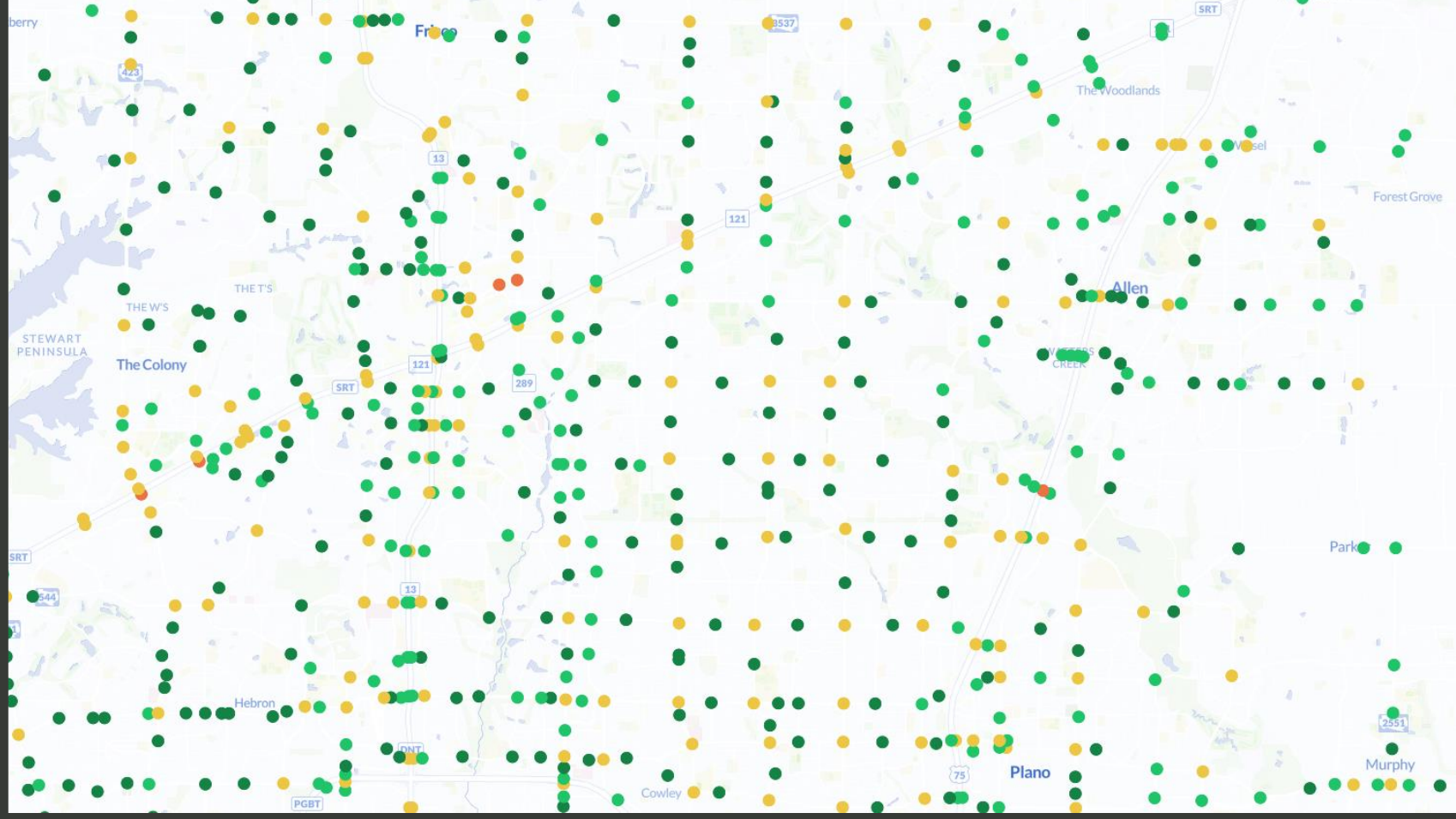

CITY OF ALLEN

Utilizing

INRIX IQ
Signal Analytics

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95% OF OUR WORK IN 2023
came from repeat clients –
a testament to who we are and what we do.

We've been ranked every year since 2018 in the **top 100** design firms based on *Engineering News-Record's* national list.

Employee Growth

2013
750
employees

2024
2,000+
employees

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What do we have?

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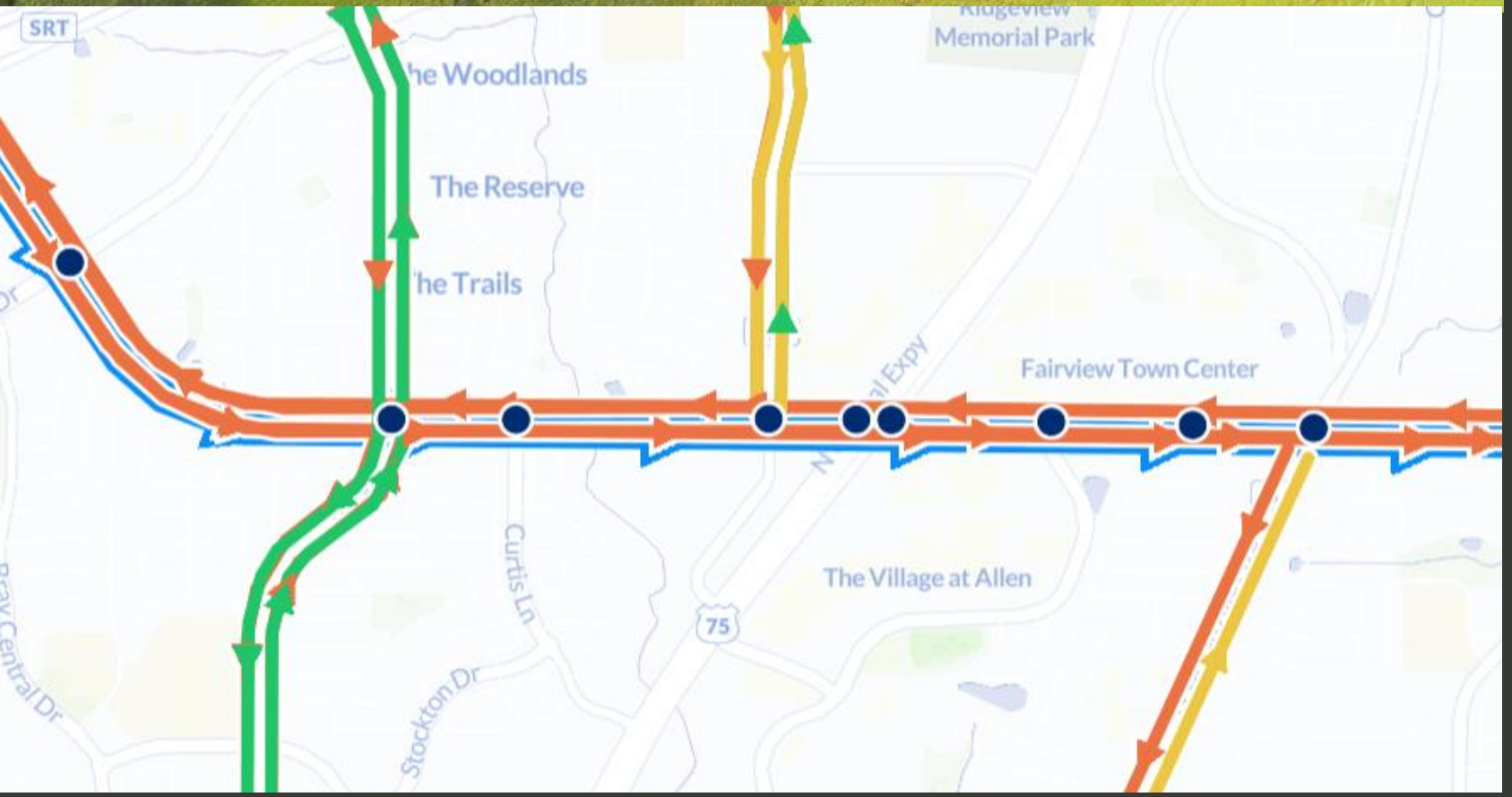
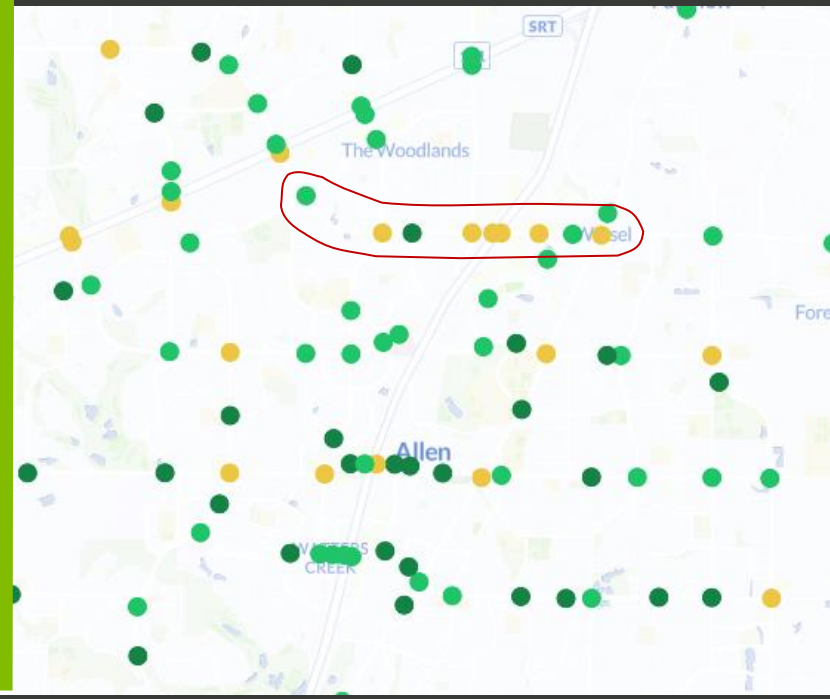
Where are we?

