# Signal Timing in Burlington County

Mid Atlantic Section of
ITE Annual Conference

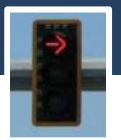
Lancaster, PA

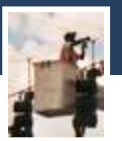
September 27, 2019

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

BOARD OF CHOSEN FREEHOLDERS 1694 BURLINGTON COUNTY, NEW JERSEY


# Team Partners





- **Traffic Signal Timing Initiative Team Partners:**

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

BOARD OF CHOSEN FREEHOLDERS 1694 BURLINGTON COUNTY, NEW JERSEY

DEPARTMENT OF TRANSPORTATION THE STATE OF NEW JERSEY

- **Consultant Team:**

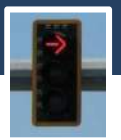
TWT Taylor Wiseman & Taylor ENGINEERS | SURVEYORS | SCIENTISTS

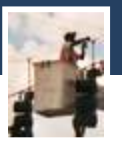
AG Albeck Gerken, Inc. Transportation Engineers

Imperial TRAFFIC & DATA COLLECTION

McMAHON TRANSPORTATION ENGINEERS & PLANNERS

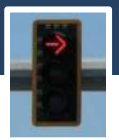
# Project Champions for New Jersey

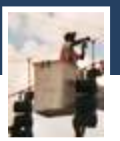


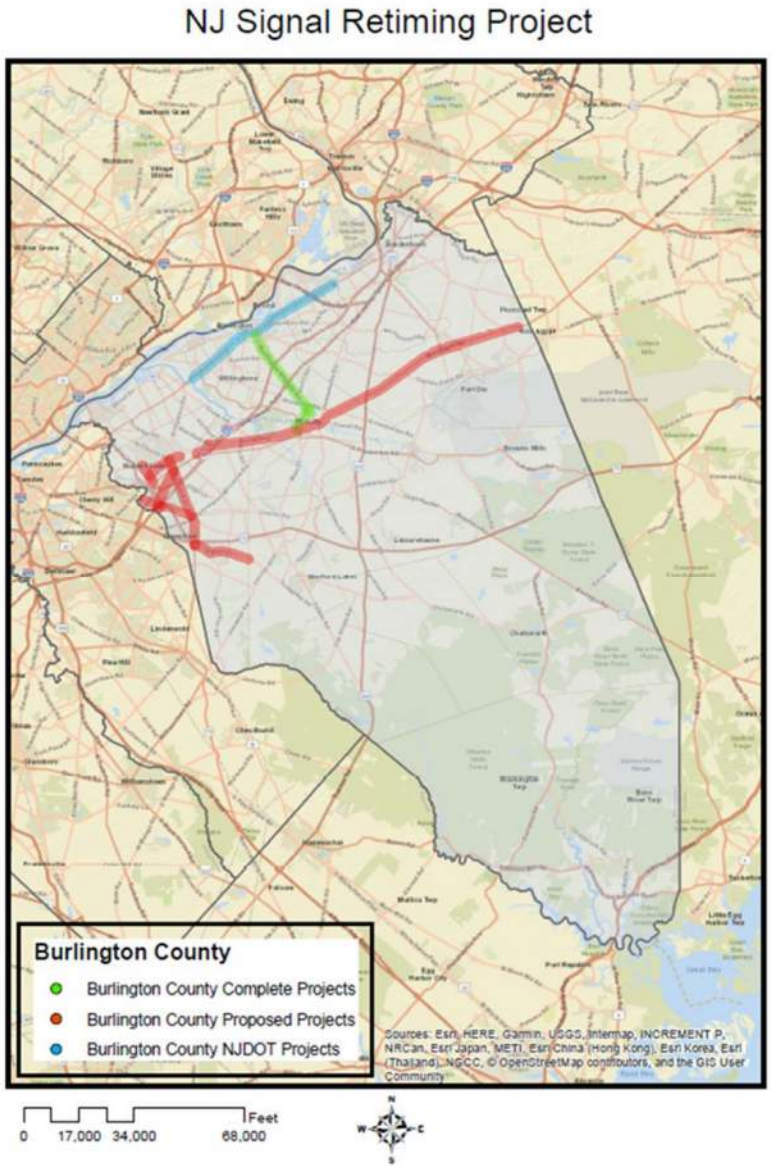


- **DVRPC**
  - **Christopher King:** Manager, Office of Transportation Operations Management
  - **Paul Carafides:** Senior Transportation Planner, Office of Transportation Operations Management

# Project Champions for New Jersey

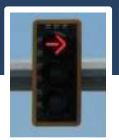


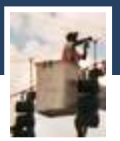




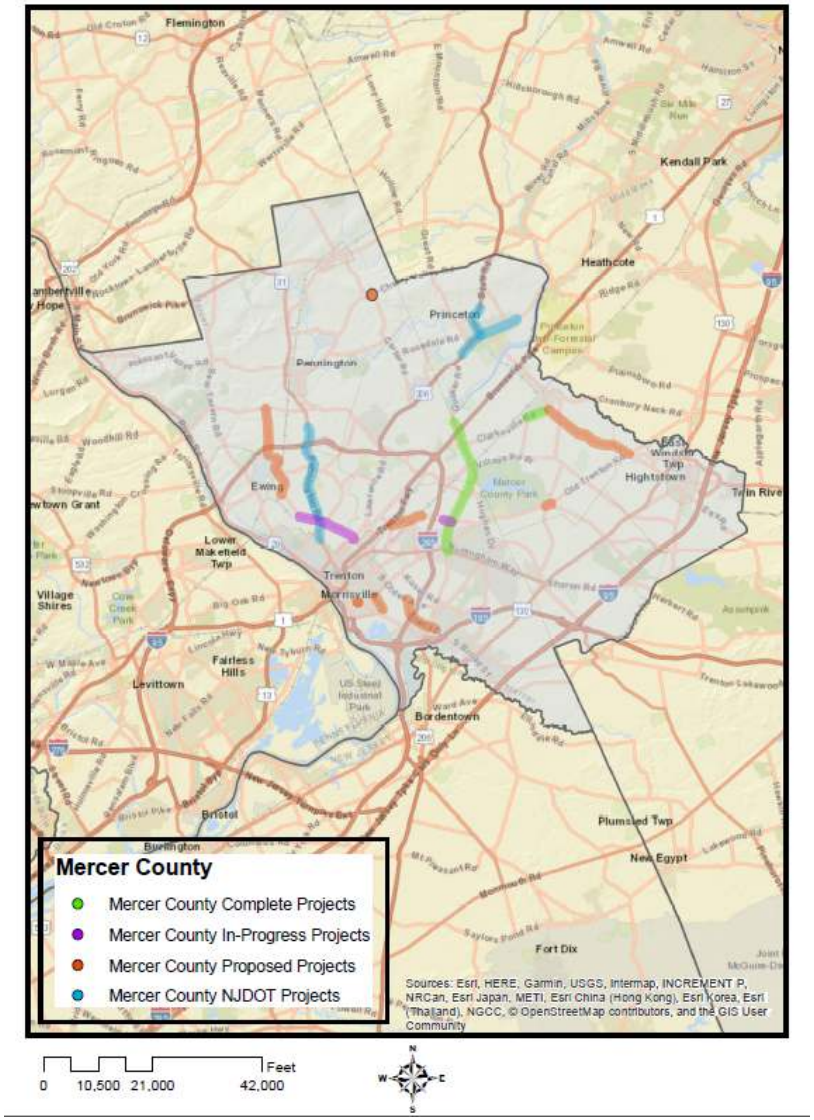

- **Burlington County**
  - **Marty Livingston,** Traffic Engineer, Burlington County
  - **Michael J. Nei,** Principal Engineer, Traffic, Burlington County
- **10 Proposed Corridors**
- **1 complete**

# Project Champions for New Jersey





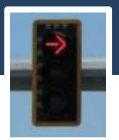
NJ Signal Retiming Project

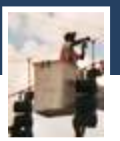



- **Mercer County**
  - **George Fallat, P.E.;** County Engineer
  - **Jeff L'Amoreaux, P.E.;** Principal Traffic Engineer

