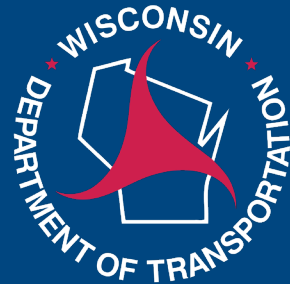


Traffic Signal Systems

Jeremy Iwen and Chloe Kurkjian

December 17th, 2025



State Signal Overview

WisDOT owns and operates 1,073 signals throughout the state

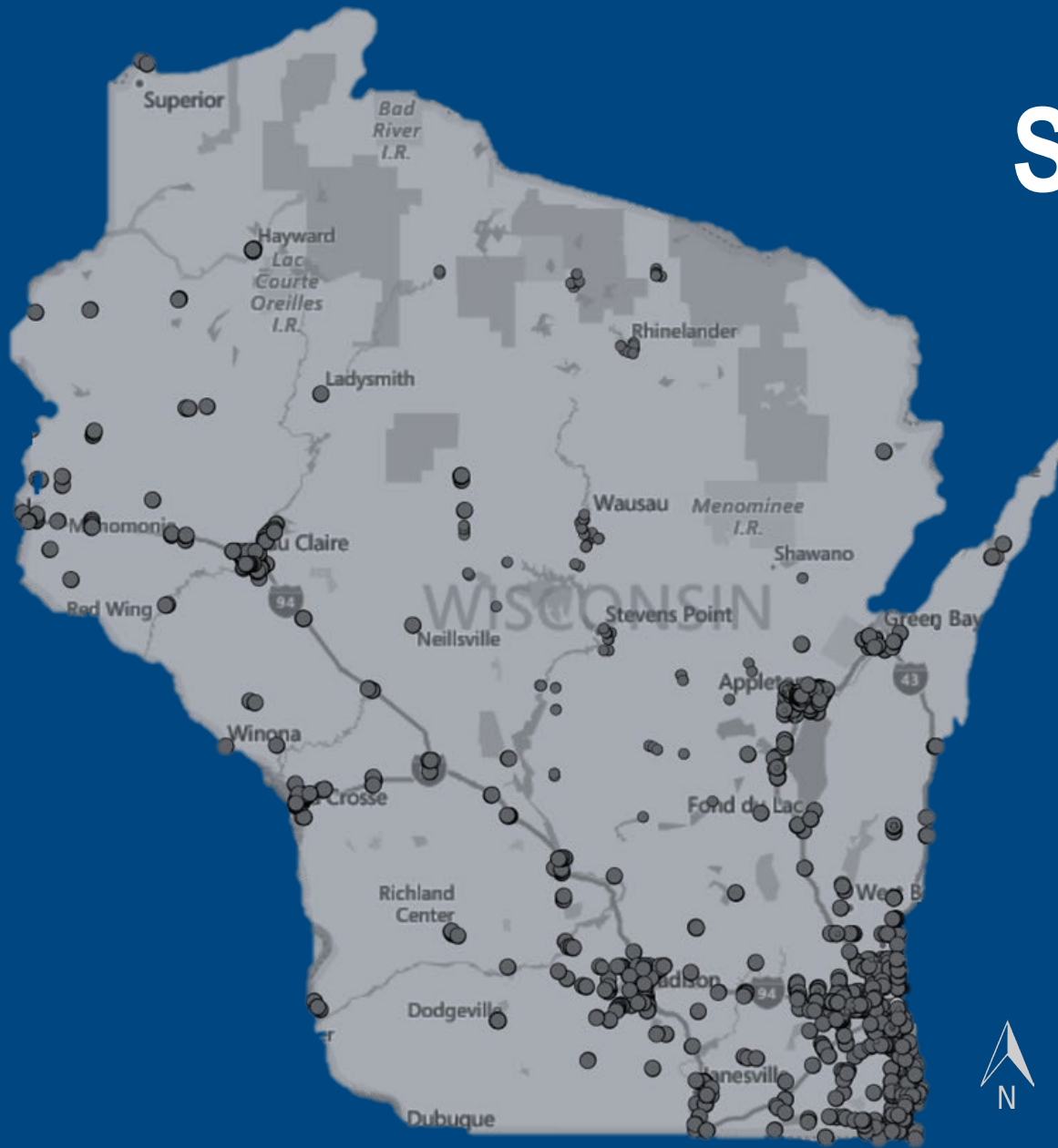
NC Region: 95 signals

NE Region: 131 signals

NW Region: 131 signals

SE Region: 525 signals

SW Region: 191 signals