CITY OF ALLEN





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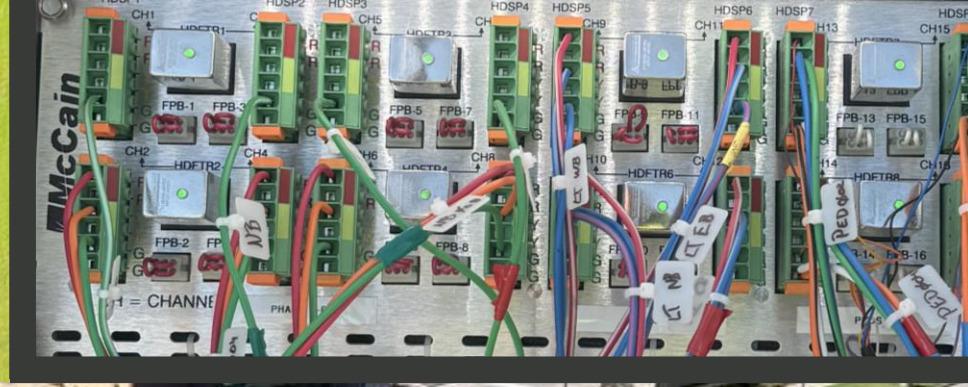
Traffic Signal Systems *are Complex*



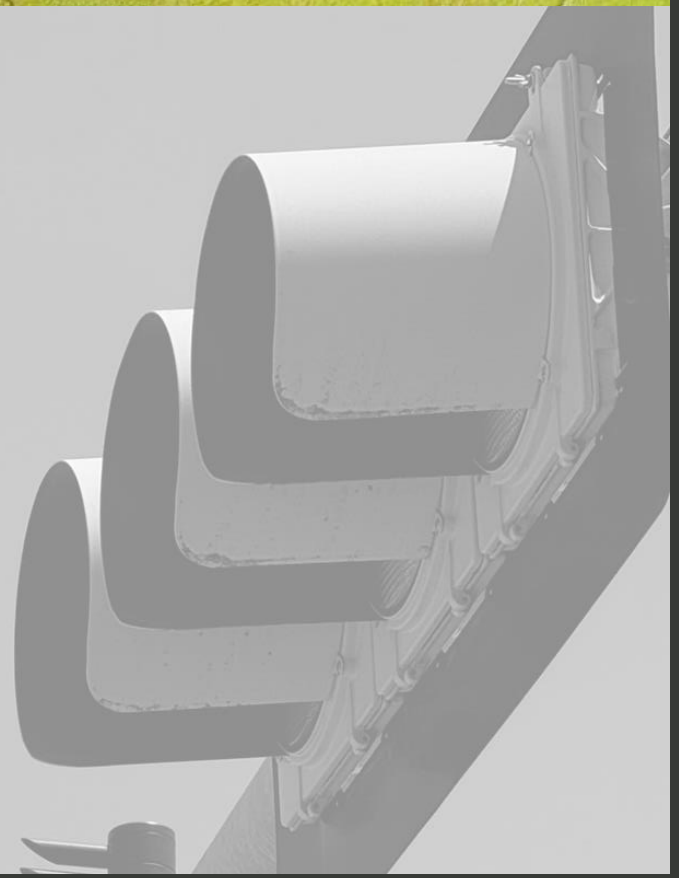
- Cabinet & Controller
- Strain Poles & Mast Arms
- Signal Heads
- Presence Detection
- Advanced Detection
- New Technologies

Stakes are High at Traffic Signals

Signal Performance Measures = Proactive System Management

Get the REAL picture!

