AASHTO Innovation Initiative

[Proposed] Nomination of Innovation Ready for Implementation

Sponsor

Nominations must be submitted by an AASHTO member DOT willing to help promote the innovation

1. Sponsoring DOT (State): Pennsylvania

2. Name and Title: Stephen Gault, P.E., PTOE, Statewide Traffic Signal Operations Engineer

   Organization: PennDOT Bureau of Maintenance and Operations, Highway Safety & Traffic Operations Division

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   State: PA

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   Email: sgault@pa.gov

   Phone: (717) 787-6988

   Fax: Click or tap here to enter text.

3. Is the sponsoring State DOT willing to promote this innovation to other states by participating on a Lead States Team supported by the AASHTO Innovation Initiative?   ☒ Yes ☐ No

Innovation Description (10 points)

The term "innovation" may include processes, products, techniques, procedures, and practices.

4. Name of the innovation:

Arterial Performance Measures

5. Please describe the innovation. Describe how this innovation transforms your existing "state of play."

Several innovations have been developed to use "big data" to analyze performance of arterial roadways, including traffic signal operations.

Automated Traffic Signal Performance Measures (ATSPM) use data from traffic signal controllers to analyze and optimize the performance of traffic signals. ATSPMs can reduce the need for expensive manual data collection to quickly deploy improved traffic signal timing. More information is available through FHWA's EDC4 program at https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/atspm.cfm

Commercial probe data can be used to evaluate and monitor traffic conditions on arterials, including comparing travel times "before" and "after" projects and ranking corridors according to their travel time characteristics, including both the median travel time and the interquartile range (IQR), a measure of the travel time reliability.

6. If appropriate, please attach photographs, diagrams, or other images illustrating the appearance or functionality of the innovation (if electronic, please provide a separate file). Please list your attachments here. Attach photographs, diagrams, or other images here.

Screenshots of existing platforms for ATSPM and probe data arterial metrics are attached.

7. Briefly describe the history of its development.

While ATSPMs have been successfully deployed in smaller agencies with a simpler traffic signal maintenance and operations structure, deployment in Pennsylvania is challenging due to the distributed nature of municipal traffic signal ownership.

There are few traffic engineers in Pennsylvania who understand the concepts of how to interpret the new data sources to effectively manage traffic signals and arterial operations. As PennDOT embarks on increased operational responsibility for traffic signals, expanding knowledge of traffic signal performance measures through training will be critical.

State of Development (40 points)

Innovations must be successfully deployed in at least one State DOT. The AII selection process will favor innovations that have advanced beyond the research stage, at least to the pilot deployment stage, and preferably into routine use.

8. How ready is this innovation for implementation in an operational environment? Please check of the following options. Please describe.

☒ Prototype is fully functional and yet to be piloted

☐ Prototype demonstrated successfully in a pilot environment

☒ Technology has been deployed multiple times in an operational environment

☐ Technology is ready for full-scale adoption

ATSPMs have been deployed by several state DOTs, including Utah and Georgia.

Probe data-based measures have been integrated into the RITIS platform using INRIX XD data and is currently available for states which have INRIX XD data in RITIS, including Pennsylvania and Michigan.

9. What additional development is necessary to enable routine deployment of the innovation? What resources—such as technical specifications, training materials, and user guides—are already available to assist with the deployment effort?

Training materials and user guides are necessary to change the standard practices within the Pennsylvania traffic signal engineering community toward use of these innovations in lieu of traditional methods.

10. Has any other organization used this innovation? ☒ Yes ☐ No

If so, please list organization names and contacts. Please identify the source of this information.

Organization	Name	Phone	Email
Utah DOT	Mark Taylor	(801) 887-3714	marktaylor@utah.gov
Georgia DOT	Matthew Glasser	(404) 635-2836	mglasser@dot.ga.gov
Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.

Potential Payoff (30 points)

Payoff is defined as the combination of broad applicability and significant benefit or advantage over other current practice (baseline).

11. How does the innovation meet customer or stakeholder needs in your State DOT or other organizations that have used it?