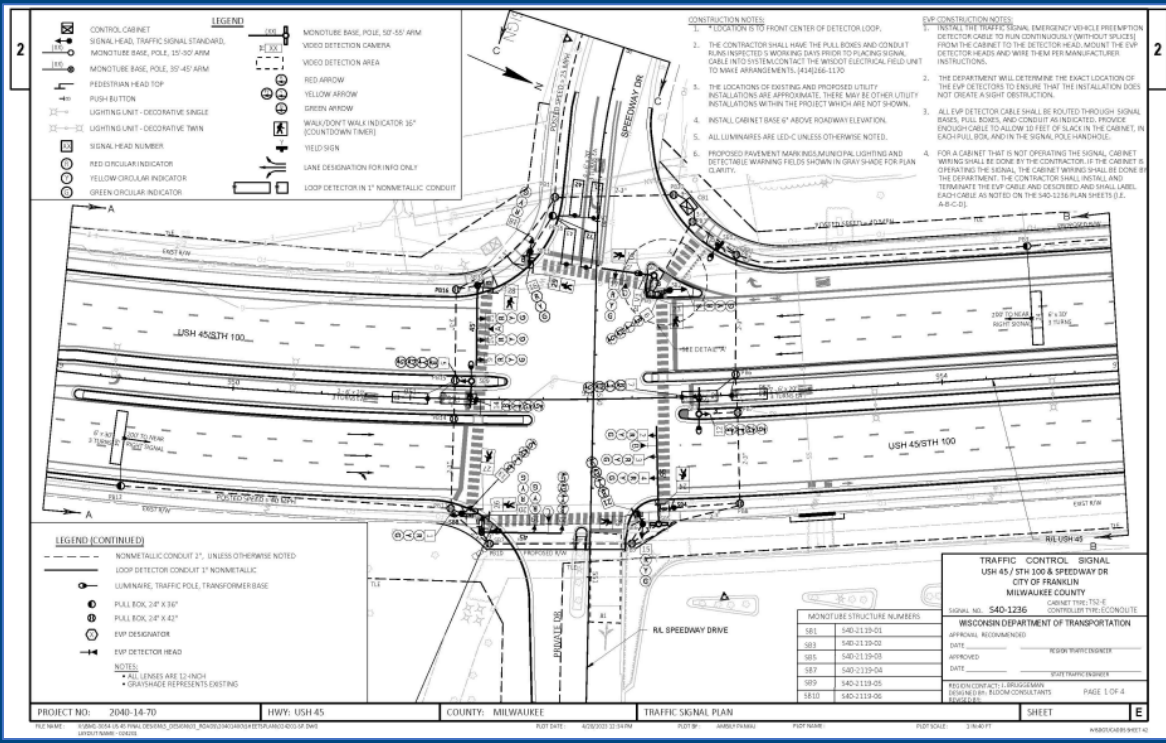


● Signalized Intersection

Signal Plans

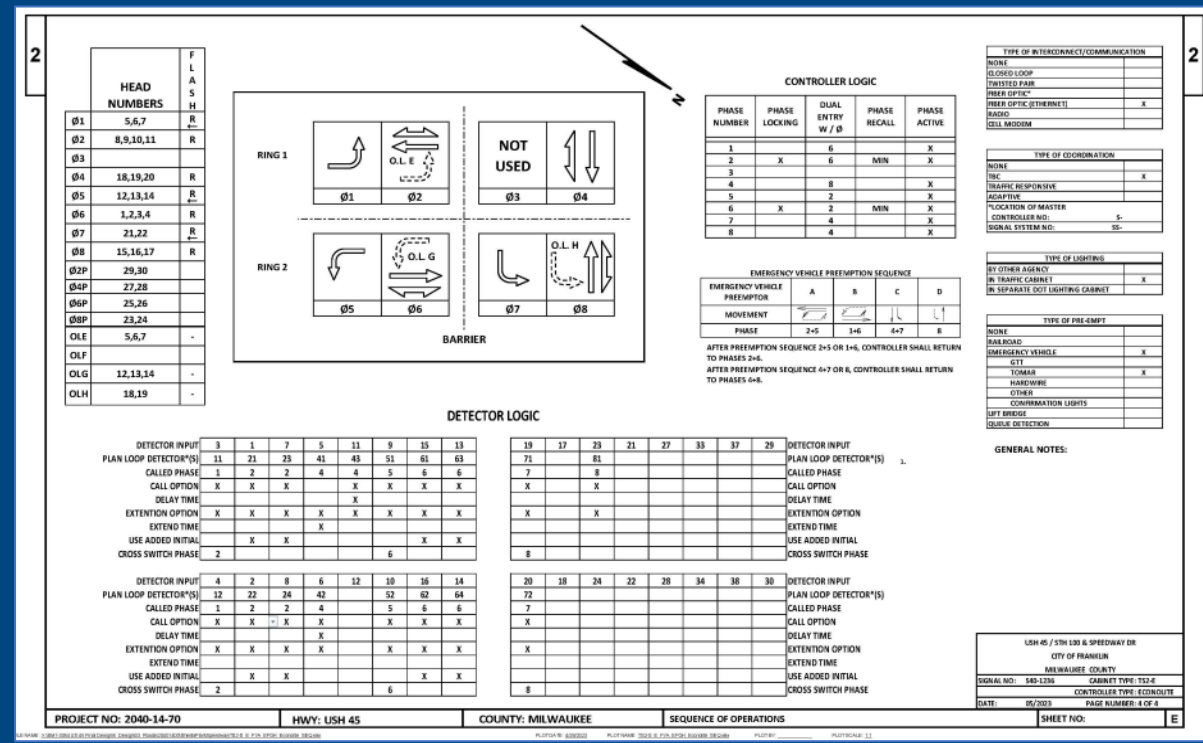
Sequence of Operations

- Phase assignments
- Controller and detector logic
- EVP sequences



Traffic Signal Plan

- Placement of signal heads and other signal infrastructure
- Crosswalk placement and curb design
- Lane designation



Signal Plans

Where do I find design guidance?