- Normal vs. Abnormal
- Identify Events or Trends
- Evaluate Solutions



Moving from ***REACTIVE*** *to* ***PROACTIVE****!*

GOOD STEWARDS

of the Signal System & Road User Safety/Mobility

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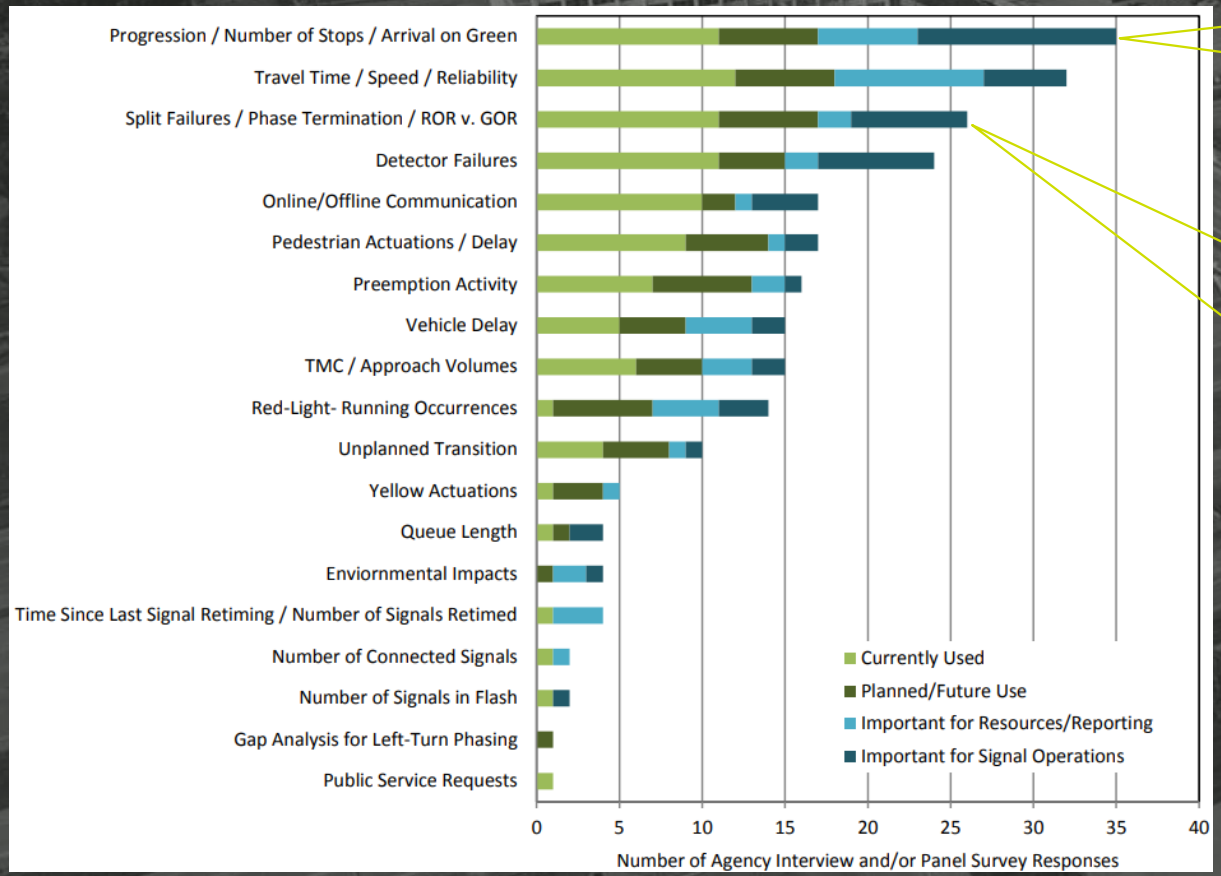
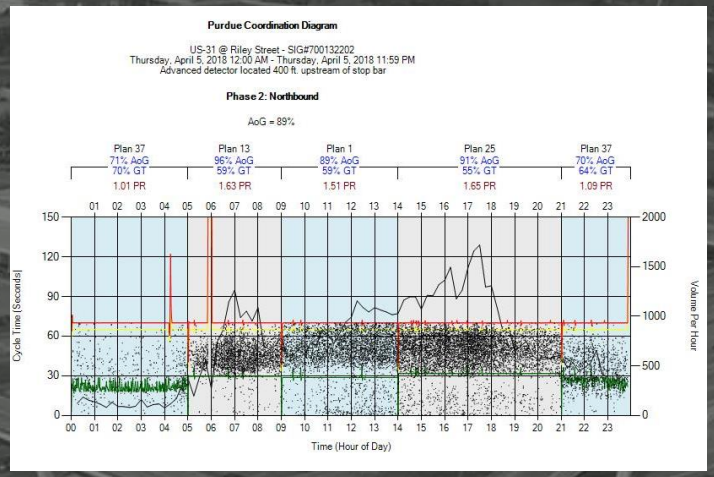
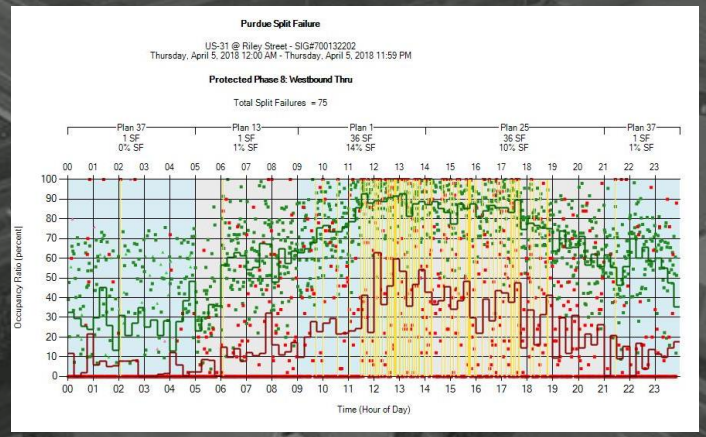
What are agencies using them for?







Source: Kittelson & Associates Inc. & Purdue University “NCHRP Project 03-122: Performance-Based Management of Traffic Signals” January 2017