Poor traffic signal timing is a primary source of congestion on arterials. By ranking locations using performance measures, limited DOT resources can be invested at the locations with the largest potential benefits. ATSPMs can be used to diagnose issues more quickly, improving customer service and reducing costly and time consuming field troubleshooting.

FHWA has identified benefits of ATSPMs including increased safety, targeted maintenance, and improved operations.

12. What type and scale of benefits have your DOT realized from using this innovation? Include cost savings, safety improvements, transportation efficiency or effectiveness, environmental benefits, or any other advantages over other existing baseline practice. Please identify the following benefit types:

Check boxes that apply	Benefit Types	Select a rating from the drop-down menu
☐	Cost Savings	Choose an item.
☐	Shortened Project/Service Delivery Schedule	Choose an item.
☐	Improved Customer Service	Choose an item.
☐	Improved Quality	Choose an item.
☐	Environmental Benefits	Choose an item.
☐	Organizational Efficiency	Choose an item.
☐	Improved Safety	Choose an item.
☐	Improved Operation Performance	Choose an item.
☐	Improved Asset Performance	Choose an item.
☐	Other (please describe)	Choose an item.

Provide an additional description, if necessary:

PennDOT has yet to realize any significant benefits from these tools due to the lack of knowledge on use of the tools by the traffic signal engineering community.

13. Please describe the potential extent of implementation in terms of geography, organization type (including other branches of government and private industry) and size, or other relevant factors. How broadly might the technology be deployed?

PennDOT maintains a contract for statewide purchase of commercial probe speed data, which can be used through the RITIS platform to analyze major roadways statewide. The INRIX network covers 20,200 miles of arterials.

PennDOT is in the early stages of connecting traffic signals statewide to the Commonwealth network, which would enable collected high resolution signal data for ATSPMs. There are currently approximately 50 signals connected and online in the unified command and control platform, with an additional 275 signals ready to come online in the near future. We anticipate adding 100+ traffic signals to the network each year across the state as various projects enabling communications and compatible controllers are completed.

Both platforms will be available to local agencies which own the traffic signals to provide a common platform for use statewide across different branches of government, and consultants working on behalf of agencies are also able to obtain access to these systems.

Market Readiness (20 points)

The AII selection process will favor innovations that can be adopted with a reasonable amount of effort and cost, commensurate with the payoff potential.

14. What specific actions would another organization need to take along each of the following dimensions to adopt this innovation?

Check boxes that apply	Dimensions	Please describe:
☒	Gaining executive leadership support	Although the value of signal performance measures is better understood by technical staff, there is limited material of a less-technical nature to be used to market the benefits to executive leadership
☒	Measuring performance (e.g. benefits documentation)	The training should provide for traffic signal engineers and operators to measure performance and document the benefits of using performance

		measures to improve operations.
☐	Improving technology understanding	Click or tap here to enter text.
☐	Overcoming financial constraints	Click or tap here to enter text.
☐	Addressing legal issues (if applicable) (e.g., liability and intellectual property)	Click or tap here to enter text.
☒	Acquiring in-house expertise	Lack of in-house and consultant community expertise has limited the use of traffic signal performance measures within Pennsylvania. Training modules will seek to acquire expertise for successful implementation and use of traffic signal performance measures using proven tools.
☐	Resolving conflicts with existing regulations and standards	Click or tap here to enter text.
☐	Other Challenges	Click or tap here to enter text.

15. What is the estimated cost, effort, and length of time required to deploy the innovation in another organization?

Please describe:

Cost: $250,000-$300,000

Level of Effort: The proposed project includes development of training materials and workshops to educate agency staff and the consultant community on how to use traffic signal performance measures.

Time: 12 months

16. To what extent should the implementation of this innovation require the involvement of third parties, including vendors, contractors, and consultants? If so, please describe. List the type of expertise required for implementation.

We anticipate using a consultant with experience from states that have implemented traffic signal performance measures to assist with development of the training materials.