- **11 Proposed Corridors**
- **3 complete**

# Project Champions for New Jersey





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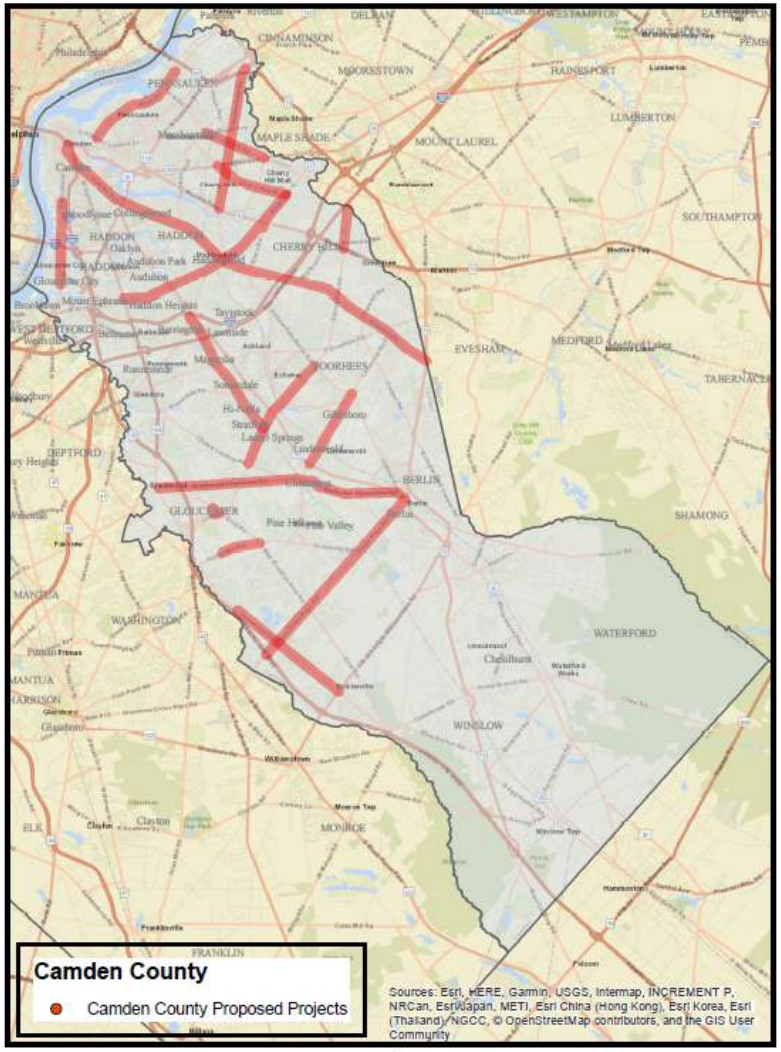
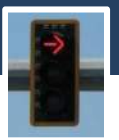
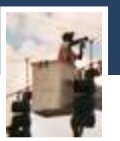



- **Camden County**
  - **Andrew Levecchia;** Director of Planning
  - **Kevin Becica, P.E.;** County Engineer

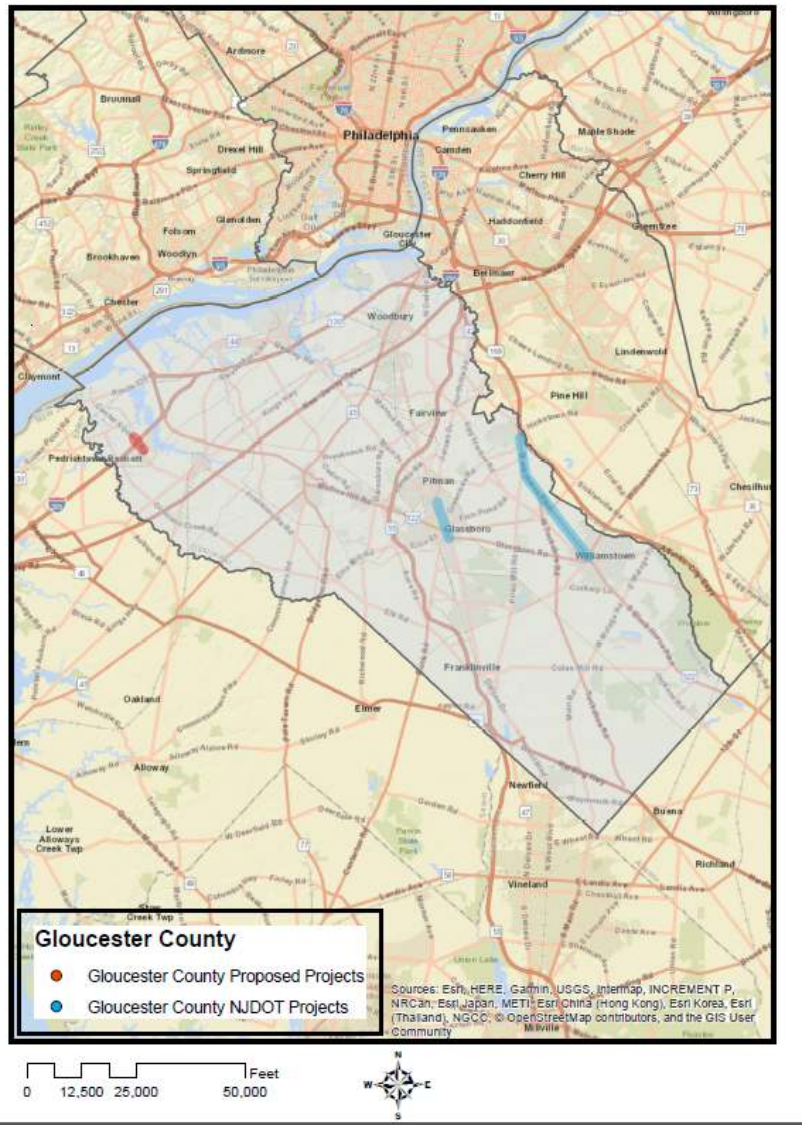
- **17 Proposed Corridors**
- **0 complete**

# Project Champions for New Jersey





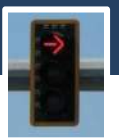
NJ Signal Retiming Project

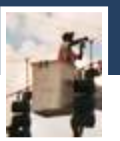



- **Gloucester County**
  - **David Lubelski, P.E.;** Assistant County Engineer

- **1 Proposed Corridors**
- **0 complete**

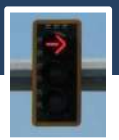
# Project Development/History

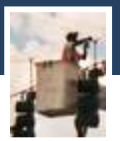




- Based on successful PennDOT 6-0 contract, now in its second iteration (first contract TWT, second Albeck Gerken)
- DVRPC Contracts, TIP, CMP, LRP at table from beginning
- TIP Line Item
- Concept discussed for years
- Collaboration with Burlington, Camden, Gloucester and Mercer Counties to initiate development
- Aware of NJDOT optimization contracts, focused solely on County Highways

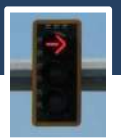
# Financial Support

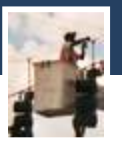




- **DVRPC's *Connections 2040* Long Range Plan**
  - Transportation Investment Priorities
    - Preserve and maintain existing transportation system and rights of way
    - Improve the operation of existing transportation facilities
    - Increase the capacity of existing multimodal transportation system, limiting the addition of through travel lanes
- **100% CMAQ funded through the TIP**
- **Contract through DVRPC**
  - Open Ended, set up for multiple years
  - $350,000 a year for four years
  - Flexible scope to meet needs of each corridor

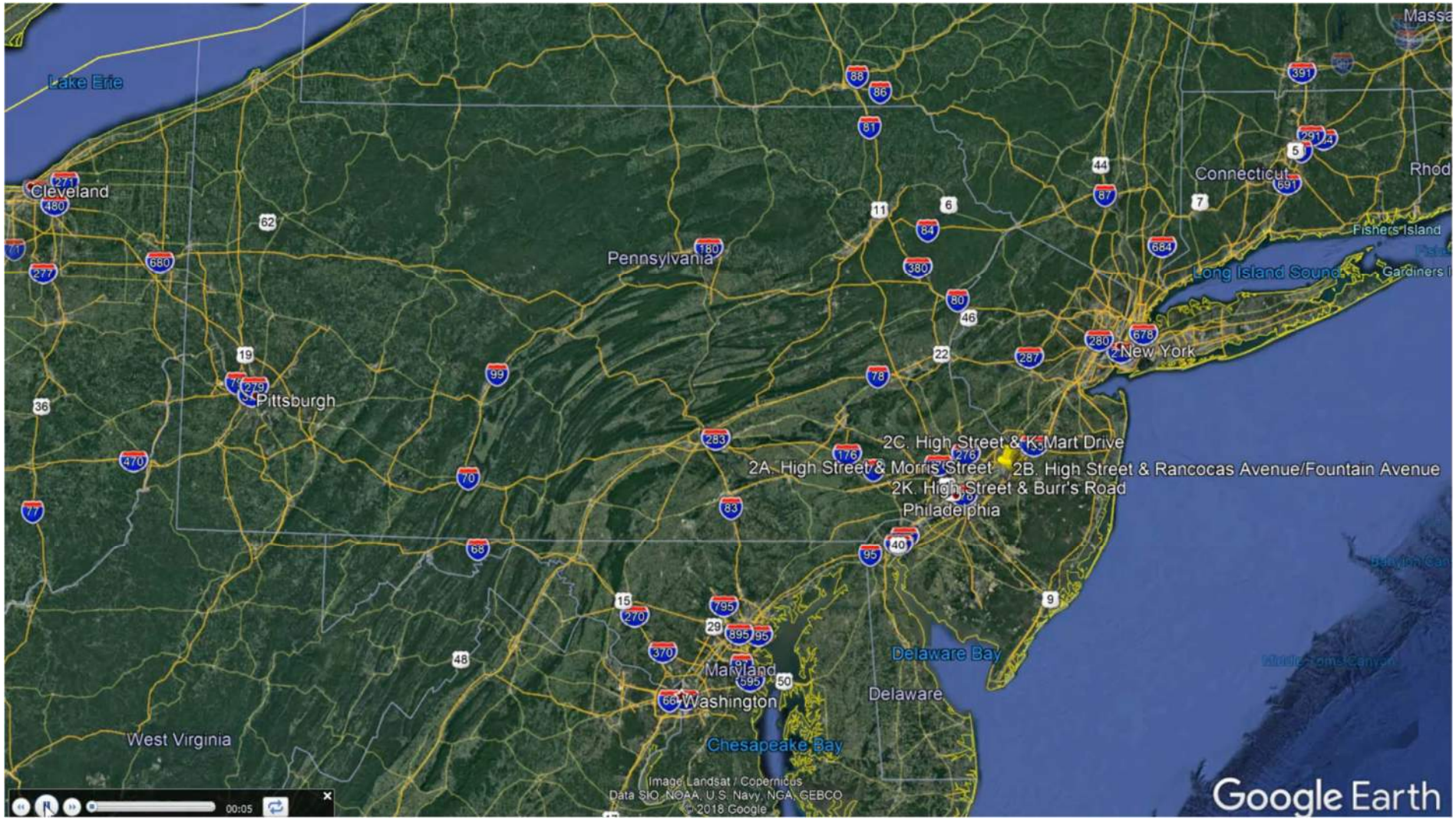
# Project Accomplishments to Date



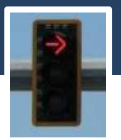


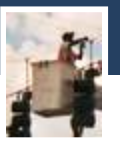
- Consultant team met with each County to identify candidate corridors.
- Each corridor/intersection quickly assessed for operational issues (communication, detection, controller time clock)
- Consultant team had second meetings to rank candidate corridors and begin actual design/implementation of new timings.
  - Managing expectations, identifying constraints
- 10 Corridors identified in Burlington County as initial potential candidates
- First corridor implementation completed  August 2018
  - Burlington (CR 541), 19 intersections
  - 20% improvement in travel time, delay, stops