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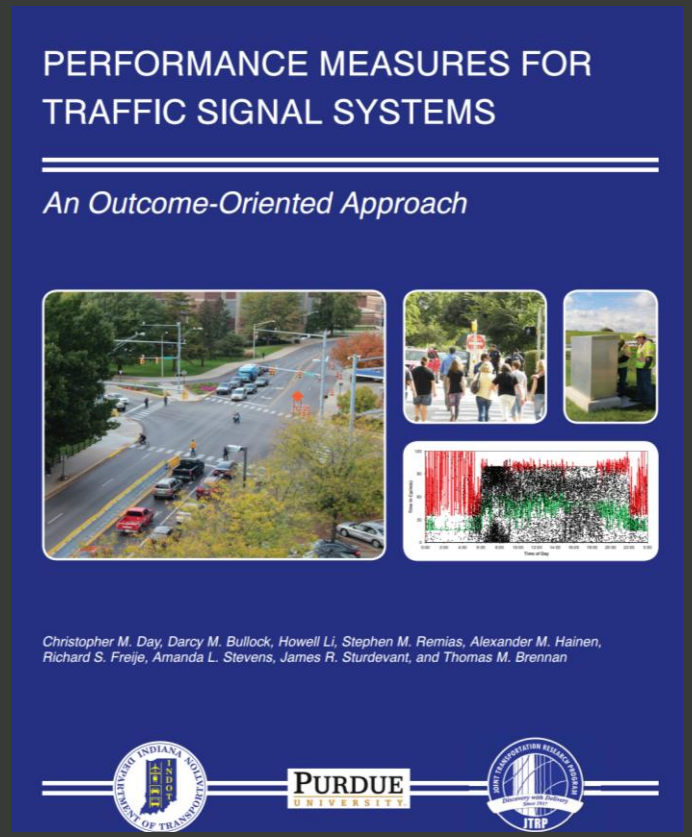
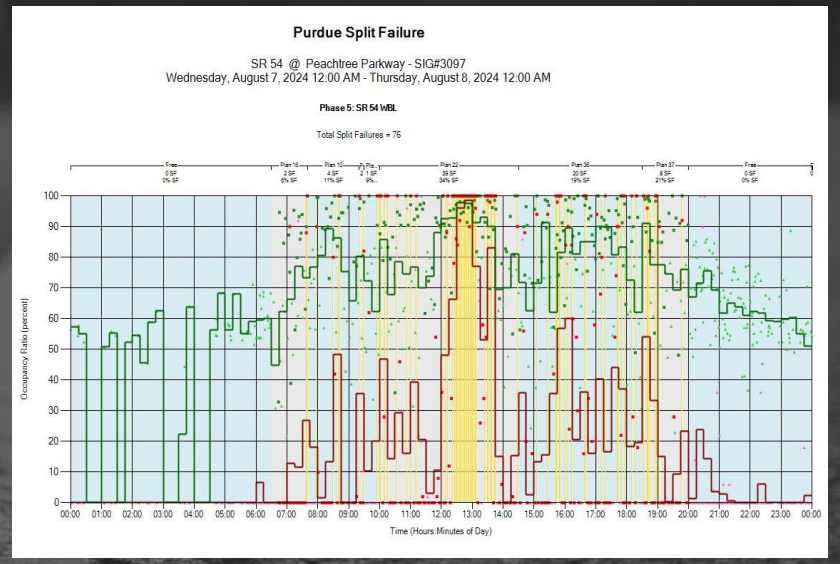
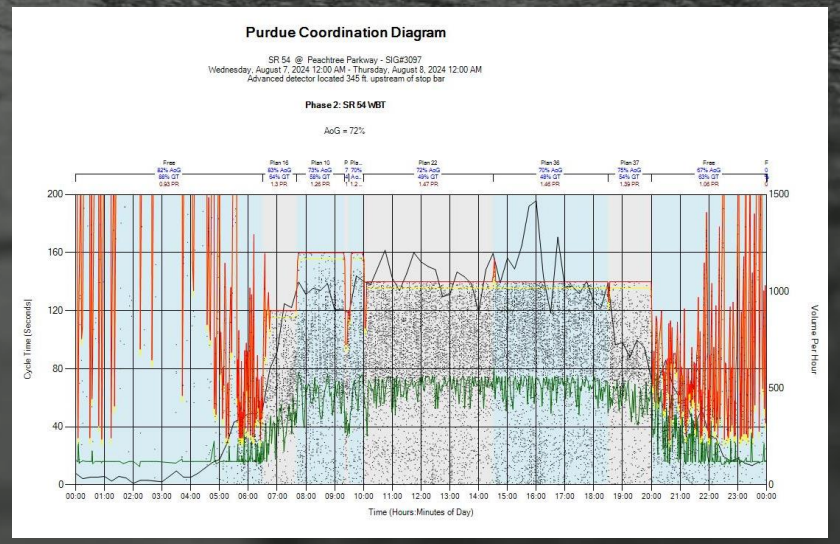
Sensor-Based / Detector-Based SPMs

Strengths
~100% of traffic
Includes signal timing information
Includes phase termination
Visualize detector actuations

Limitations
Detector asset inventory
System-wide comparison difficult
Many points of failure
Configuration/knowledge dependent







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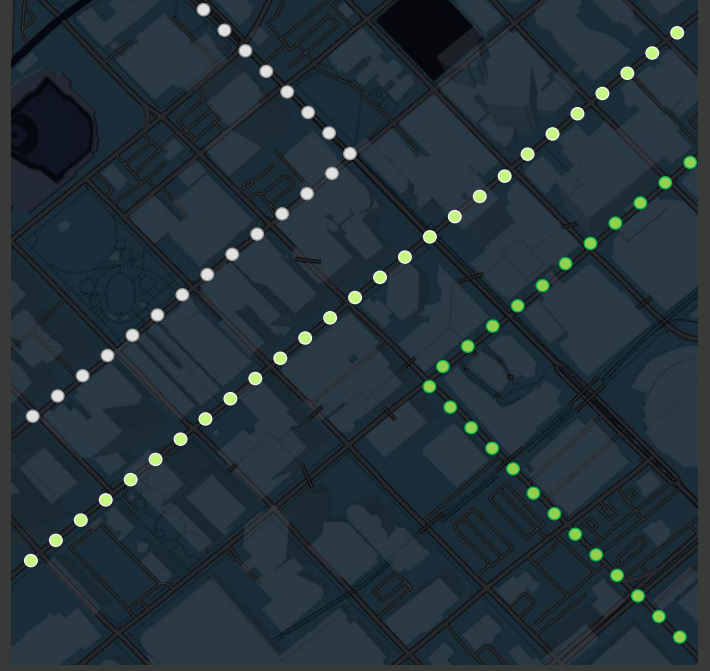
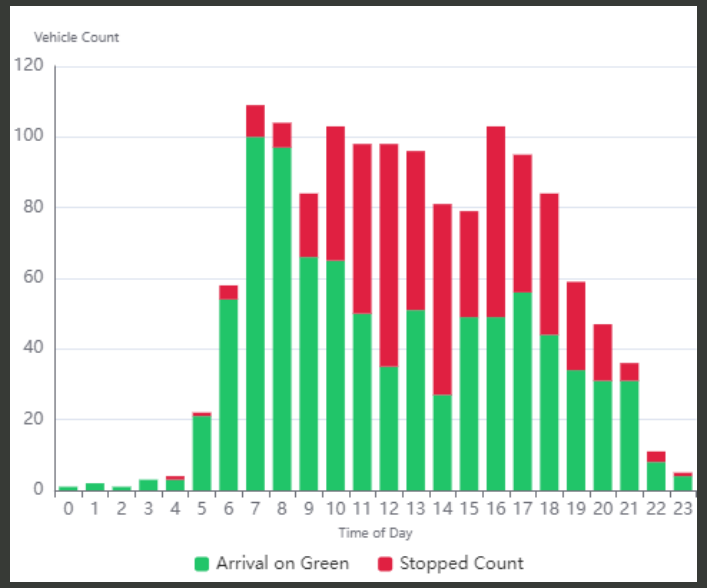
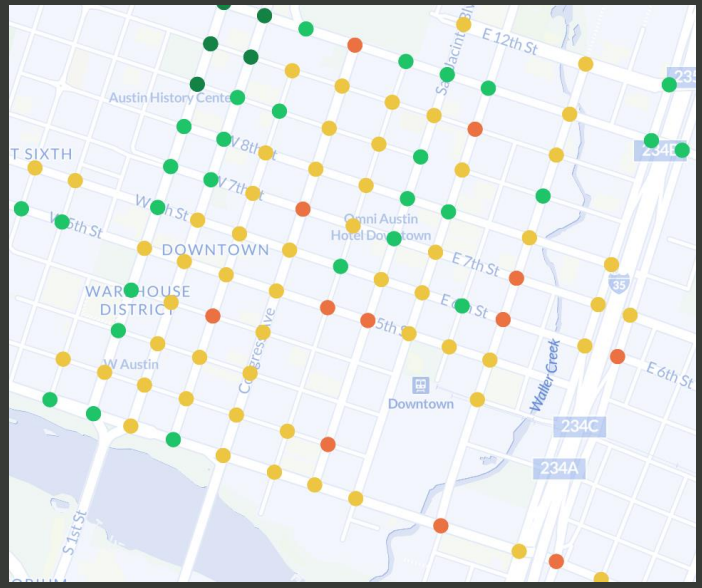
GPS-Based SPMs