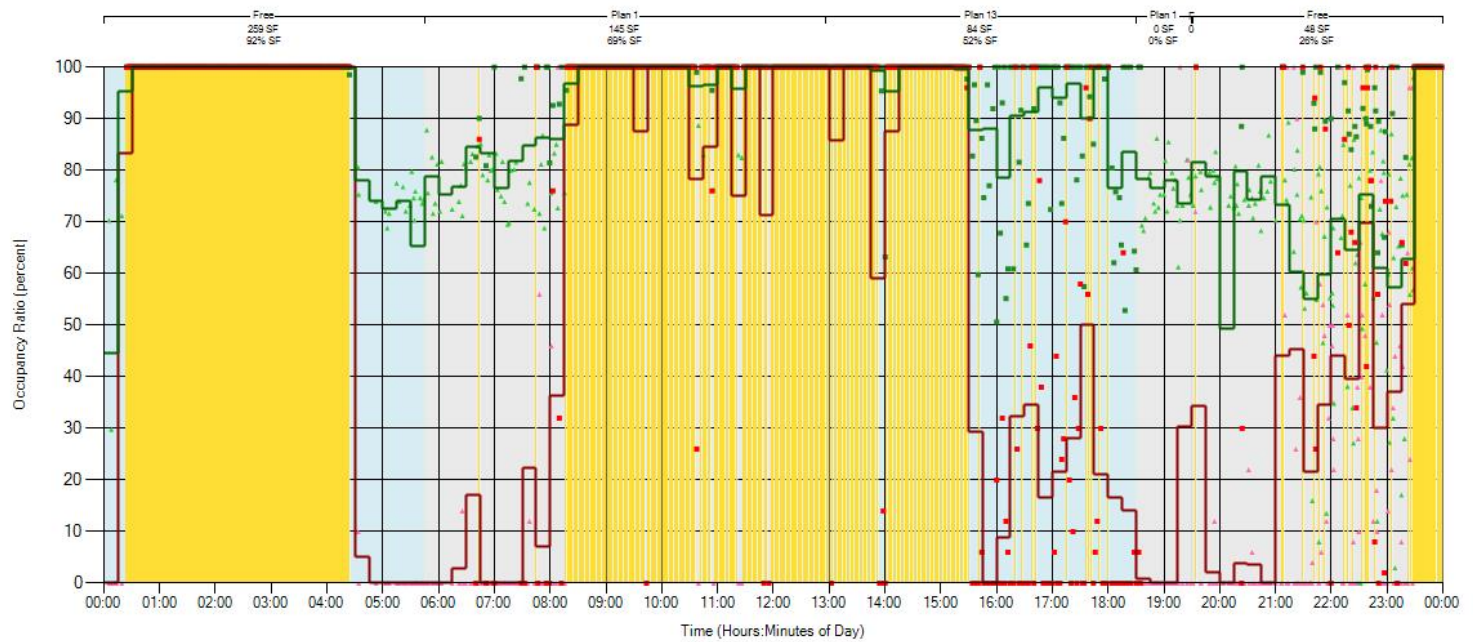Example Split Failure metric from UDOT open source code (ATSPM)