# Burlington County 541



# The Signal Timing Process





- Met with County to identify candidate corridors

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Minimize Delays

Reduce Emissions

Manage Queues

Determine Project Goals, Define Success, Determine Schedule

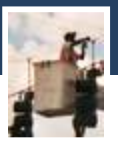
Reduce Stops

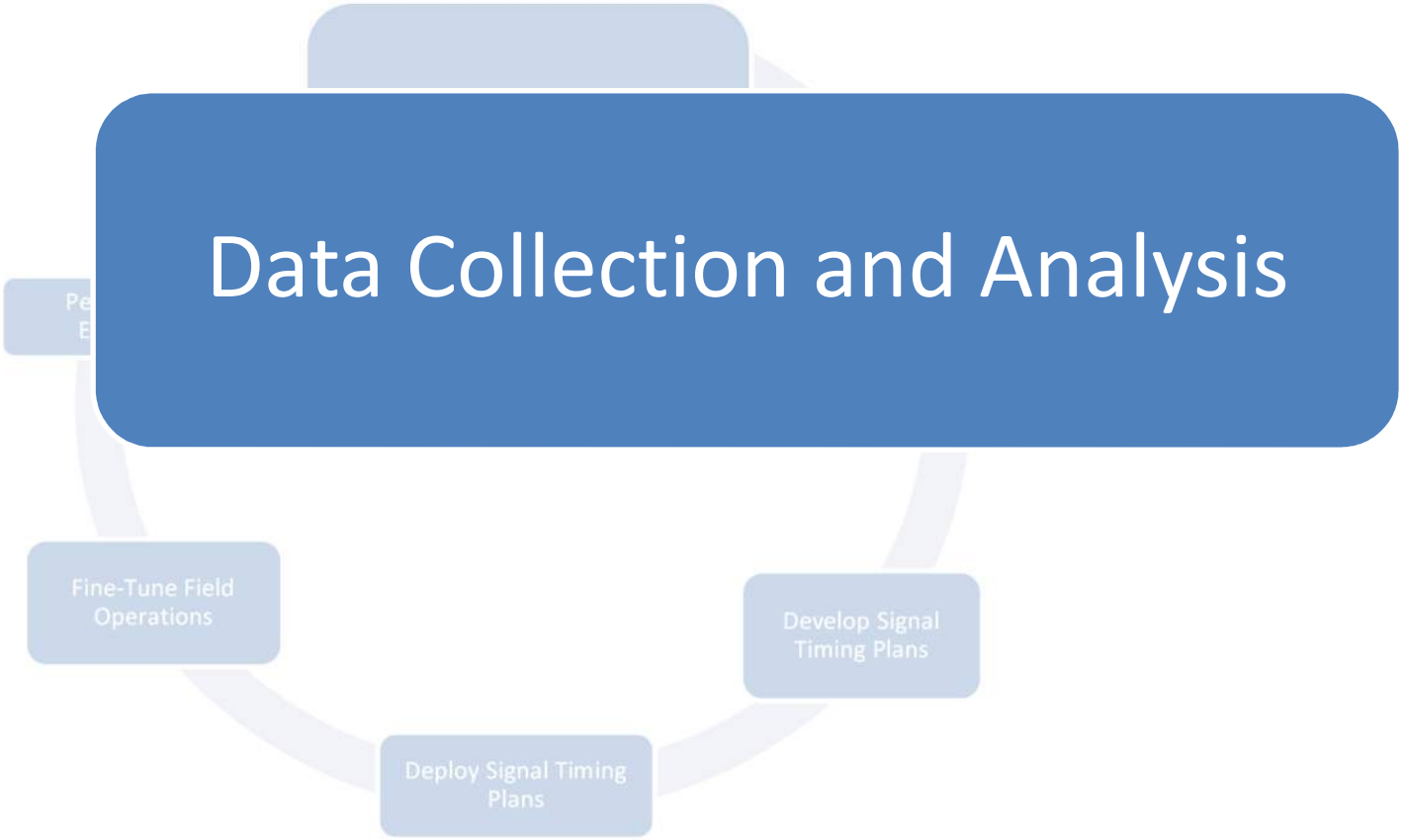
Reduce Complaints

Increase Throughput

# Six-Step Signal Timing Process

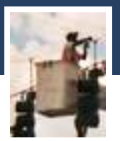




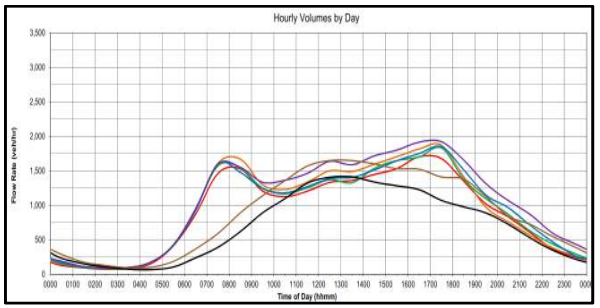


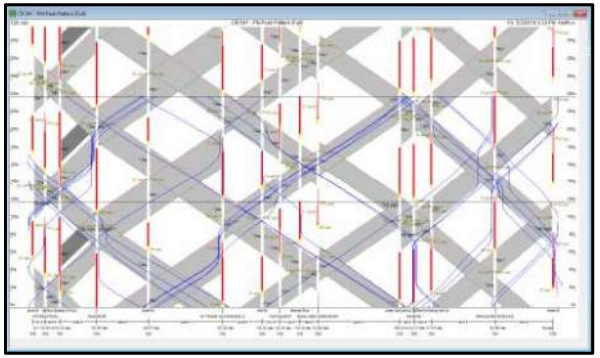
# Data Collection





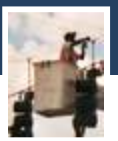
- 24-Hr Weekly Volume Profiles
- Turning Movement Counts
  - Miovision SCOUT units deployed
- Travel Time Runs
  - Tru-Traffic w/ Video
- Signal System/Field Intersection Inventory
  - Link lengths
  - Lane widths and types
  - Controller Type
  - Condition of Signal Equipment
  - Existing Communication Equipment
  - Detection Devices
  - Existing Timings and Phasing
  - Status of time clock?