- Wisconsin adaptation to the Manual of Uniform Traffic Control Devices (WMUTCD)
[Wisconsin Department of Transportation Wisconsin Manual on Uniform Traffic Control Devices \(WMUTCD\)](#)
- Traffic Engineering, Operations & Safety Manual (TEOpS) Chapter 4
[Wisconsin Department of Transportation TEOpS Chapter 4](#)



Signal Plans

Why not the Traffic Signal Design Manual (TSDM)?

- TSDM is retired, all the information is now in TEOpS Chapter 4



What is in TEOpS Chapter 4?



TEOpS Chapter 4

Highlights

- Glossary of traffic signal terminology
- How to complete a signal warrant analysis
- Signal plan examples



TEOpS Chapter 4

Highlights

- How to design a traffic signal system
 - Where do poles / monotubes go?
 - Where do signal heads go / how many are needed?
 - Detectors needed
 - Emergency Vehicle Preemption / Railroad Preemption



TEOpS Chapter 4

Highlights

- Basic operations
 - Overly simplified.... when are the lights green
- Pedestrian & bicycle considerations



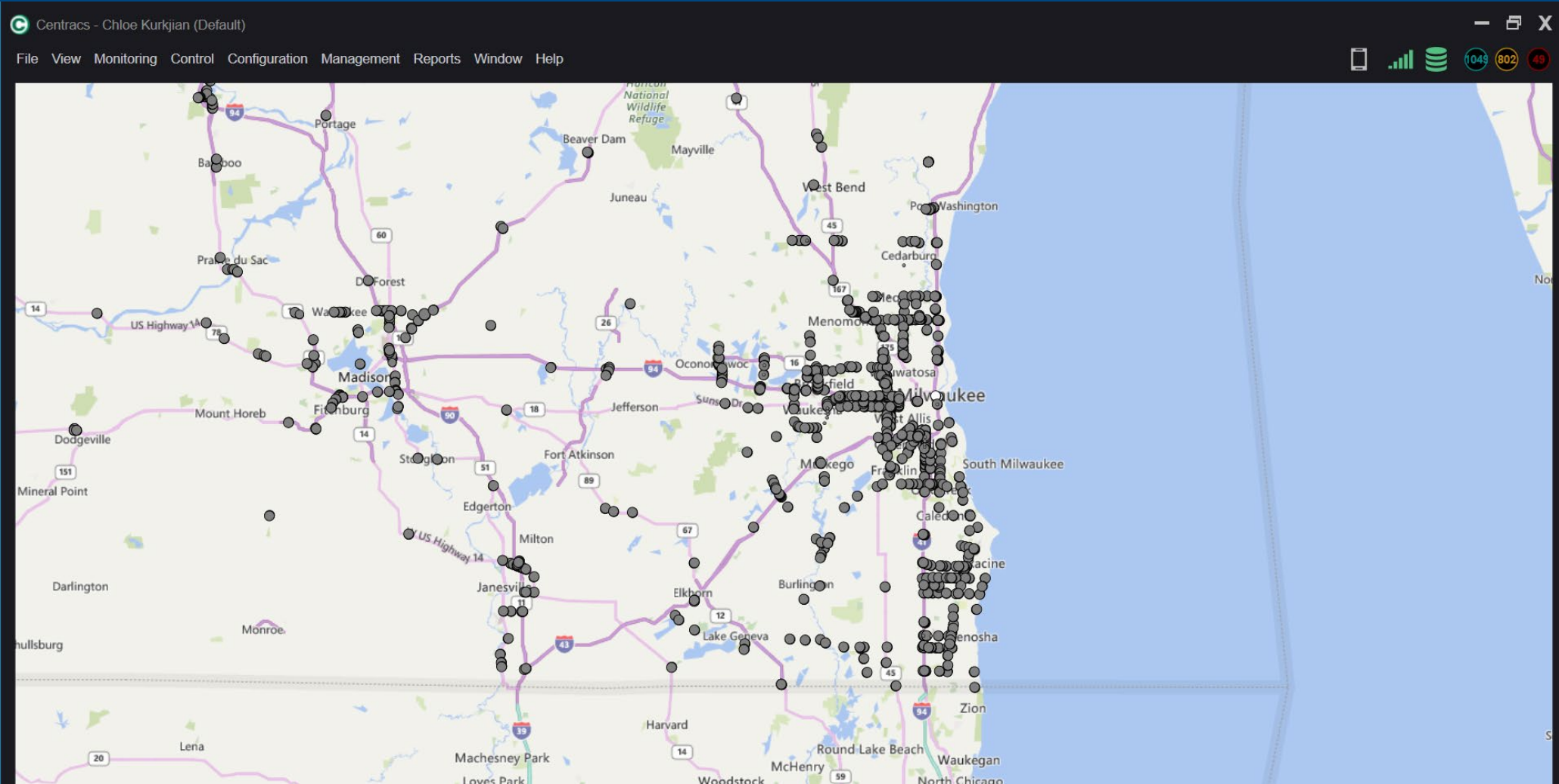
Advanced Traffic Management System

Centracs

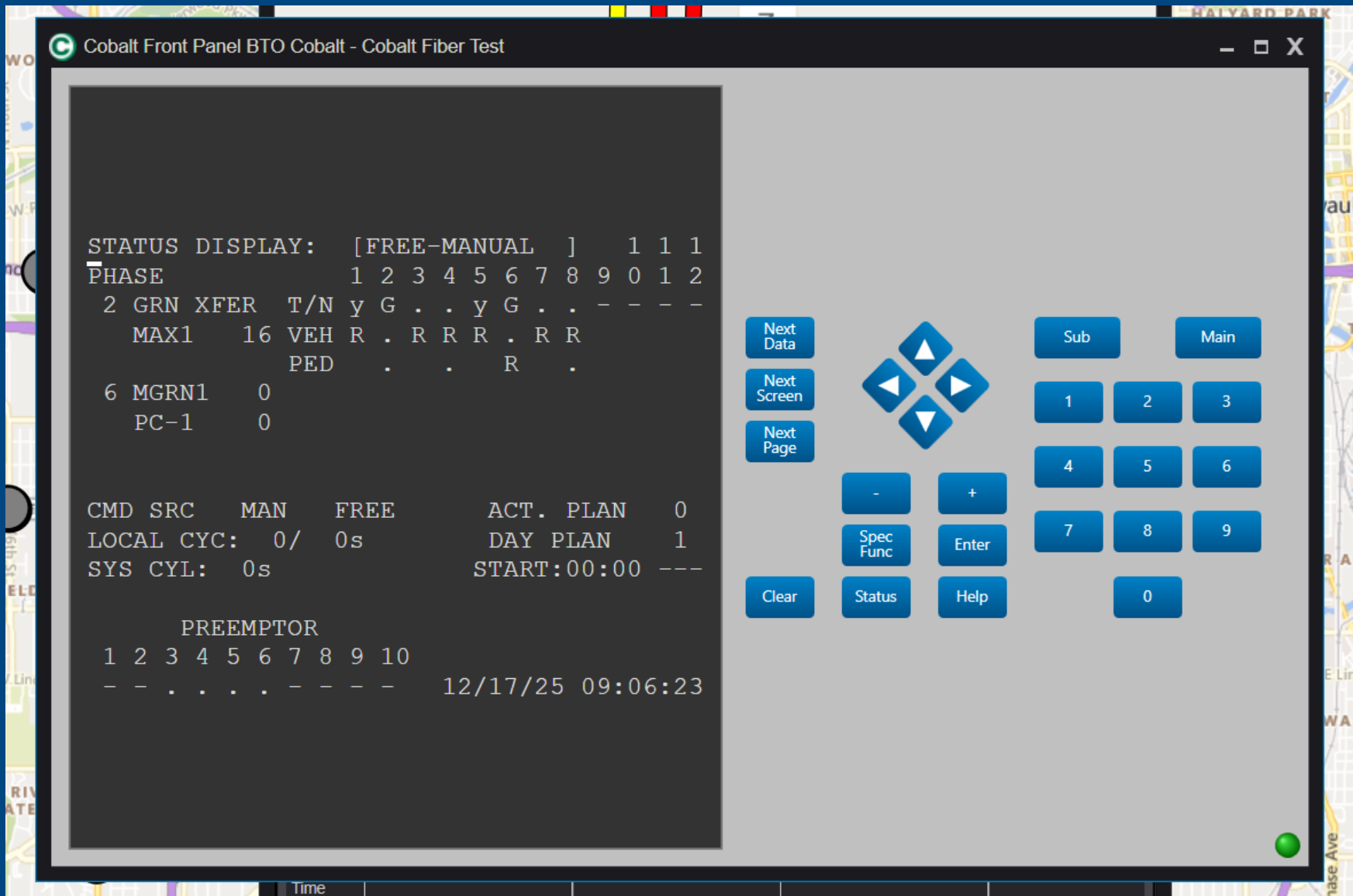
Central signal ATMS developed by Econolite

Features

- Traffic signal monitoring and control
- Data collection and analytics
- Signal performance measures
- Device and detection management







Automated Traffic Signal Performance Measures

WisBOOM

Free web-based software using UDOT's ATSPM program

Features

- Real-time and historical analytics
- Performance measurement
- Alerts and maintenance support



Automated Traffic Signal Performance Measures

How does it work?



