I-95

Variable Speed Limit System

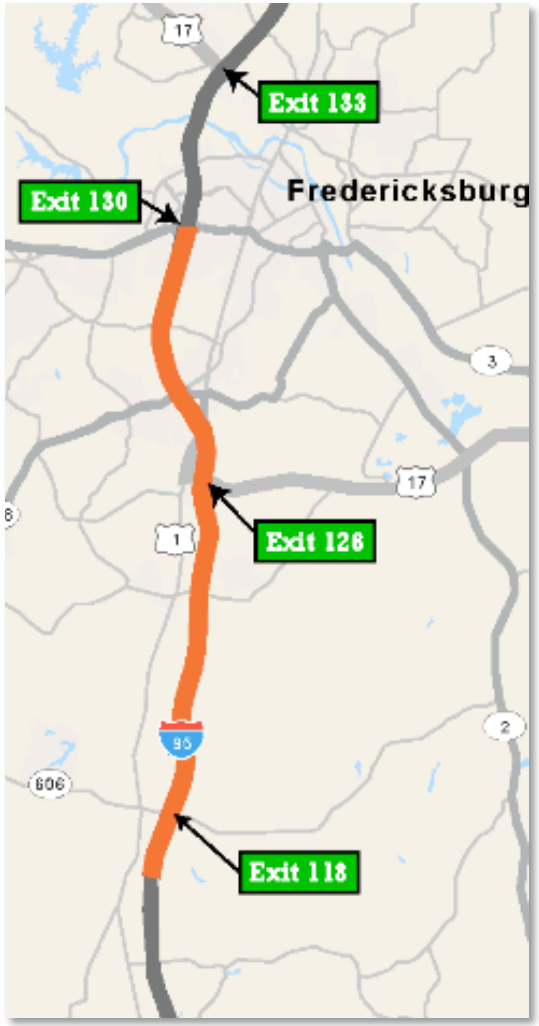
Commonwealth Transportation Board Meeting