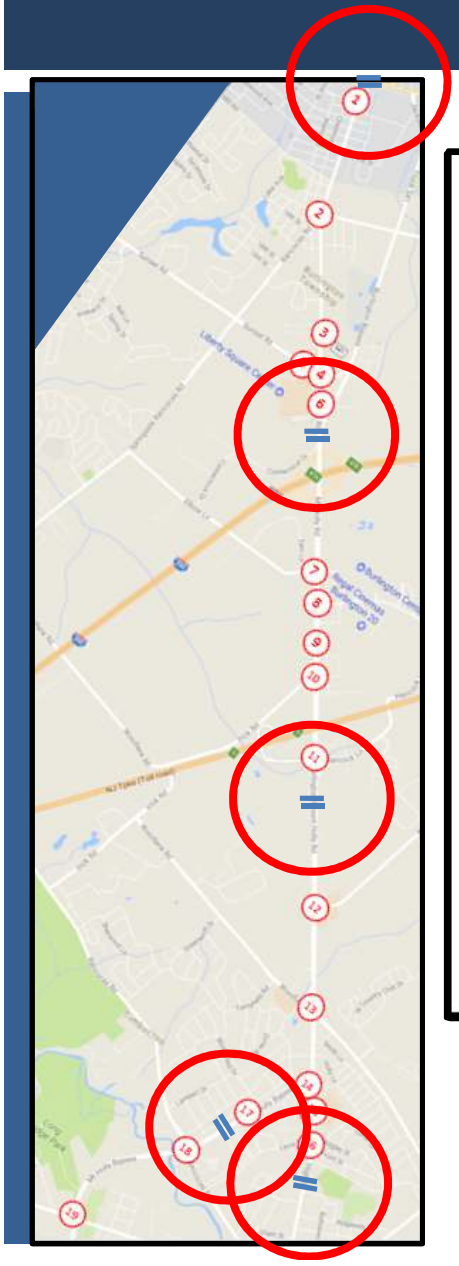


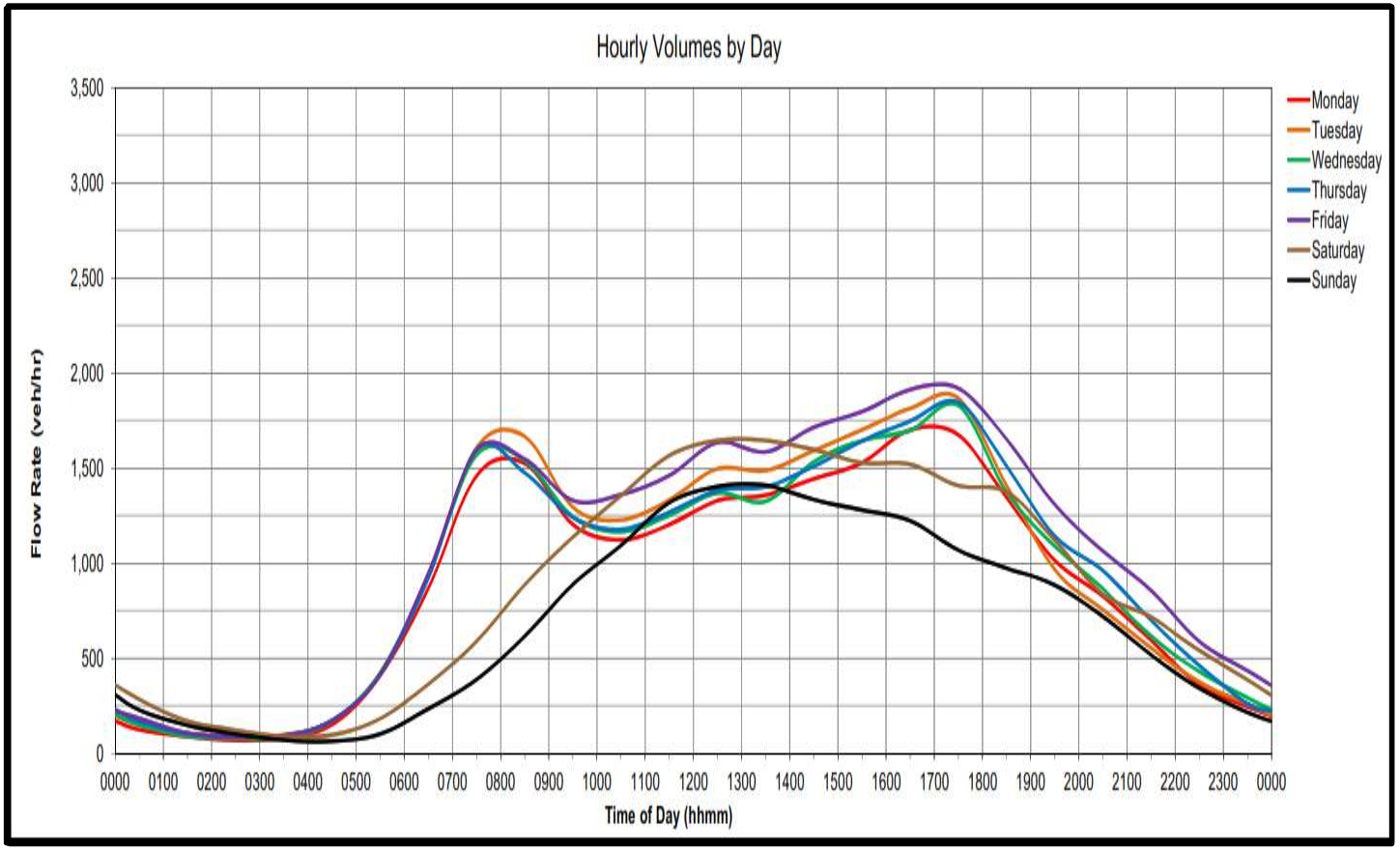



# Data Collection



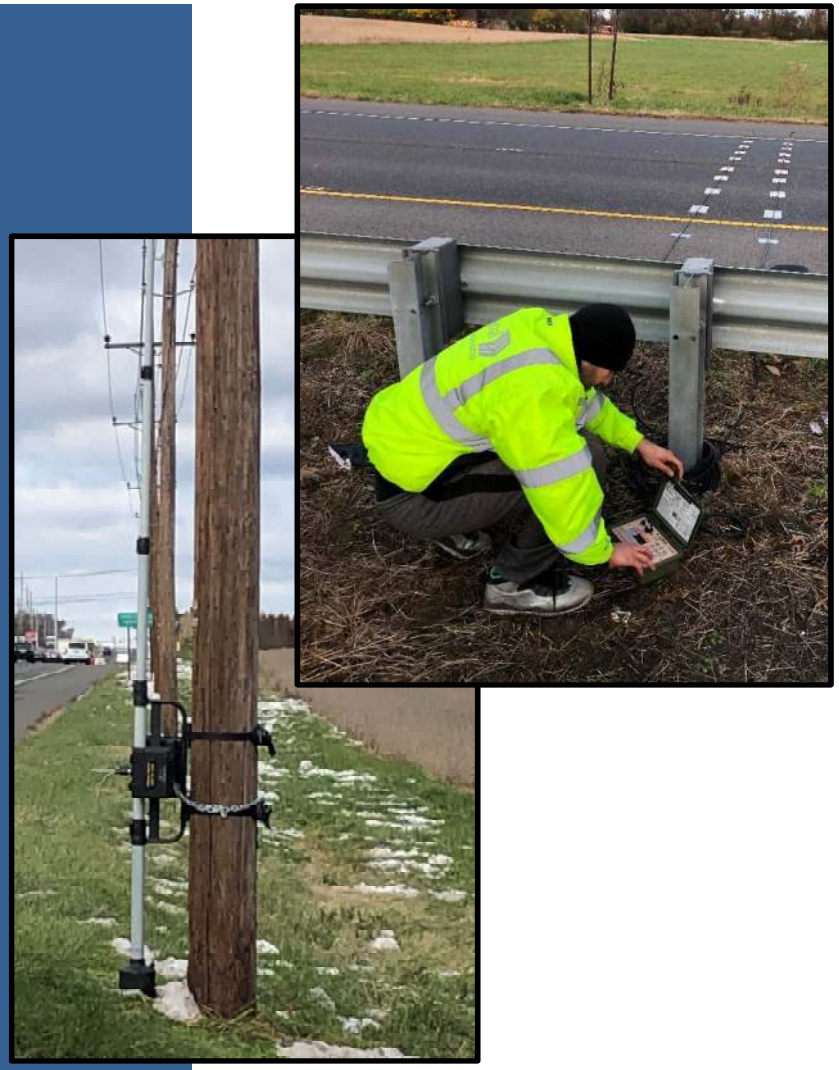






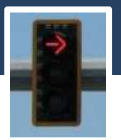

CR 541, Average Daily Traffic

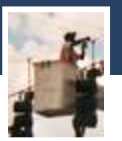
# Lessons Learned: Data Collection



- Use of Miovision has greatly improved accuracy of data and reduced costs
- ATR counts provide valuable insight into traffic patterns
  - Most traffic patterns are recurring
- ATR counts/manual turning movement counts done concurrently for QA/QC

# Six-Step Signal Timing Process





# Signal Timing Development Considerations

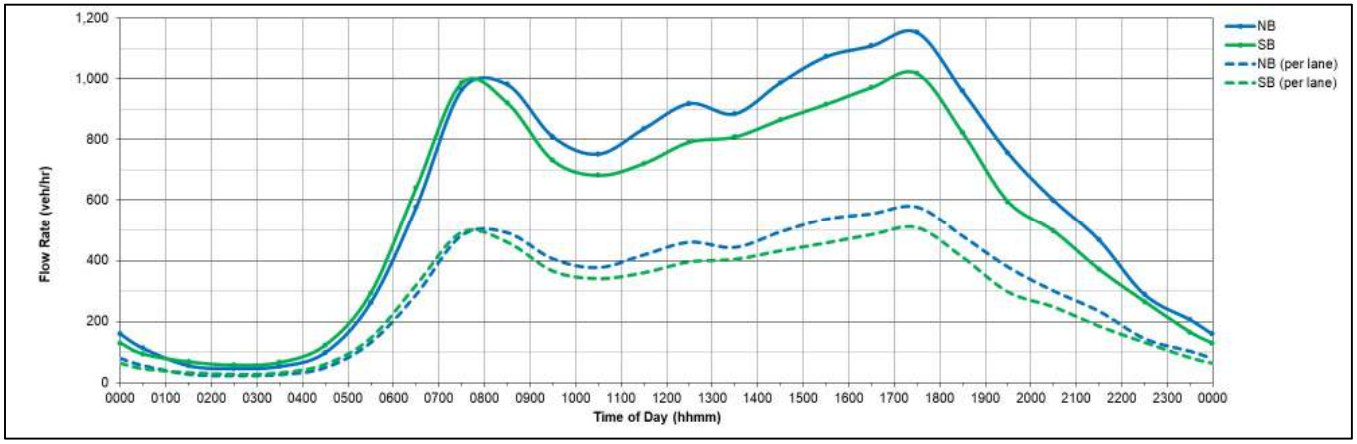


- Stated goals and what will be considered a success?
  - Safety and Quality
- Conceptual Strategy
- Design speed vs Posted Speed
- Thinking ‘inside the box’
- Logical Zones