Strengths
Real ‘observed’ vehicles
No added infrastructure
Scale & Consistency
Integrated Software

Limitations
Sample size of vehicles
No direct signal/phasing measurement
Vehicle only
Data is a day delayed







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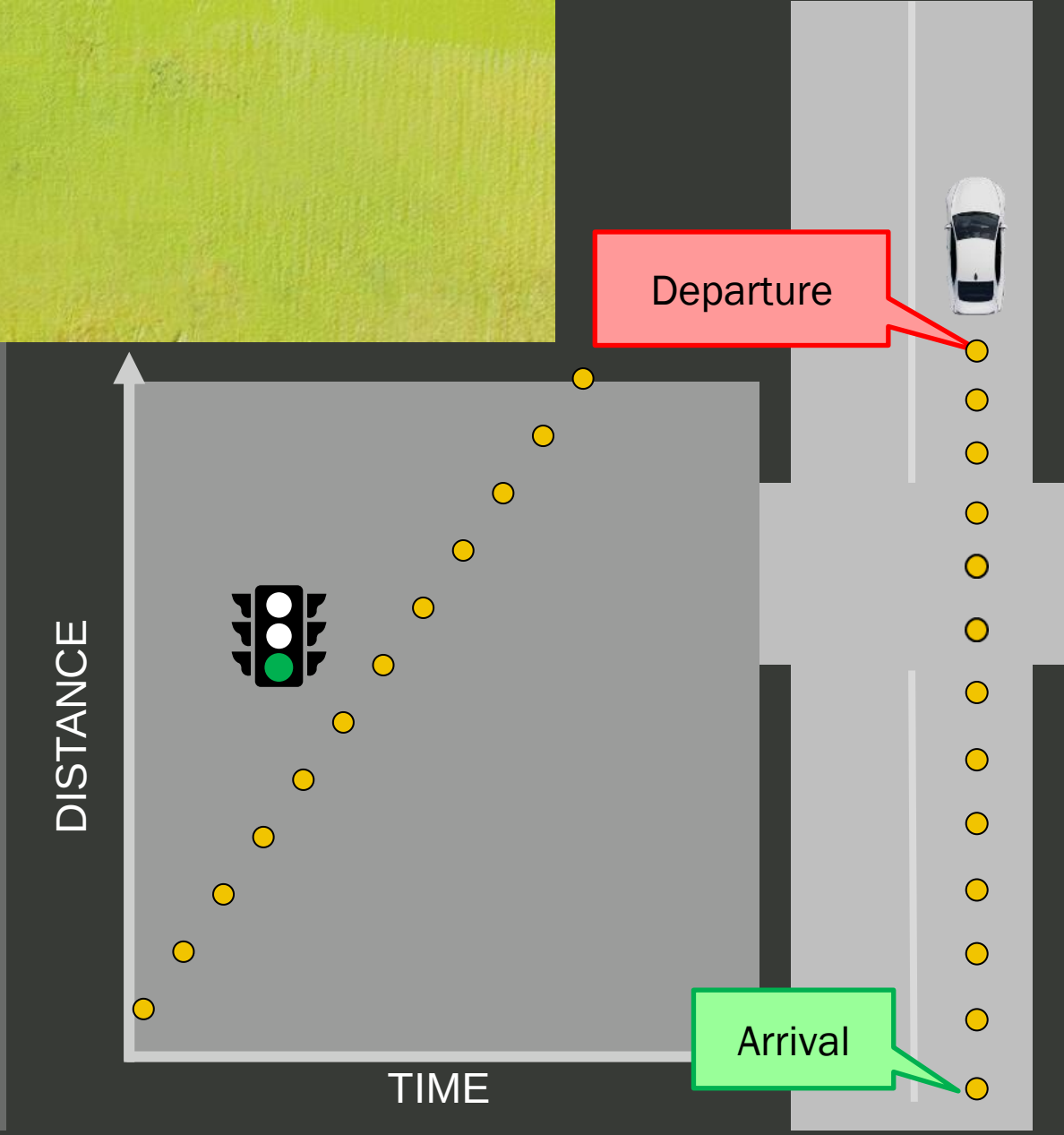
Intersection, Approach and Movement Level Metrics

Signal Performance Metrics

- Travel Time
- Approach Speed
- Control Delay
- Level of Service
- Turn Ratios
- Observed Traffic
- Split Failures
- Stops / AOG



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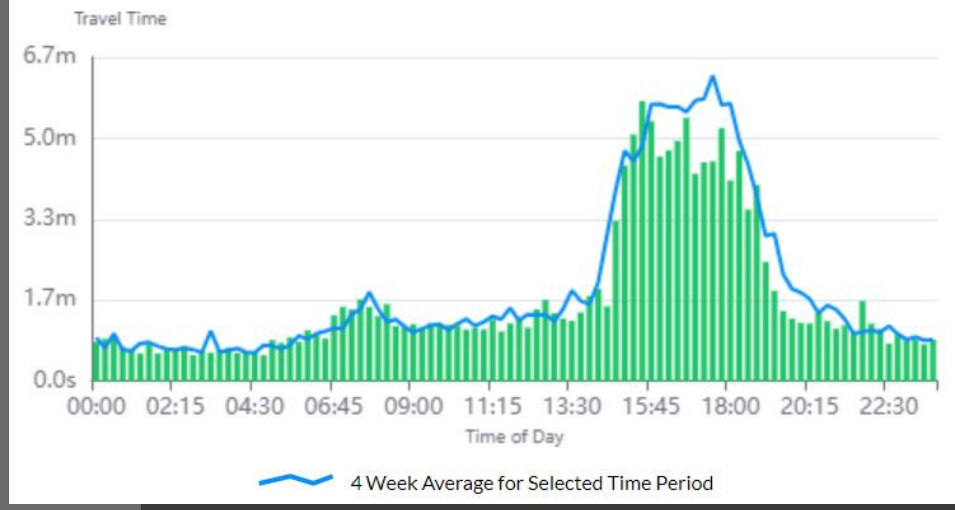
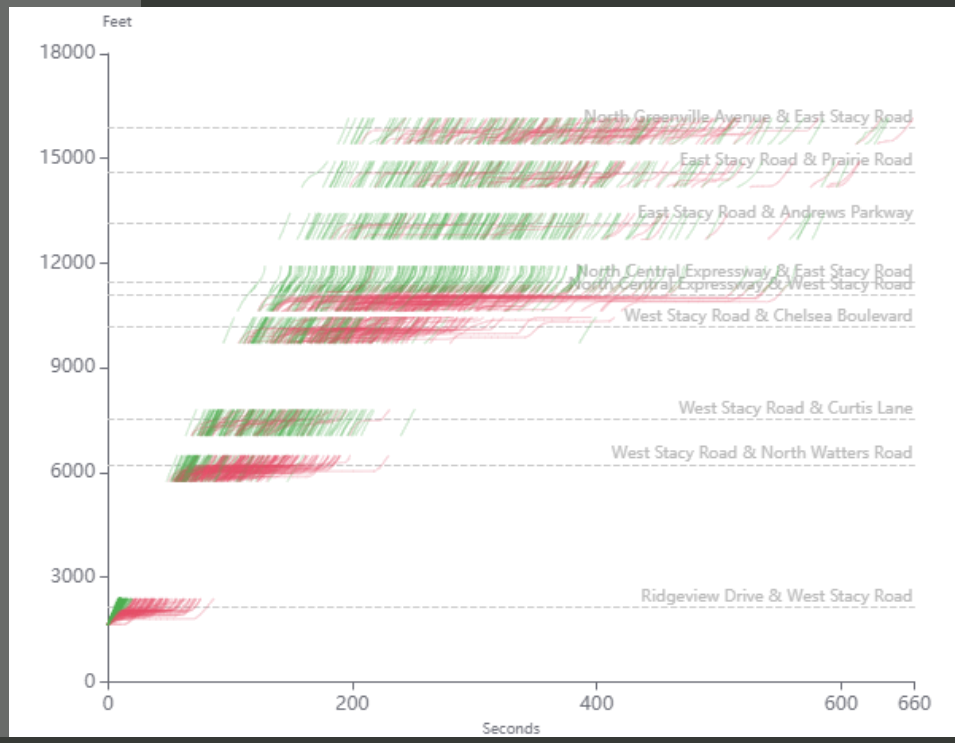
Corridor Level Performance Metrics