January 11, 2022

Kimley»Horn | VDOT Virginia Department of Transportation

INTERSTATE 95

I-95 VSL Project Development

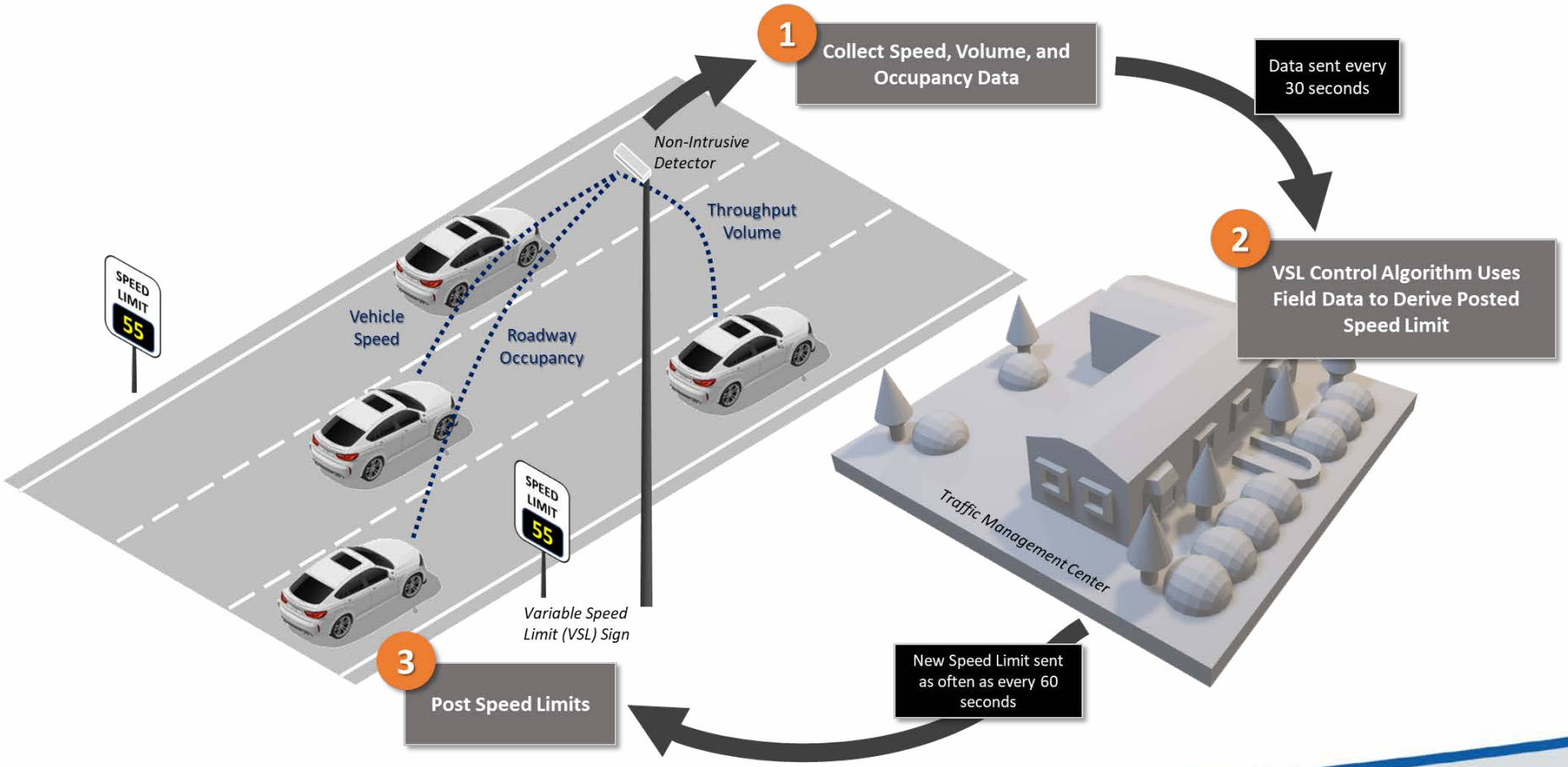


Corridor Characteristics

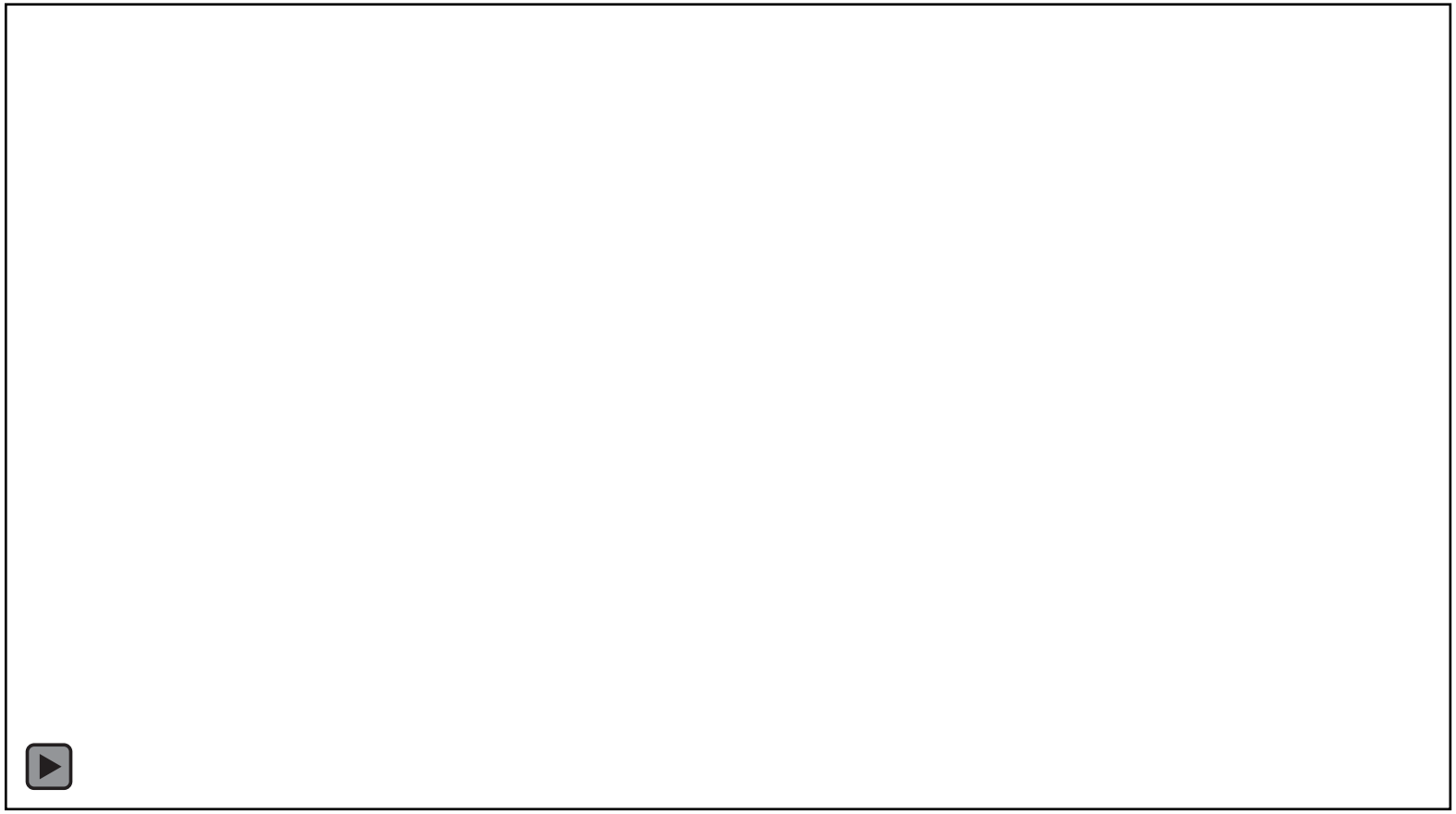
- Recurring and non-recurring congestion
- Hot spots with stop-and-go conditions
- Speed variations
- Higher crash rates – significant incident delay