Automated Traffic Signal Performance Measures

- Signal controller uploads information to server every 15 minutes
- ATSPM software uses the data to produce graphs with desired information
- Allows user to receive near immediate feedback of how signal is performing



Automated Traffic Signal Performance Measures

How is the data provided by ATSPM used?



Automated Traffic Signal Performance Measures

ATSPM Data Usage

- Optimizing traffic signal timing
 - Some measures show if there is time wasted (gap outs) or not enough time given (force off or max outs) during the cycles. Also can find out if all the traffic is cleared from the queue during a phase (split failure).
 - Depending on the traffic, may take time from one phase and shift it to another phase, or reduce the length of the cycle.



Automated Traffic Signal Performance Measures

ATSPM Data Usage

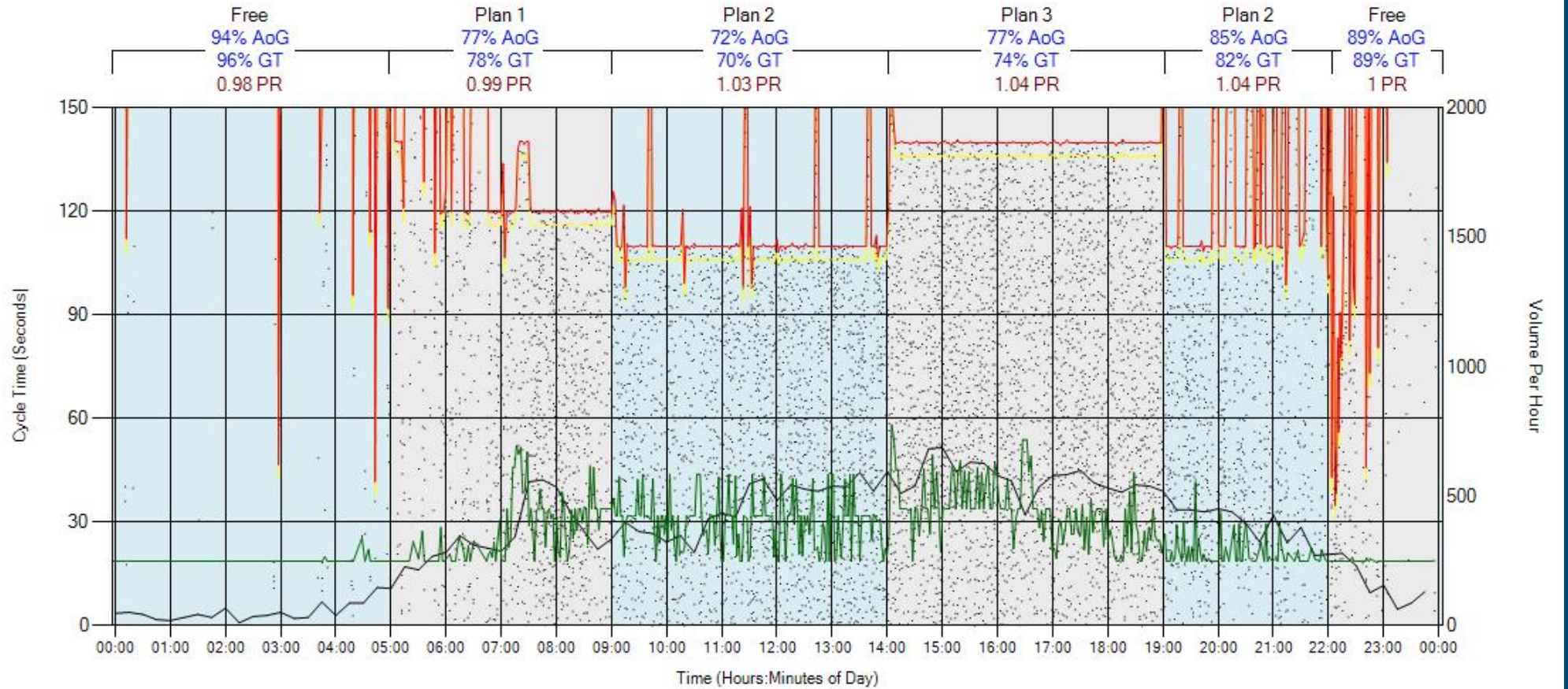
- Check corridor coordination
 - Provides the percentage of vehicles arriving to the signal on green
 - Tells user if the signals are coordinated correctly, or if adjustments are required.