Purdue Split Failure

900 West @ 2100 South - SIG#1009
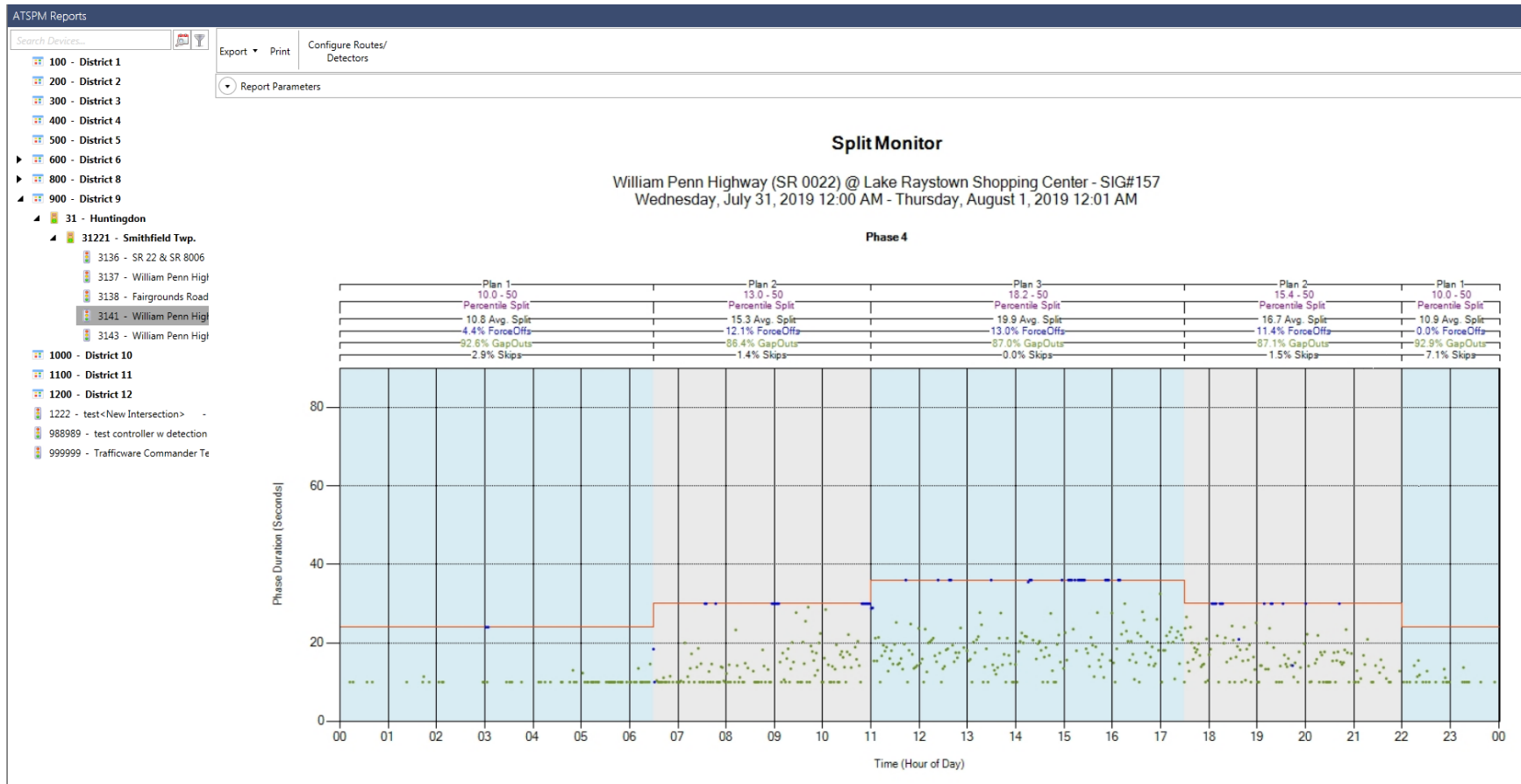Wednesday, July 31, 2019 12:00 AM - Thursday, August 01, 2019 12:00 AM