Site Under Construction

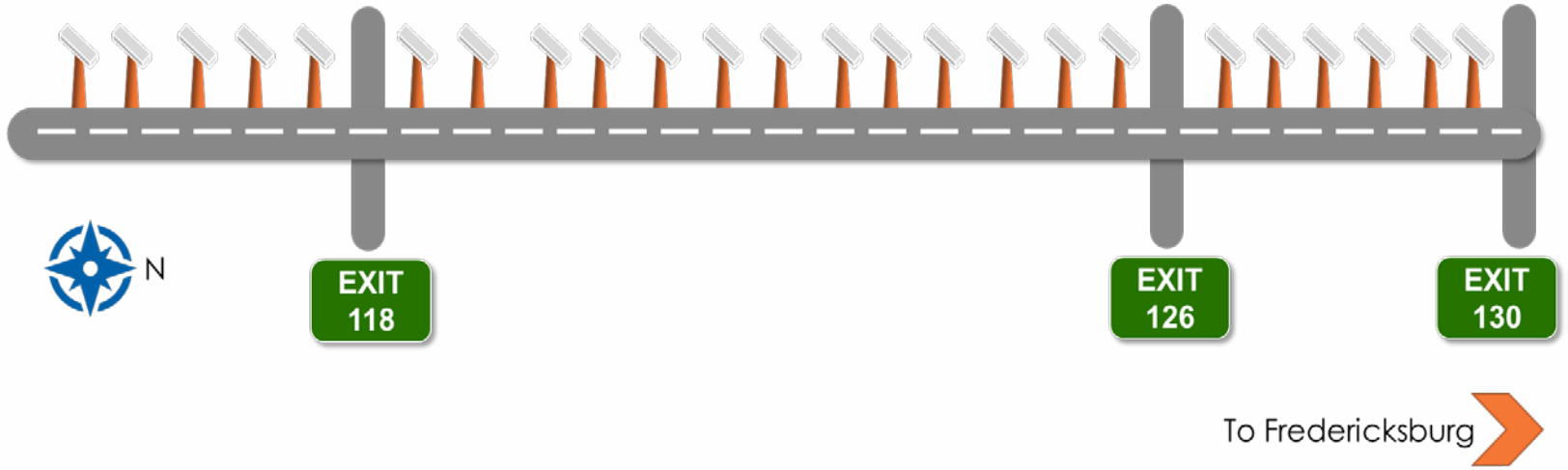
What makes this VSL system unique?