Phase 6: P6 Northbound Through

AoG = 78%

- Volume Per Hour
- Detector Activation
- Change to Green
- Change to Yellow
- Change to Red
- AoG - Arrival On Green
- GT - Green Time
- PR - Platoon Ratio



Automated Traffic Signal Performance Measures

ATSPM Data Usage

- Traffic Volumes
 - Can retrieve through and turning traffic volumes

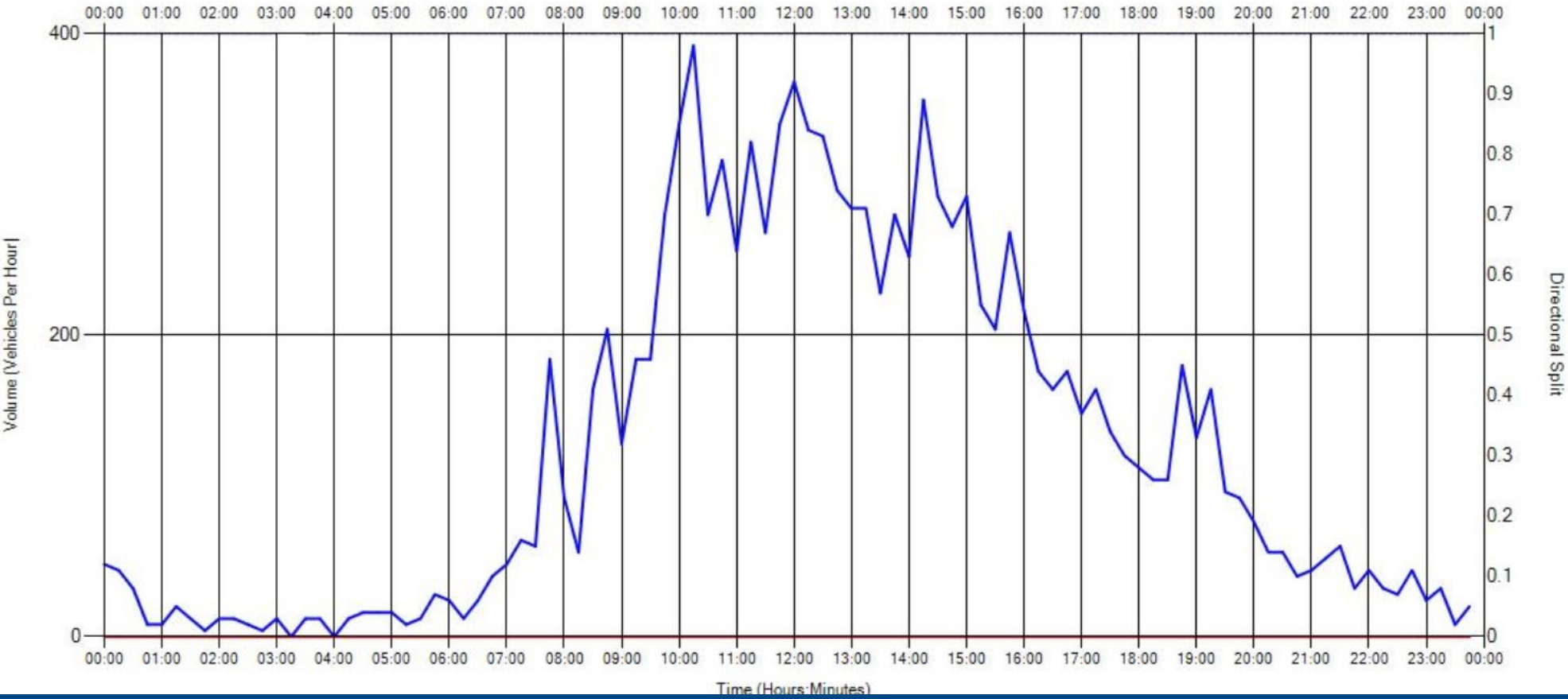


I41 NB @ Lombardi Ave - SIG#051354
Sunday, December 14, 2025 12:00 AM - Monday, December 15, 2025 12:00 AM