- Avg. & Percentile Travel Times
- Travel Time vs. Normal (4-week rolling TT)
- Running Speed (TT/Distance)
- Free-Flow Travel Time (5th %ile)
- Observed Vehicle Count
- PTI & TTI Reliability
- Time-Space (Stops, Split Fails)
- Level of Travel Time Reliability (80th/50th)





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Analytics in Action

Intersection Performance Report

- Previous day vs four-week average
  - Top 5 Delay Increases
  - Signal
  - Corridor

- What would cause these typically okay signals to all increase delays?

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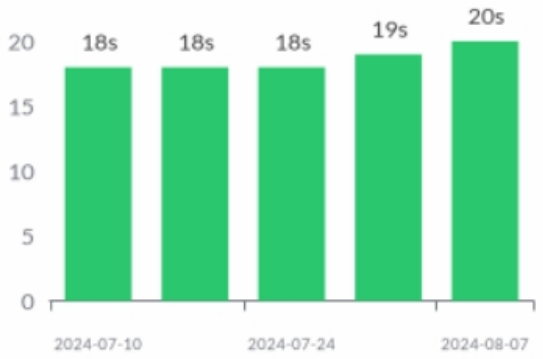
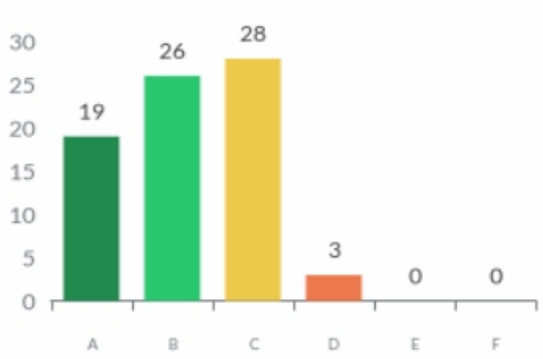
All Licensed | 2024-08-07 | City Allen

Intersections	Approaches	Movements
76	276	711

Average Control Delay per Vehicle



Intersection Counts LOS

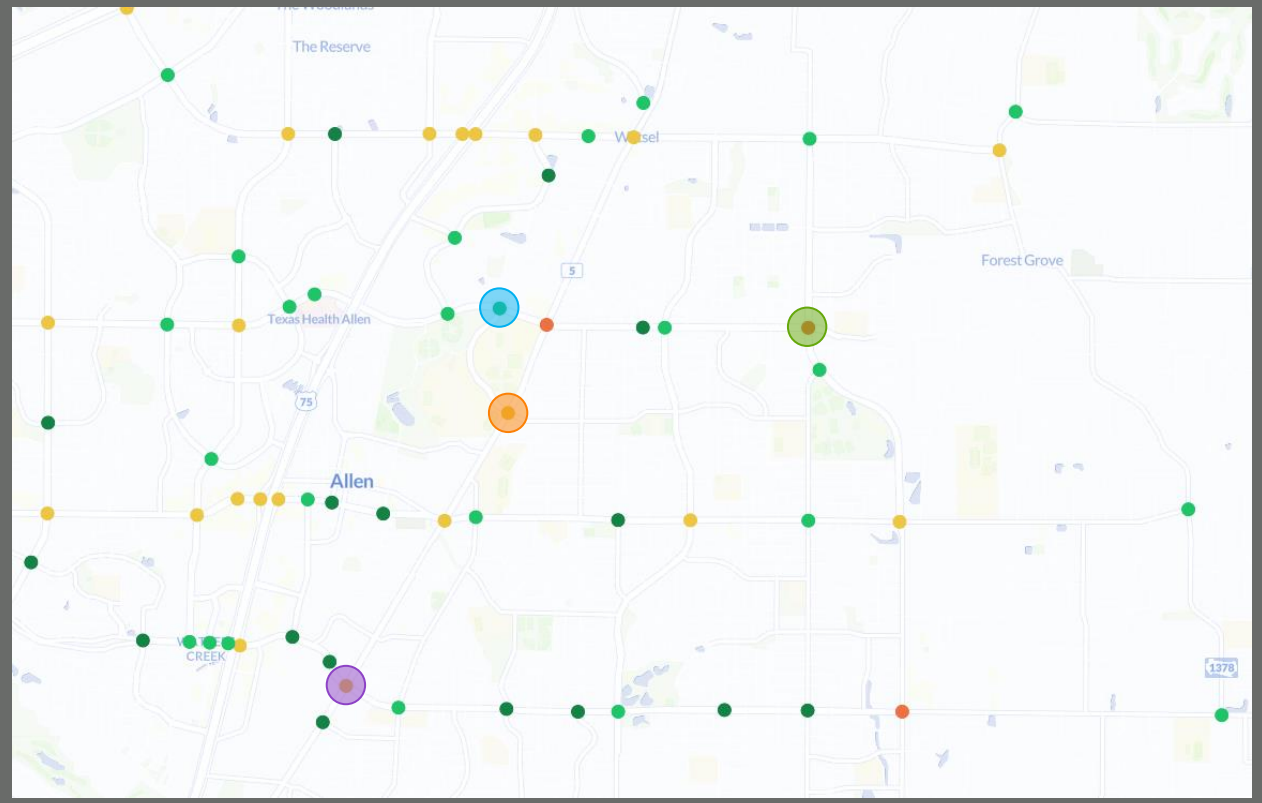


Intersections: Top 5 Control Delay Issues | 2024-08-07 | 24 Hrs

Worsened Control Delay (Total)	4-wk Avg	2024-08-07	Change	
1 East Exchange Parkway & Angel Parkway	11.1h C	15.5h D	+4.4h	+40%
2 East Exchange Parkway & Rivercrest Boulevard	5.7h A	9.8h B	+4.1h	+72%
3 Rivercrest Boulevard & North Greenville Avenue	3.4h B	7.2h C	+3.7h	+109%
4 East Bethany Drive & South Jupiter Road	8.1h B	10.3h B	+2.1h	+26%
5 South Central Expressway & West McDermott ...	16.1h C	18.0h C	+1.9h	+12%