System Operation



Algorithm Testing with Live Data

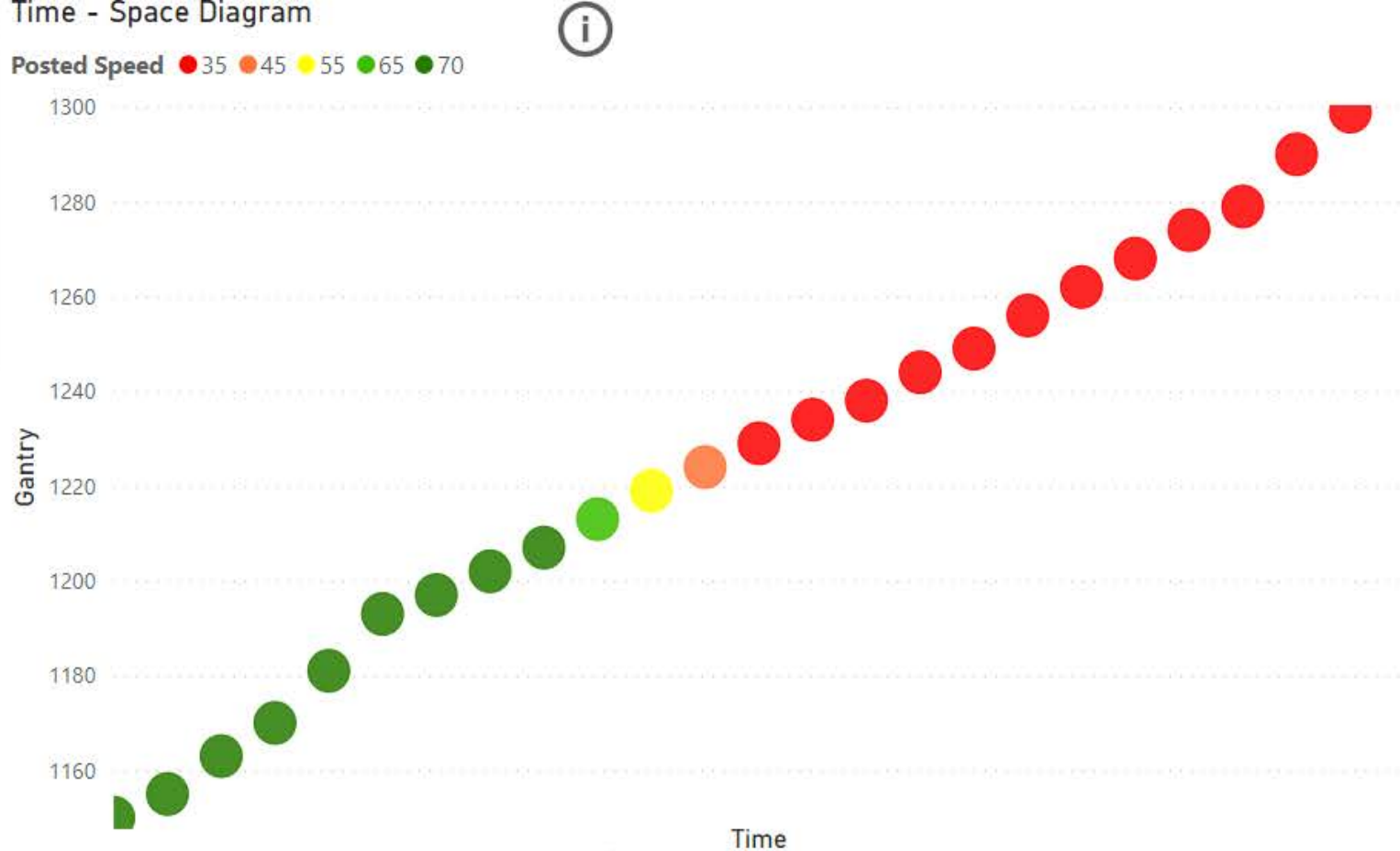


Goals of Trailer Detector Deployment:

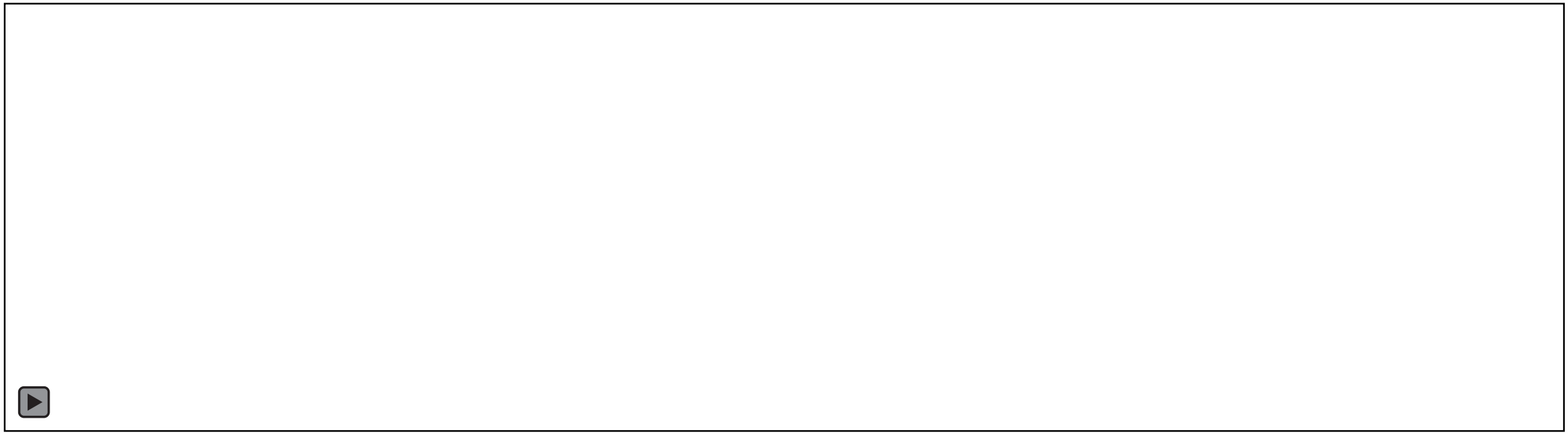
- Algorithm testing and fine tuning
- Collect before and after evaluation data

Calibrated to I-95 Corridor

Driver #	Min PSL	Speed Changes	Speed Drops	Speed Flux	Start Time
137	35	15	3	0	11/7/2021 4:00:00 PM
138	35	14	3	0	11/7/2021 5:00:00 PM
134	35	11	5	2	11/7/2021 1:00:00 PM
89	55	9	3	1	11/5/2021 4:00:00 PM
141	45	9	3	1	11/7/2021 8:00:00 PM
111	55	8	2	2	11/6/2021 2:00:00 PM
143	35	8	3	0	11/7/2021 10:00:00 PM
24	35	7	3	0	11/2/2021 11:00:00 PM
131	55	7	1	0	11/7/2021 10:00:00 AM
136	35	7	3	0	11/7/2021 3:00:00 PM
139	35	7	3	0	11/7/2021 6:00:00 PM
47	35	6	3	0	11/3/2021 10:00:00 PM
133	35	6	3	1	11/7/2021 12:00:00 PM
140	35	6	3	0	11/7/2021 7:00:00 PM
6	35	5	3	0	11/2/2021 5:00:00 AM
23	35	5	3	0	11/2/2021 10:00:00 PM
54	35	5	3	0	11/4/2021 5:00:00 AM
55	35	5	3	0	11/4/2021 6:00:00 AM
71	35	5	3	0	11/4/2021 10:00:00 PM
72	35	5	3	0	11/4/2021 11:00:00 PM
87	55	5	1	1	11/5/2021 2:00:00 PM
132	45	5	3	1	11/7/2021 11:00:00 AM
144	35	5	3	0	11/7/2021 11:00:00 PM
48	35	4	3	0	11/3/2021 11:00:00 PM
53	35	4	3	0	11/4/2021 4:00:00 AM
88	65	4	0	0	11/5/2021 3:00:00 PM
91	55	4	1	0	11/5/2021 6:00:00 PM
95	35	4	3	1	11/5/2021 10:00:00 PM
109	55	4	1	1	11/6/2021 12:00:00 PM
115	55	4	1	1	11/6/2021 6:00:00 PM
135	35	4	3	0	11/7/2021 2:00:00 PM
2	45	3	2	1	11/2/2021 1:00:00 AM
12	55	3	1	0	11/2/2021 11:00:00 AM
49	35	3	3	1	11/4/2021 12:00:00 AM
66	55	3	2	2	11/4/2021 5:00:00 PM
142	45	3	2	1	11/7/2021 9:00:00 PM
7	45	2	2	1	11/2/2021 6:00:00 AM
73	45	2	2	1	11/5/2021 12:00:00 AM