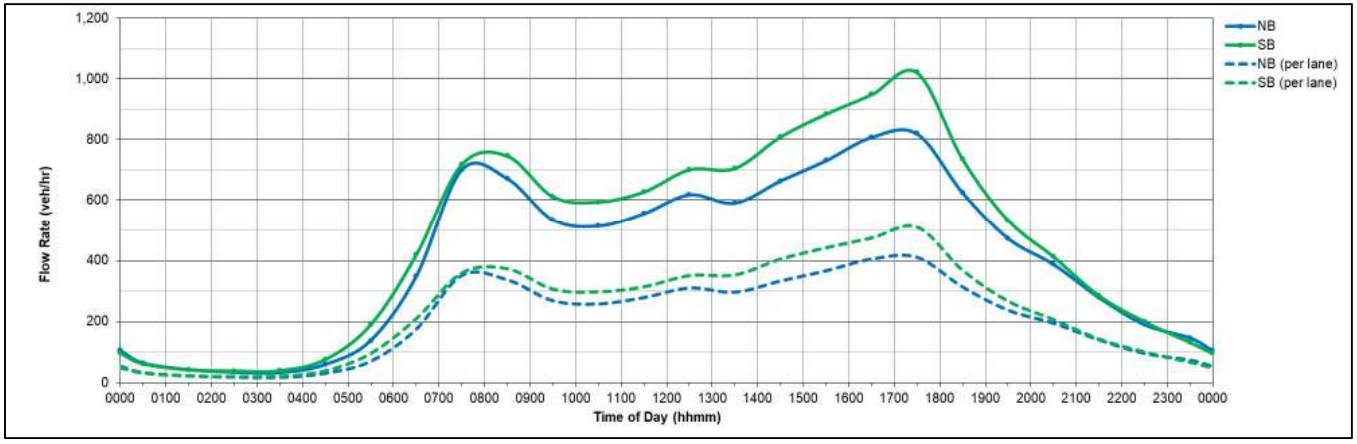
# Development of Timing Plans



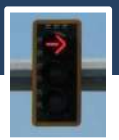
Average Weekday Volumes North of I-295

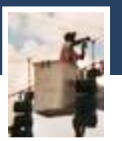


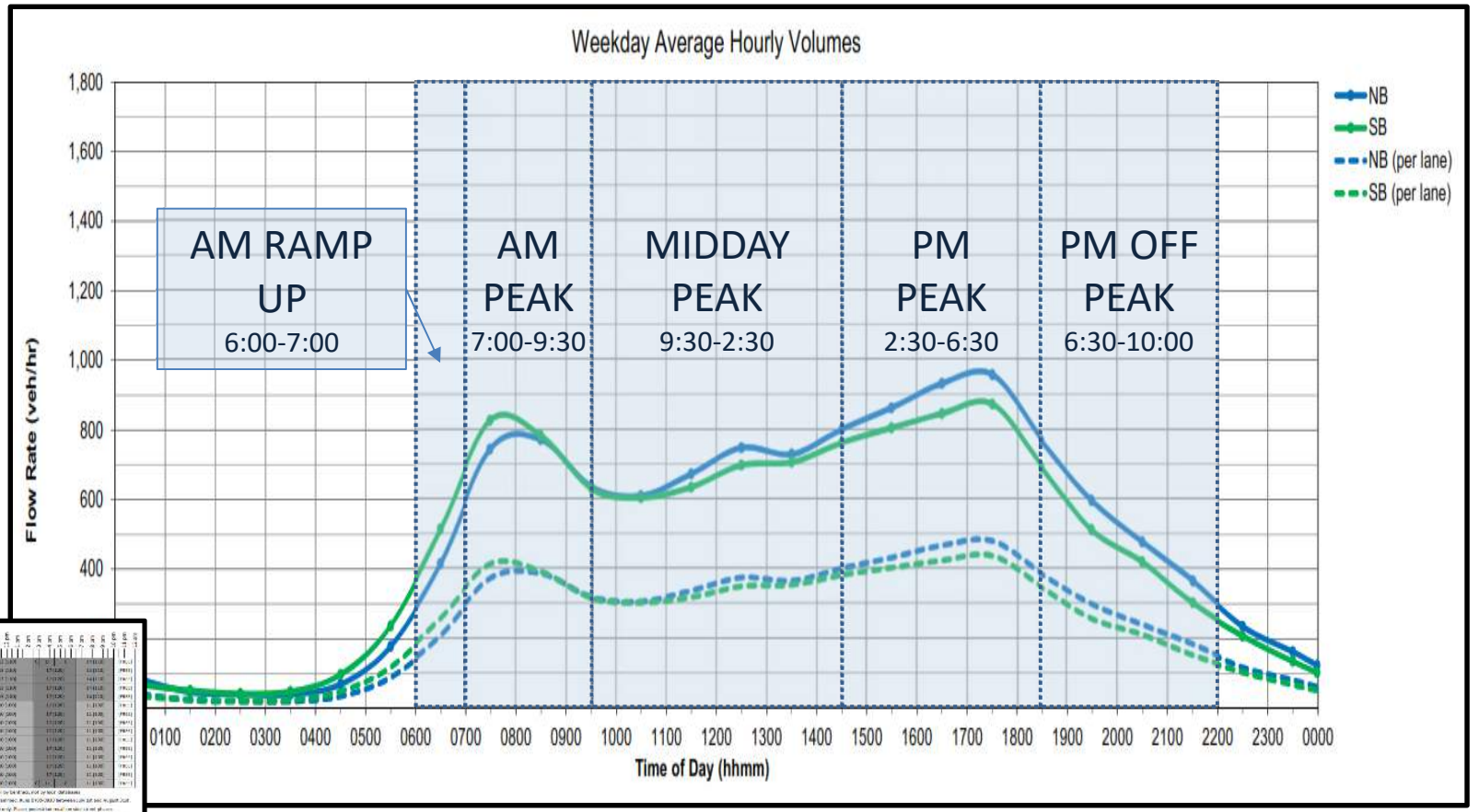

Average Weekday Volumes South of I-295

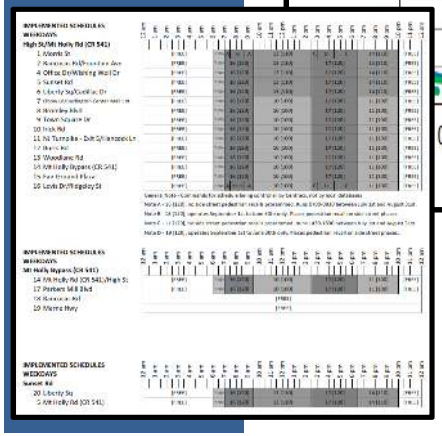


# Weekday Timing Plan



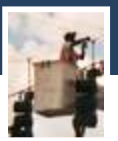


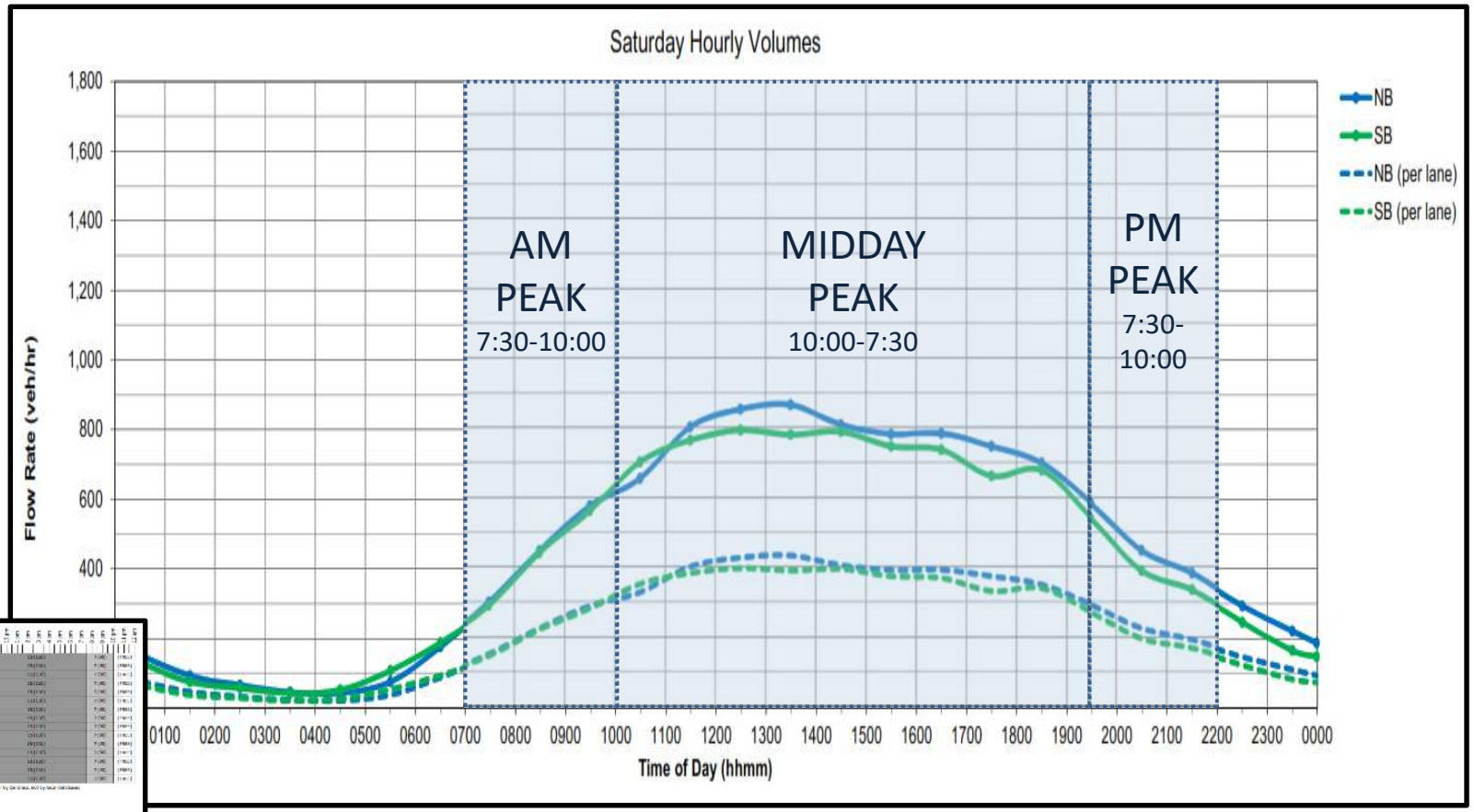


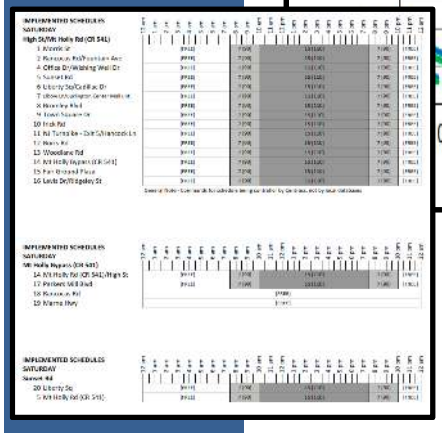



# Saturday Timing Plans

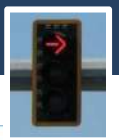


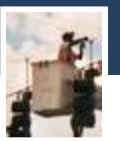




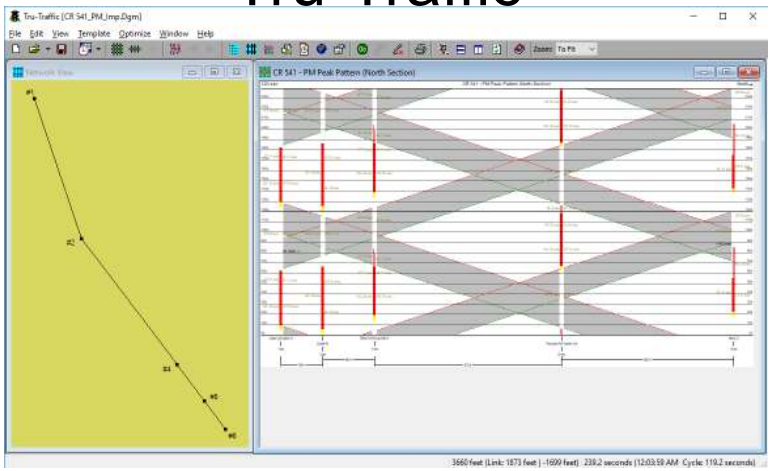



# Model Building / Optimization





Tru-Traffic



Universal Traffic Data Format (UTDF)

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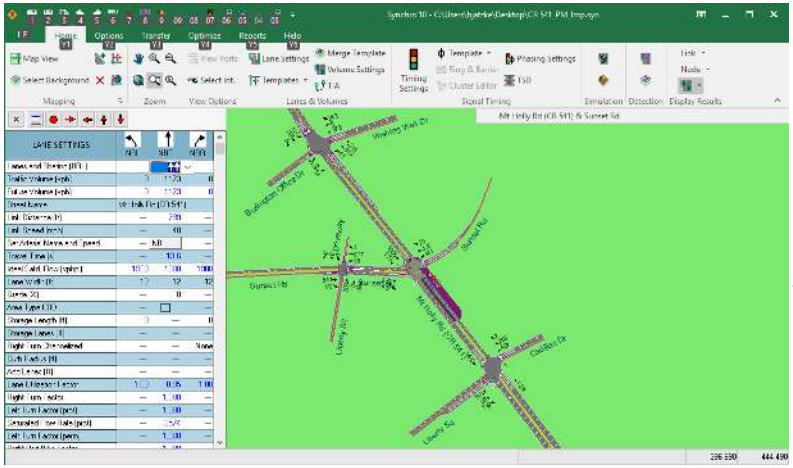
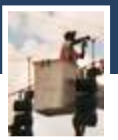