Worsened Control Delay (per Vehicle)	4-wk Avg	2024-08-07	Change	
1 Rivercrest Boulevard & North Greenville Avenue	10s B	21s C	+11s	+109%
2 East Exchange Parkway & Angel Parkway	25s C	35s D	+10s	+40%
3 East Exchange Parkway & Rivercrest Boulevard	10s A	17s B	+7s	+72%
4 Ridgeview Drive & North Alma Drive	19s B	24s C	+4s	+22%
5 North Malone Road & Angel Parkway	8s A	12s B	+4s	+48%

Analytics in Action



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All Licensed | 2024-08-07 | City Allen

Intersections	Approaches	Movements
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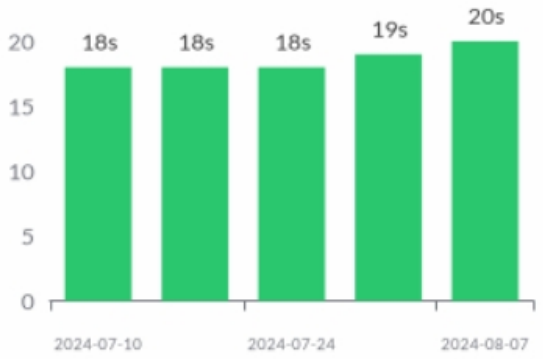
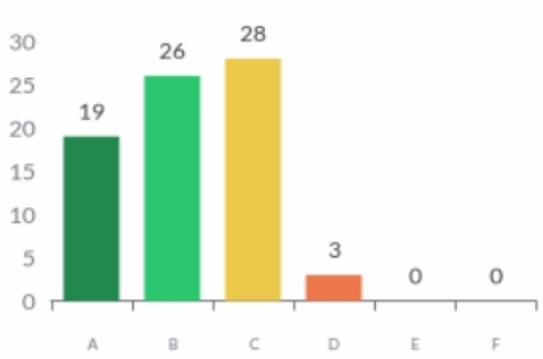
Average Control Delay — per Vehicle



Intersection Counts — LOS



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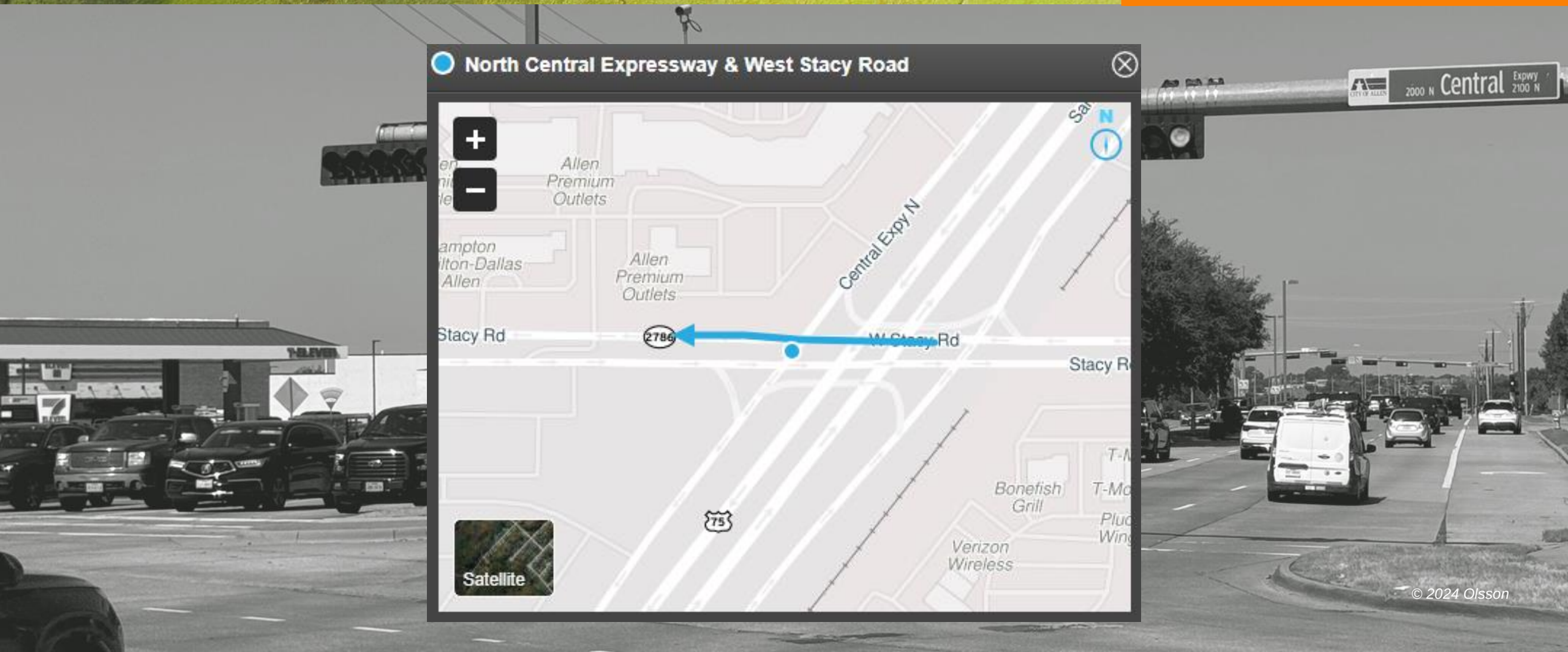
Analytics in Action



Analytics in Action

Arrivals on Green

Primary Data Type: POG

Secondary Data Type: Vehicle Count: Total

Legend: 0% 50% 40 55 70 85

Granularity: 15 Minutes

Percent on Green

	12 AM	1 AM	2 AM	3 AM	4 AM	5 AM	6 AM	7 AM	8 AM	9 AM	10 AM	11 AM	12 PM	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PM	11 PM	Daily Average
Mon																									Mon 100%
Tue																									Tue 100%
Wed																									Wed 100%
Thu																									Thu 100%
Fri																									Fri 100%
Sat																									Sat 84%
Sun																									Sun 82%
Weekday Average	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	Weekday Average 100%
Weekend Average	100%	100%	100%	100%	100%	100%	100%	100%	100%	98%	100%	92%	75%	62%	48%	54%	76%	84%	95%	100%	100%	100%	100%	100%	Weekend Average 83%
Total Average	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	97%	92%	86%	84%	85%	94%	96%	99%	100%	100%	100%	100%	100%	Total Average 95%

Proactive Weekend Opportunity?

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Analytics in Action

Arrivals on Green

Primary Data Type: POG

Secondary Data Type: Vehicle Count: Total

Legend: 0% 50% — 40 55 70 85

Granularity: 15 Minutes

Percent on Green

	12 AM	1 AM	2 AM	3 AM	4 AM	5 AM	6 AM	7 AM	8 AM	9 AM	10 AM	11 AM	12 PM	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PM	11 PM	Daily Average
Mon																									Mon 100%
Tue																									Tue 100%
Wed																									Wed 100%
Thu																									Thu 100%
Fri																									Fri 100%
Sat																									Sat 94%
Sun																									Sun 92%
Weekday Average	100%	100%	93%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%	Weekday Average 100%
Weekend Average	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	98%	88%	80%	82%	83%	85%	98%	100%	100%	100%	100%	100%	100%	Weekend Average 93%
Total Average	100%	100%	96%	100%	100%	100%	100%	100%	100%	100%	100%	99%	96%	94%	94%	95%	96%	99%	100%	100%	100%	100%	100%	100%	Total Average 98%

It was there earlier too. Less intense.