Northbound and Southbound Approaches

Inductive Loops at stop bar

- Northbound
- Southbound
- Northbound D-Factor
- Southbound D-Factor

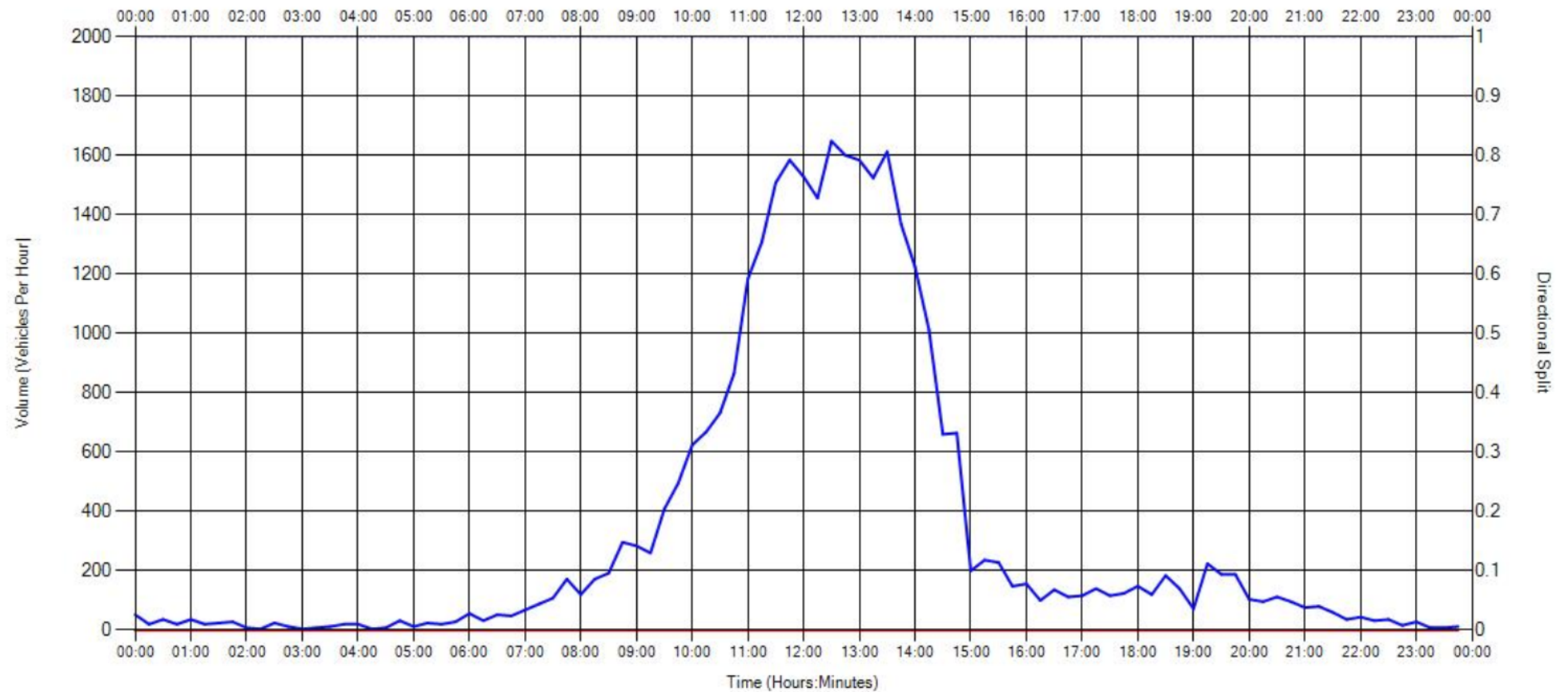


I41 NB @ Lombardi Ave - SIG#051354
Sunday, December 7, 2025 12:00 AM - Monday, December 8, 2025 12:00 AM