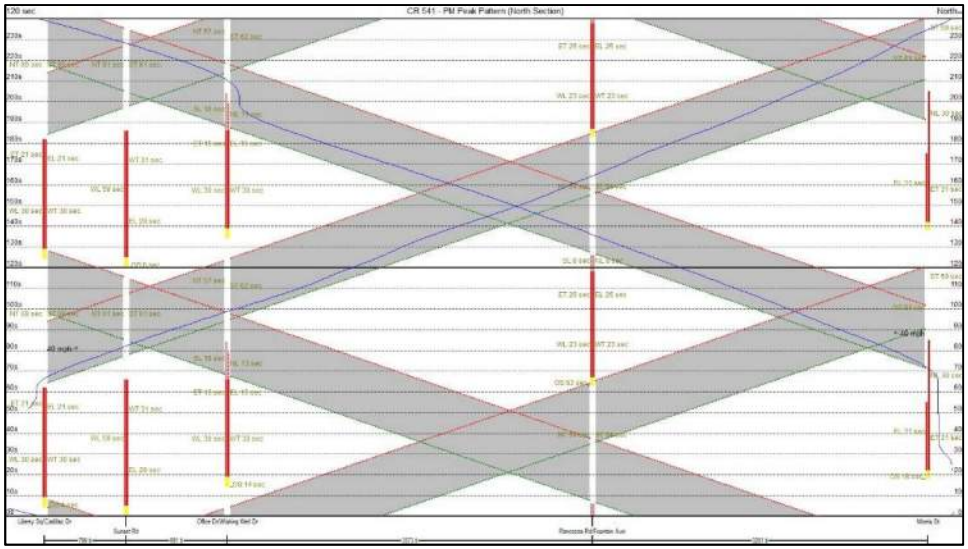
Synchro

# Development of Timing Plans

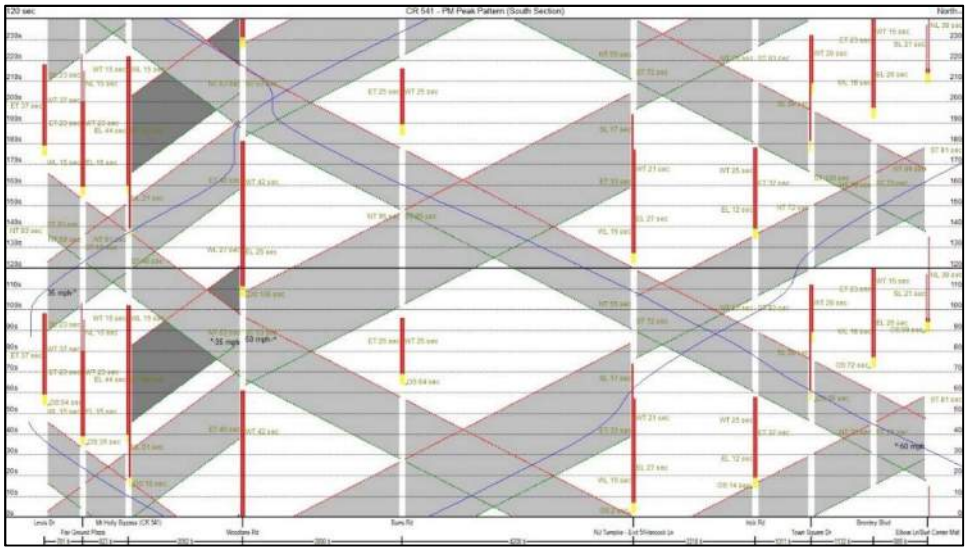




North of I-295

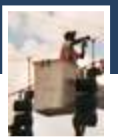



South of I-295

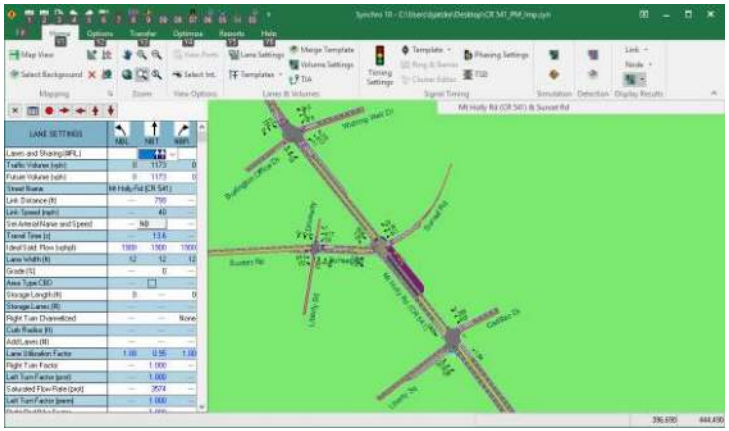


# Create CENTRACS Timing File

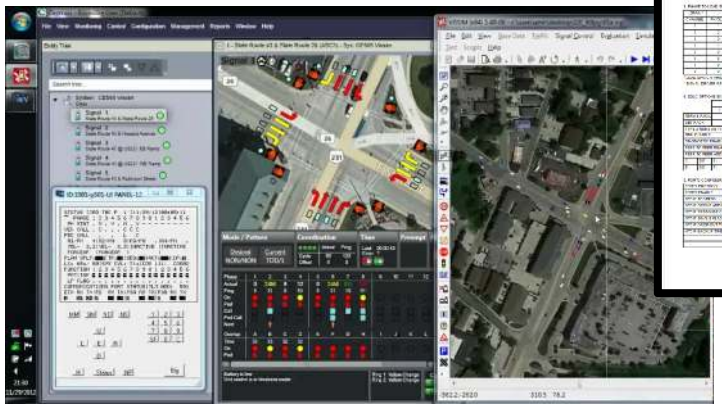


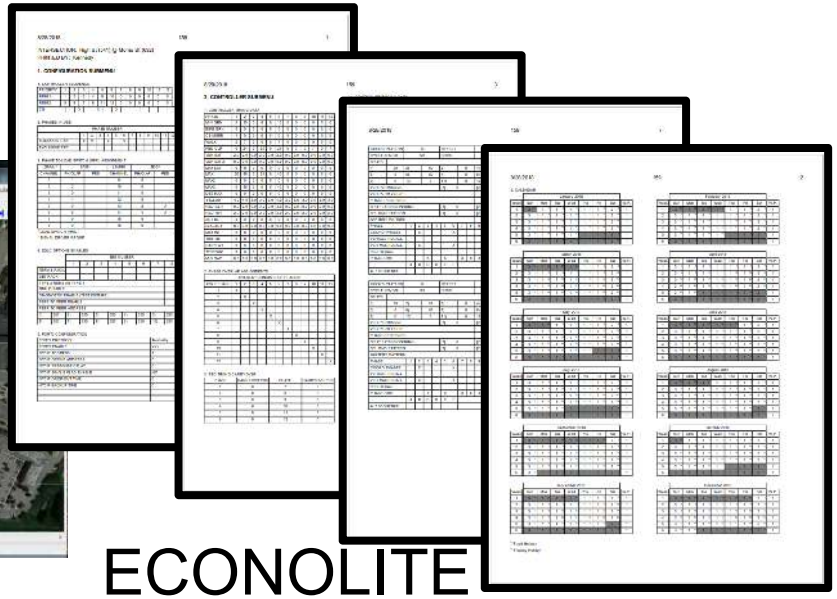


Synchro



CENTRACS





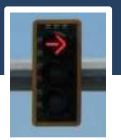
ECONOLITE

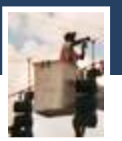
# Lessons Learned: Development of Timing Plans

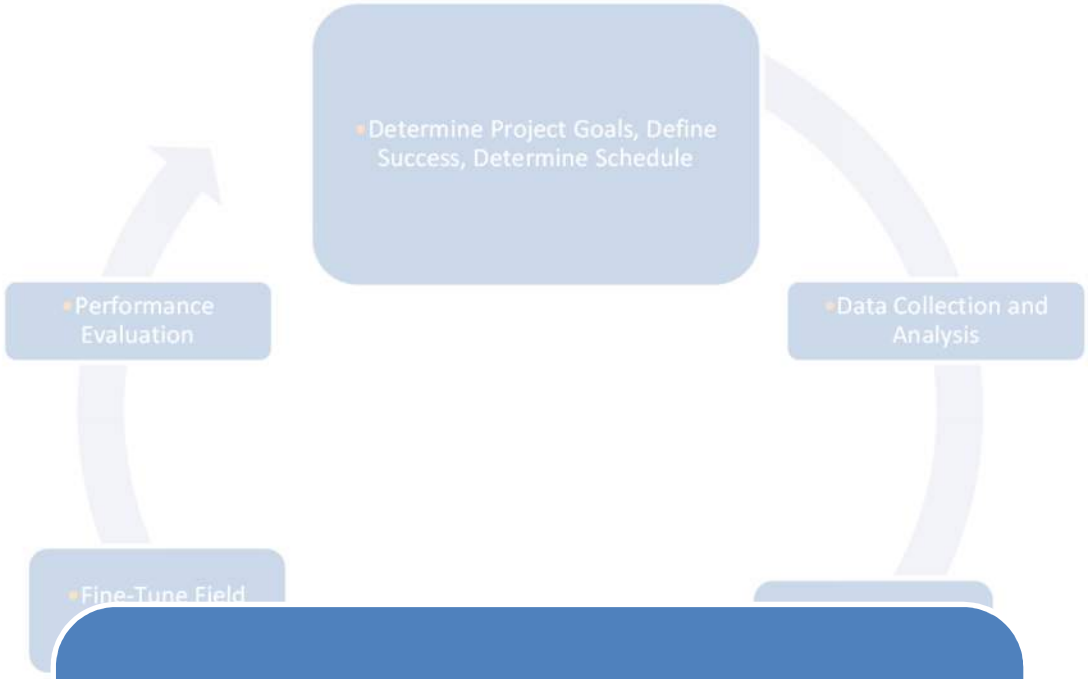


- Pedestrian and vehicle clearance intervals updated to current standards.
- Special program developed to deal with Burlington City High School egress at Fountain.
- Pedestrian recalls by time of day for school areas
- Left turn phase sequence at Town Square Dr was changed by time of day (Lagging SBLT during PM) to optimize progression.
- Six unique patterns, including mid-day peak, early evening peak (6:30 PM to 10PM) and weekend time periods.

# Six-Step Signal Timing Process

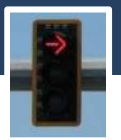