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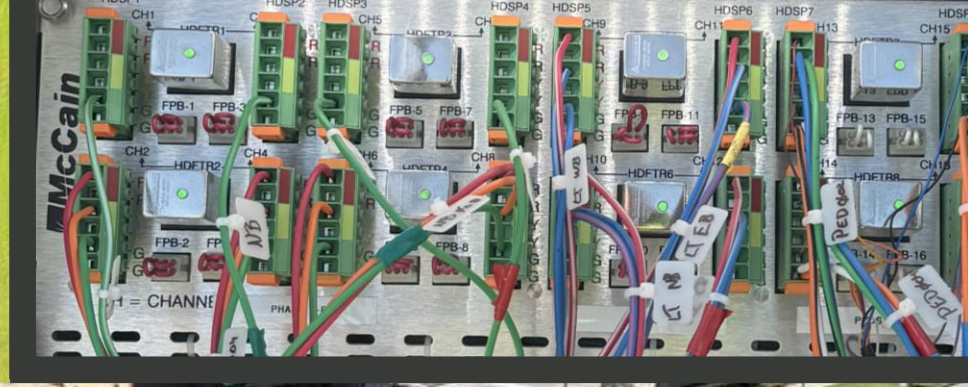
Traffic Signal Systems *are Complex*



- Cabinet & Controller
- Strain Poles & Mast Arms
- Vehicle Signal Heads
- Stop Bar Detection
- Advanced Detection
- New Technologies

Project Examples

Before/After Evaluation
Easy before/after evaluation of corridors and signalized intersections to fulfill project requirements

Data-Driven Signal Retiming Program
Match resources to measured biggest needs across an agency(s)

Construction Traffic Management
Monitor for operational changes (delay, queuing, split failures). Rapid response signal timing or work zone mitigations.

Progression Analysis
Visually via time-space diagram trajectory plots and easy query of data

Adaptive Signal Control
Determine best candidates for adaptive signal control, inform system configuration, evaluate effectiveness, support ASC management and operations.

Transit Signal Priority
Analyze transit routes by movements at signalized intersections, determine impacts of various TSP strategies

Model/Simulation Calibration
Speed, travel time, delay and other metrics to calibrate existing conditions model/simulation to measured reality

Queuing Analysis
Detailed queuing patterns in trajectory plots

Development Review/ Traffic Studies
Measured intersection and corridor performance measures to support development application review

Prioritized Troubleshooting
Easily determine highest increase in delay, indicating a location to troubleshoot

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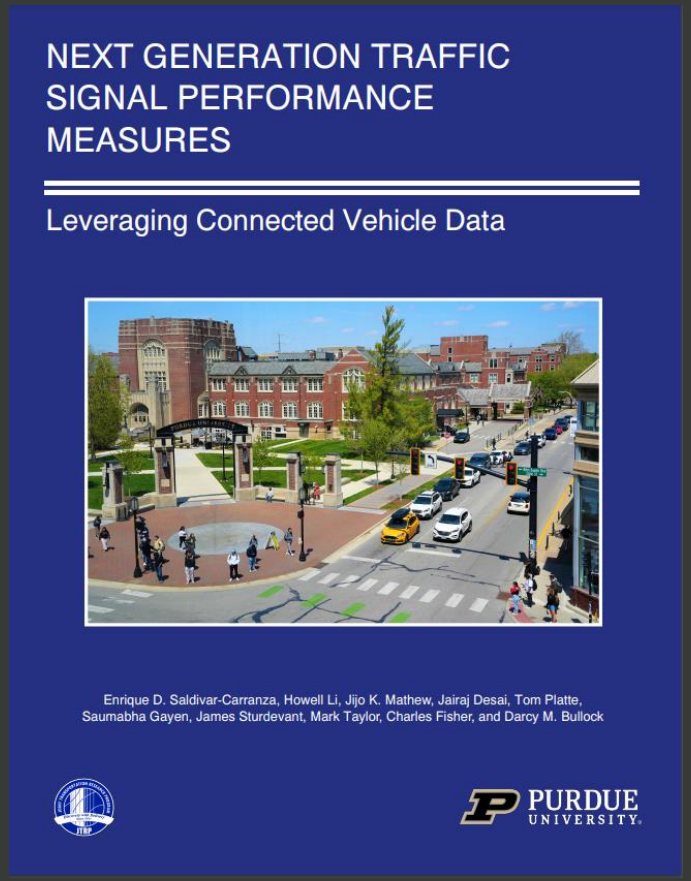
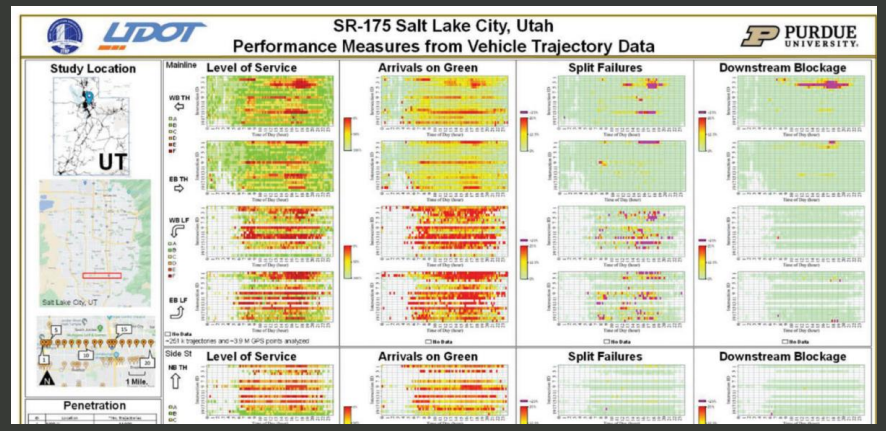
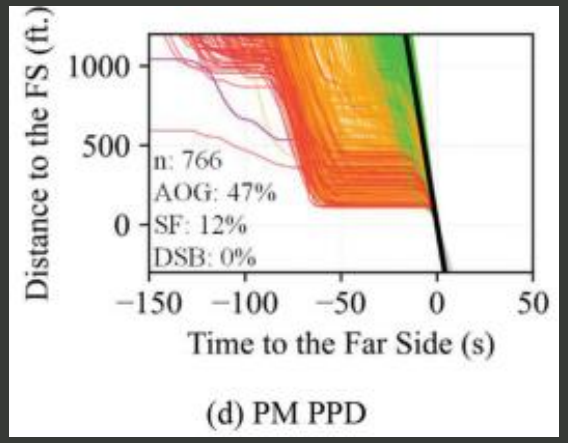
Pooled Fund Research:
GPS-CV Signal Performance Measures (2023)







Indiana DOT, Caltrans, Connecticut DOT, Georgia DOT, Minnesota DOT, North Carolina DOT, Ohio DOT, PennDOT, TexDOT, Utah DOT, Wisconsin DOT, FHWA, College Station, Purdue

"CV data provides opportunities to ***systematically evaluate transportation infrastructure in a scalable manner****, without the need for detection or communication equipment…"*

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Thank you!

Continue the conversation with:

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