagram data file, and you may select which ones are visible at any moment.
	  ◦ Used to prepare comparative Travel Time and Delay Reports, which can be extended with user-defined formulas and can be easily be copied and pasted into word-processing documents or spreadsheets for detailed analysis. These can be powerful tools of analysis for determining the effectiveness of a timing plan.
	  ◦ Plotted as Speed vs. Distance or as Time vs. Distance plots
	  ◦ Played back as a movie showing progress through signal timings diagram or over Network View
	  ◦ Saved as an *.AVI Video Clip
	  ◦ Used to measure the actual travel distance between intersections.
	  ◦ Used to calculate the "optimal" relative offset between intersections for a given direction of travel.
	  ◦ Used to calculate the actual average speed between intersections.
	  ◦ Used to color-code the links on the Network View according to a summary of the average link speed.

ENVIRONMENT	Requires Microsoft Windows 2000, Windows XP, Windows Vista, or Windows 7, 10MB available memory, and 15MB of disk space. Also, the system must have a printer driver installed, even if it's for just a virtual printer connected to print to a file, not to a real port or on the network. A GPS receiver (either NMEA 0183 compatible, or Garmin Proprietary, or DeLorme Earthmate) is required for tracking position and recording trip logs. See GPS Receiver Recommendations
STATUS	Ready to run. Hundreds of current users.

10.8 Traffic Analysis Checklist

Overview

With the guidance provided within this Chapter, there are a number of procedural steps that should be considered in the conduct of a traffic analysis project, many of which are practically-speaking already implemented in practice. Stakeholders should address these items during project scoping. The material presented by this Chapter is supplemental guidance that does not replace other project scoping requirements for traffic analysis work.

Below is an example step-by-step process of how to perform a traffic analysis. This step-by-step process is intended to be used in parallel with the traditional project scoping process and does not replace the scoping requirements for the various traffic analysis project types under the purview of the Department. This process is not exhaustive, but it does represent many of the major procedural considerations.

Process

1. Attend a project scoping meeting and obtain consensus between stakeholders;
2. Establish a project data collection plan that identifies the necessary data and supplemental field studies that may be necessary for the subject traffic analysis project using the guidance provided in Publication 46, Chapter 10.2;
3. Identify the manner in which future demand volumes for automobile and non-automobile modes will be calculated;
4. Establish analysis context(s) (planning or operations, or both) as well as the Pennsylvania land use contexts (urban, suburban, or rural) for the traffic analysis project using the guidance provided in Publication 46, Chapter 10.3;
5. Select the appropriate traffic analysis tool category or categories using the selection process in Publication 46, Chapter 10.3 and the desired commercial software packages relative to the required tool categories for the project;
6. If HCM-based tools are appropriate, identify the scope of the operational analysis, including the use of the multimodal analysis and/or the use of the urban street facility analysis options in accordance with Publication 46, Chapter 10.4 and Chapter 10.5;
7. If any methodological limitations would preclude the use of HCM-based tools, identify the specific software tool that may be used in accordance with the HCM2010 Alternative Tools Method outlined in Publication, Chapter 10.6;
8. Consider the use of locally-collected data for the traffic analysis project, use of the Pennsylvania default values, and the availability of HCM2010 default values using Publication 46, Chapter 10.4
9. Identify the candidate traffic analysis tool or commercial software using Publication 46, Chapter 12.2;
10. If the desired traffic analysis tool or commercial software is not provided in Publication 46, Chapter 12.2, follow the established procedure requesting the use of another analysis tool; and
11. Establish a calibration and validation data collection plan using the guidance in Publication 46, Chapter 10.7 , in conjunction with the project data collection plan and evaluation of the available default values.

PennDOT Synchro 10 Users

	Name		Comp name
Oil City, PA (D-1)	Hank	Alward	PD01CDW520W7\halward
	Larry	Lineman	PD01CDW310W7\llineman
	Greg	Maser	PD01CDW311W7\grmaser
Clearfield, PA (D-2)	Mark	Czajkowski	PD02CDW406W7\mczajkowsk
	James	Roman	PD022TRF06W7\jaroman
	Jonathan	Tate	PD02LT0ITS04W7\jtate
Montoursville, PA (D-3)	Josephine	Beaver	PD03CDW430W7\jobeaver
	Lara	Lapinski	PD03LTTRA01W7\llapinski
Dunmore, Pennsylvania (D-4)	Joseph	Bartos	PD04CDW505W7\jbartos
	Tyler	Bekanich	PD04CDW409W7\tbekanich
	Jamie	Goetz	PD04CDW310W7\jagoetz
	John	Pfeiffer	PD04CDW407W7\jopfeiffer
	Thomas	Pichiarella	PD04CDW517W7\tpichiarel
Allentown, PA (D-5)	Jacque	Baldwin	PD05DT344W7\jabaldwin
	Adam	Stettler	PD05CDW512W7\astettler
	Christopher	Surovy	PD05DT343W7\csurovy
	Brian	Boyer	PD05DT345W7\briboyer
	District 5-0	Laptop	PD05LTTRRADARW7\trafficlt
King of Prussia, PA (D-6)	David	Adams	PD064TRF02W7\davidadams
	Robert	Welch	PD064TRF41W7\rowelch
	KEVIN	LEWIS	PD064TRF30W7\kevlewis
	Paul	Lutz	PD064TRF26W7\plutz
	Platt	Michael	PD064TRF32W7\mplatt
	Ashwin	Patel	PD06LT4TRF29W7\ashpatel
	BHAVIN	PATEL	PD064TRF22W7\bhavpatel
	Nipul	Patel	PD064TRF31W7\nipatel
Harrisburg, PA (D-8)	Rickey	Barnett	PD08LT0222W7\rbarnett
	Mike	Centi	PD08LT0215W7\mcenti
	Matthew	Clouser	PD08CDW520W7\maclouser
	Eric	Kinard	PD08LT0213W7\ekinard
	Dean	Noles	PD08CDW331W7\dnoles
	Cory	Poff	PD08CDW332W7\cpoff
Hollidaysburg, PA (D-9)	Michael	Buck Jr	PD09CDW329W7\michbuck
	Kevin	Snyder	PD09CDW413W7\kevisnyder
	John	Ambrosini	PD09LTD233W7\jambrosini
	Tony	Tanzi	PD09CDW504W7\ttanzi
Indiana, PA (D-10)	Michael	Ashbaugh	PD10CDW503W7\micashbaug
	Ernest	Cascino	PD10CDW328W7\ecascino
	Adam	Marshall	PD100TDSUW7\admarshall
	Daniel	Tyger	PD10CDW329W7\dtyger
Bridgeville, PA (D-11)	Daniel	Fedio	PD11CDW317W7\dafedio
	Edward	Miller	PD11CDW315W7\edmille
	Frank	Cippel	PD11LT076W7\fcippel

	Mark	Pemu	PD11CDW326W7\mpemu
	Douglas	Smith	PD11CDW511W7\DOUGLASSM
Uniontown, PA (D-12)	Eric	Bell	PD12CDW411W7\erbell
	emily	chilzer	PD12CDW311W7\echilzer
	Andrew	Hill	PD12LTTRF11W7\andhill
	Timothy	Mankey	PD12CDW413W7\tmankey
	James	Vasiloff	PD12CDW512W7\jvasiloff
	Bryan	Walker	PD12LTTRF03W7\brywalker
Harrisburg, PA (Bomo)	Matthew	Depaoli	PDKB6C76W7\madepaoli
	Mike	Dzurko	PDKBLT6B62W7