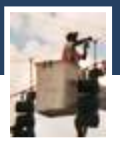




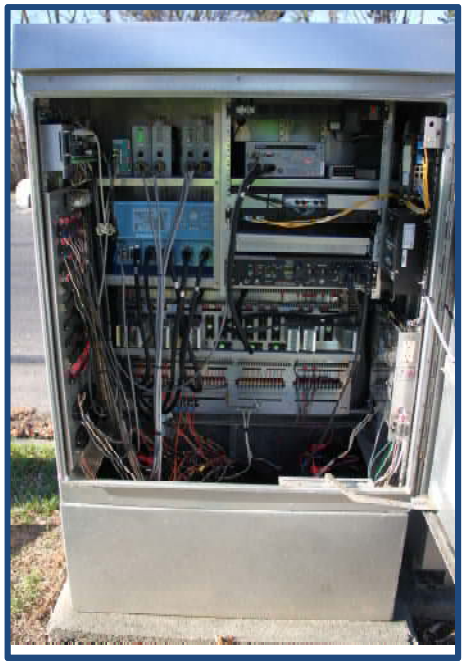

Deploy Signal Timing Plans

# Signal Timing Deployment Process

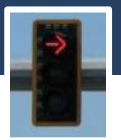


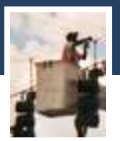


- Submit proposed directives for review, made adjustments as necessary
- Upload databases prior to programming, compare to previous upload and reconcile any differences. Archive existing file.
- Used checklist to program databases settings:
  - Basic Timings
  - Coordination Data
  - Day Plan Schedule
  - More advanced features: Yellow trap protection, fixed vs. floating force-off methods, time of day settings and recalls, etc.



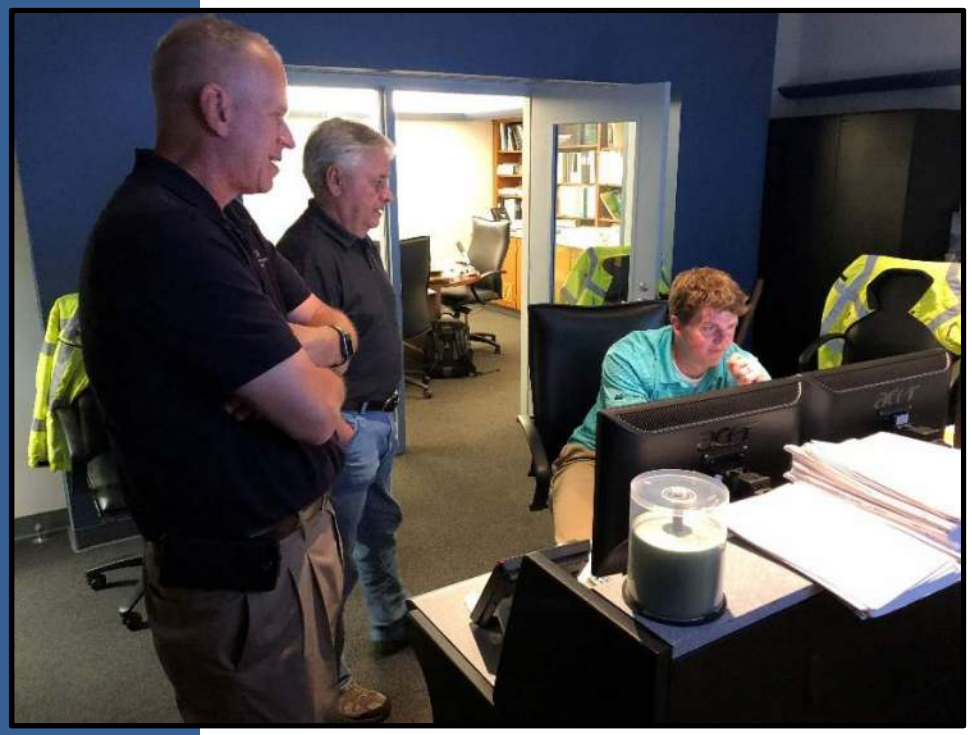
# Deploy Signal Timing Plans





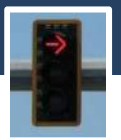
- Download plans via Econolite CENTRACS with team at local intersection.
- Ensure correct time, programming and detection at each controller.
- Observe system using Tru-Traffic to determine if timings are functioning as desired
- Burlington County assisted and observed total corridor from TOC using cameras.