Phase 1: SB Phase1

Total Split Failures = 536

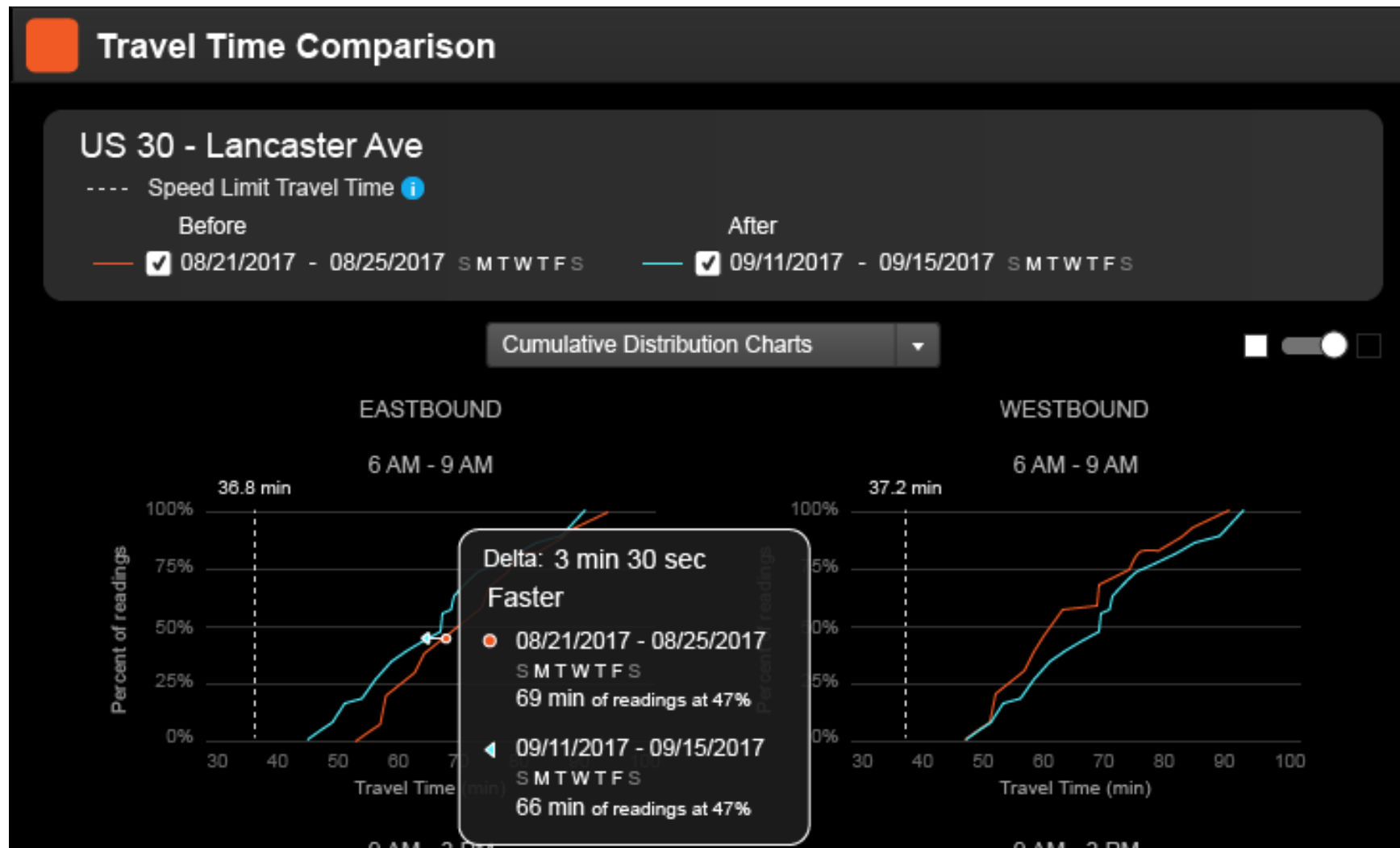Example Split Monitor metric from Intelight Maxview (PennDOT's Central System) (ATSPM)

Split Monitor

William Penn Highway (SR 0022) @ Lake Raystown Shopping Center - SIG#157
Wednesday, July 31, 2019 12:00 AM - Thursday, August 1, 2019 12:01 AM

Phase 4

Example Travel Time Comparison – RITIS PDA Suite

Travel Time Comparison

US 30 - Lancaster Ave

- - - - Speed Limit Travel Time ⓘ

Before
— ☑ 08/21/2017 - 08/25/2017 S M T W T F S

After
— ☑ 09/11/2017 - 09/15/2017 S M T W T F S

Cumulative Distribution Charts ▼

EASTBOUND

6 AM - 9 AM

36.8 min

Delta: 3 min 30 sec
Faster
● 08/21/2017 - 08/25/2017
  S M T W T F S
  69 min of readings at 47%

◄ 09/11/2017 - 09/15/2017
  S M T W T F S
  66 min of readings at 47%

WESTBOUND

6 AM - 9 AM

37.2 min

Travel Time (min)

Example Travel Time Delta Ranking – RITIS PDA Suite