Northbound and Southbound Approaches

Inductive Loops at stop bar

- Northbound
- Southbound
- Northbound D-Factor
- Southbound D-Factor

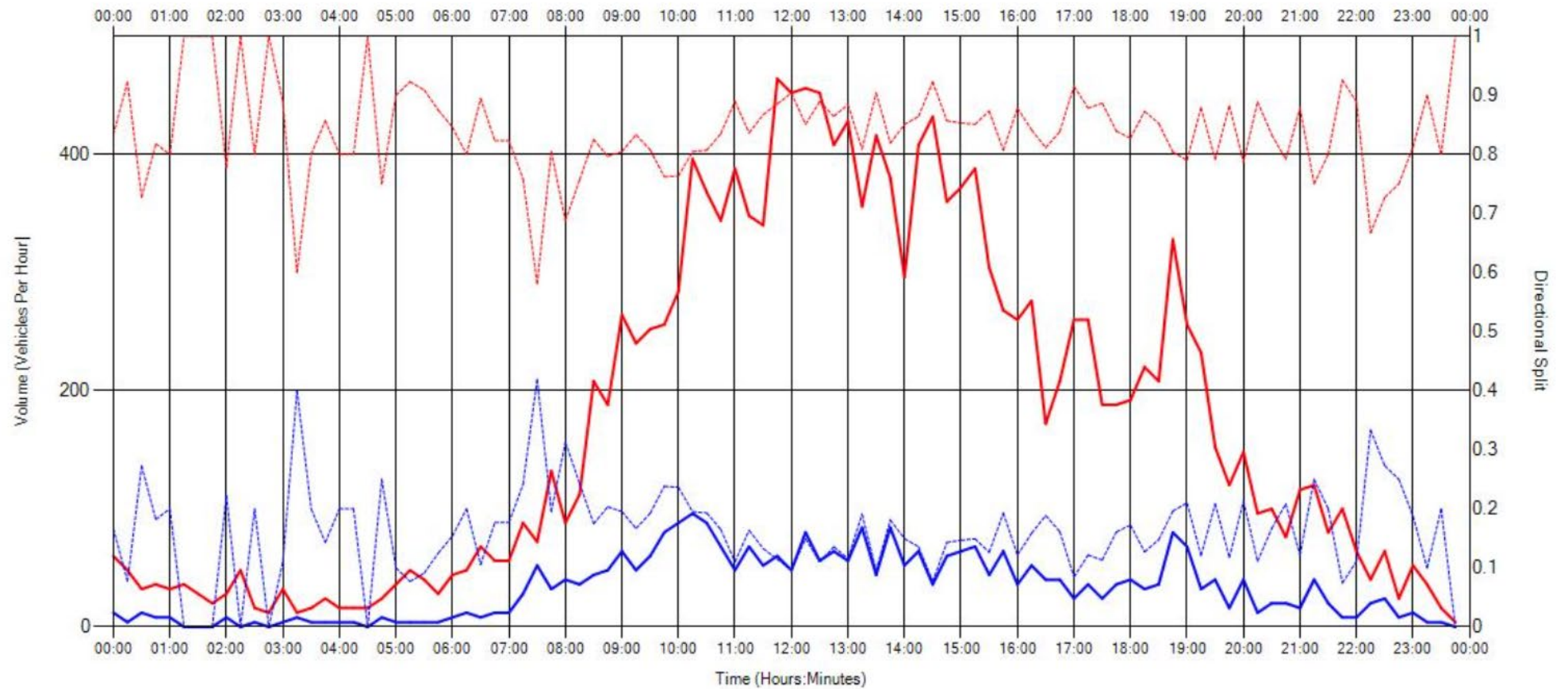


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Eastbound and Westbound Approaches

Inductive Loops at stop bar

- Eastbound
- Westbound
- Eastbound D-Factor
- Westbound D-Factor

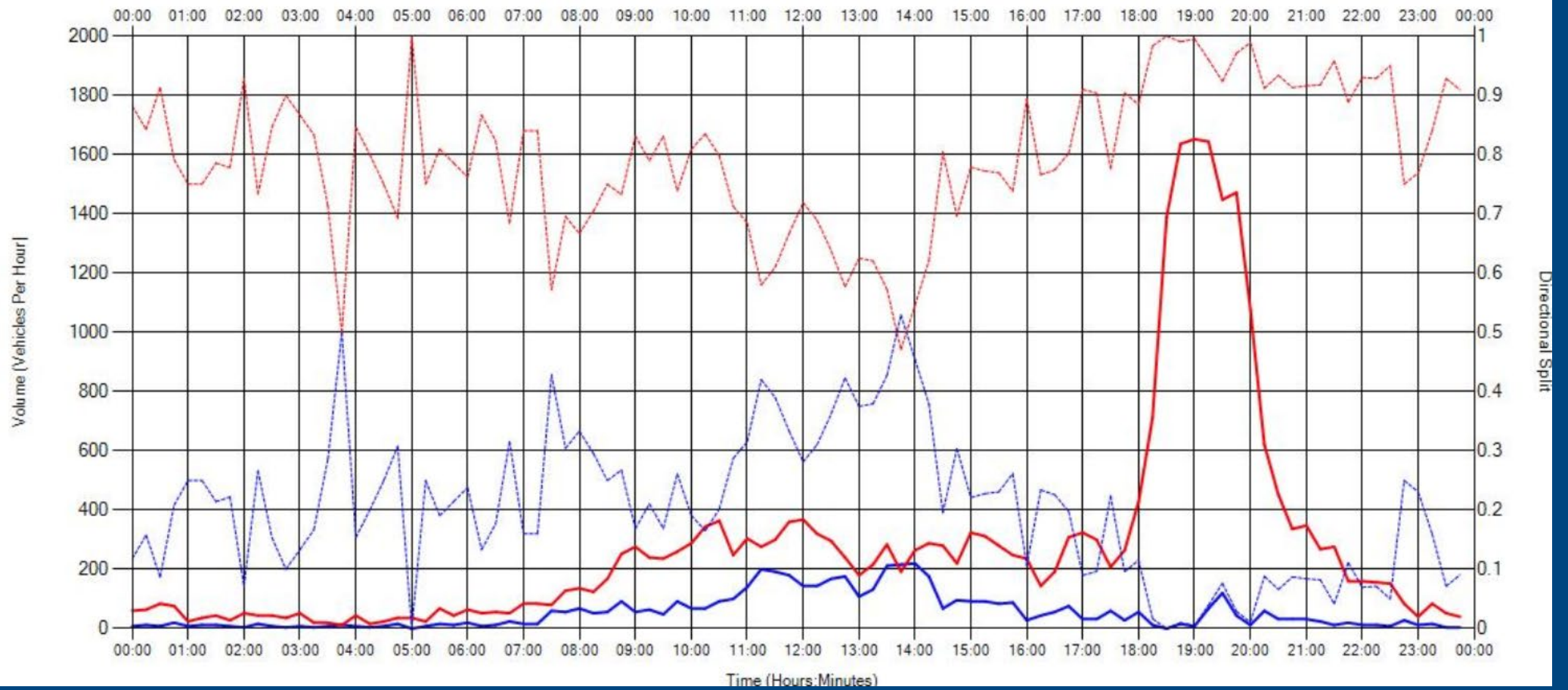


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Eastbound and Westbound Approaches

Inductive Loops at stop bar

- Eastbound
- Westbound
- Eastbound D-Factor
- Westbound D-Factor



Automated Traffic Signal Performance Measures

ATSPM Data Usage

- Problems with signals
 - Users can elect to receive daily emails that will alert the users of possible signal malfunctions.
 - Issues include malfunctioning detectors (stuck on or stuck off), malfunctioning pedestrian push buttons, and communication issues.



Thank you

Questions?