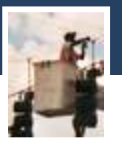
# Lessons Learned: Deployment of Timing Plans

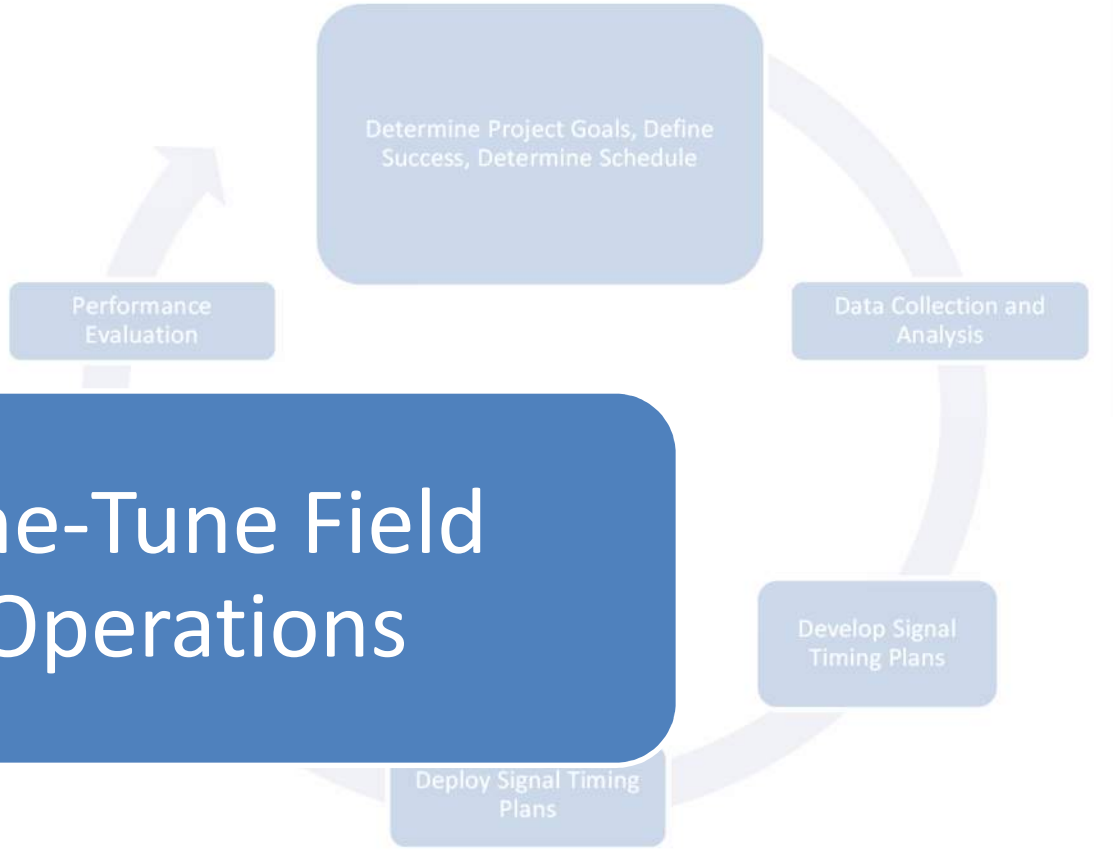


- The ability to direct connect and download settings is invaluable. The Burlington County TOC made the process easy.
- Tru-Traffic gives you immediate insight into the operation of the system.
- Relations with Contractors & Signal Vendors very important
  - Signal Control Products
  - Techna Pro Electric, LLC

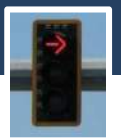
# Six-Step Signal Timing Process

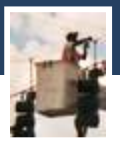






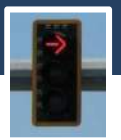
# Fine-Tune Field Operations

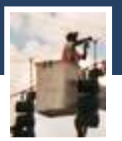




- Never allow pattern to operate unobserved the first time scheduled
- Monitor critical intersections, drive the corridor using Tru-Traffic adjusting necessary settings to achieve goals
  - More than just Cycle / Offset / Split
  - Every system unique, knowing controller capabilities can support the timing plans
- Changes were made in field and documented by project team.
- At the end of implementation, CENTRACS database rectified (upload/download)
- Long days, but the team did not leave until it's right!

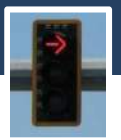
# Lessons Learned: Fine Tuning

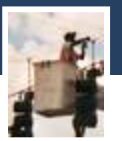




- Signal timing parameters can be adjusted effectively—despite what Synchro says
  - Bandwidth vs. Getting the Queue moving
  - Watch side street and left-turn delays
  - Understand pedestrian impacts, as well as emergency preemption
- Maintain communications with stakeholders and actively seek their involvement

# Six-Step Signal Timing Process





Performance Evaluation

Determine Project Goals, Define Schedule

Data Collection and Analysis

Develop Signal Timing Plans

Deploy Signal Timing Plans

Fine-Tune Field Operations

# County Route 541 Modeled Network Wide MOEs



| Saturday Peak Hour Period Weekday (1100 to 1300) | Travel Time (seconds) | Delay (seconds) | Number of Stops | Fuel Cons (gal) |
|---|---|---|---|---|
| Existing | 647 | 290 | 25,014 | 1,025 |
| Implemented (w lead/lag) | 626 | 270 | 21,839 | 977 |
| % Difference | -3.2% | -6.9% | -12.7% | -4.7% |

# County Route 541: Northbound Field Travel Time



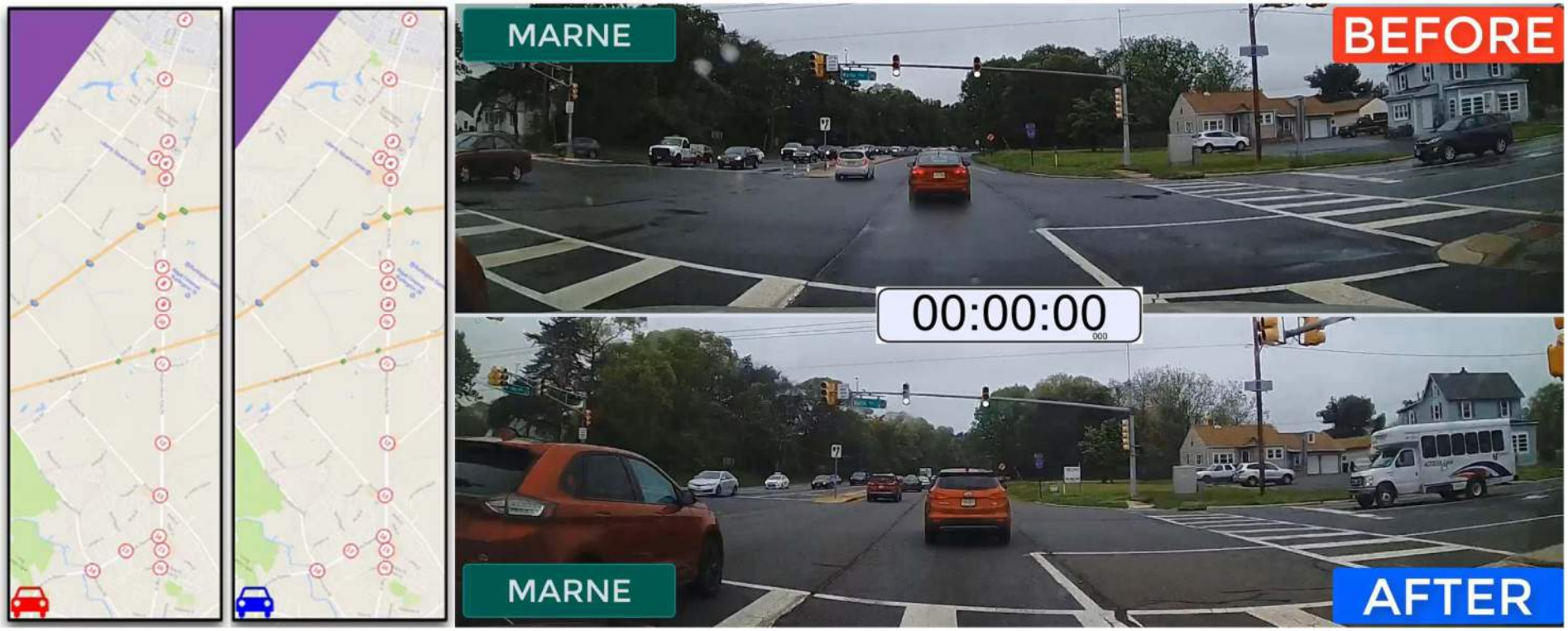
| PM Peak Hour Period Weekday (1600 to 1800) | Travel Time (seconds) | Delay (seconds) | Number of Stops | Speed (mph) |
|---|---|---|---|---|
| **Before** | 768 | 306 | 7.4 | 26.1 |
| **After** | 605 | 143 | 3.2 | 33.2 |
| **% Difference** | -21.2% | -53.3% | -56.8% | 27.2% |

# County Route 541: Southbound Field Travel Time



| PM Peak Hour Period Weekday (1600 to 1800) | Travel Time (seconds) | Delay (seconds) | Number of Stops | Speed (mph) |
|---|---|---|---|---|
| **Before** | 689 | 232 | 6.4 | 29.0 |
| **After** | 529 | 72 | 2.6 | 38.1 |
| **% Difference** | -23.2% | -69.0% | -59.4% | 31.4% |

# County Route 541
# Before vs. After



# County Route 541 Signal Retiming Project Summary



- **Traffic signal operations can be improved by simple retiming initiatives—with returns similar to that of adaptive.**
- **Success depends on collaboration, cooperation, coordination, and consensus building**

# Questions

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