Algorithm Validation



Soft Launch and Go-Live

- “Soft launch” will illuminate signs, but speeds will not change
- Will start mid-week
- Algorithm will be activated the following week

Public communications plan:

Key messages

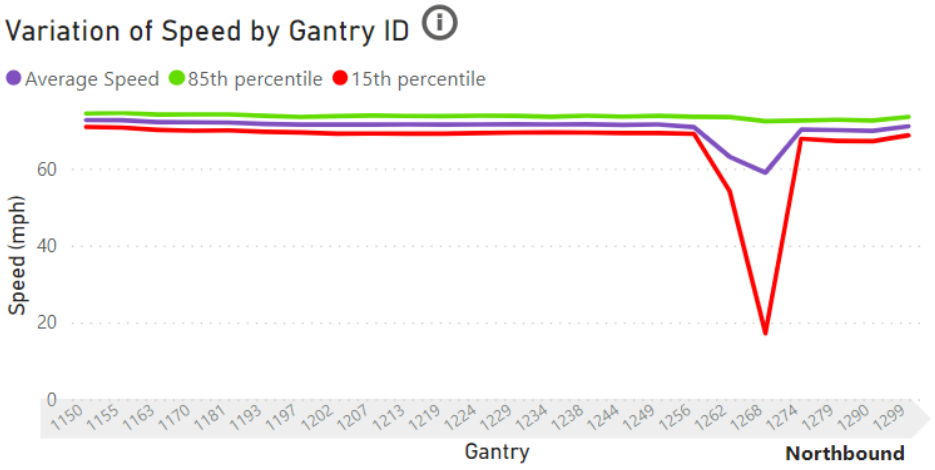
Prepare to adjust your speed – when there's a need

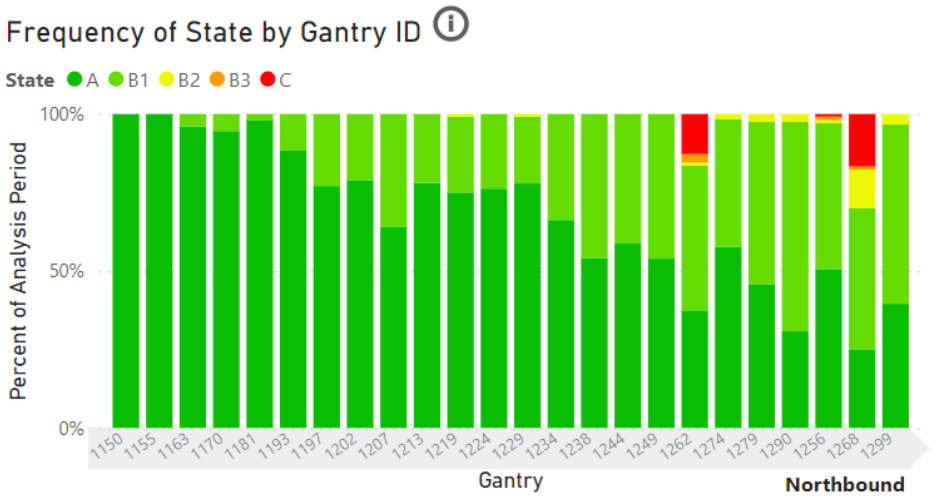
- New variable speed limit signs are posted on I-95 northbound between Exit 110 (Ladysmith) and Exit 130 (Fredericksburg).
- When traffic and weather conditions call for reduced speed, or there is a crash or work zone ahead, these electronic signs will display reduced speed limits to gradually slow vehicles down
- Slowing traffic down *before* an incident, or congestion, helps everyone keep moving – and arrive safely (rice jar)
- Seeks to avoid sudden halts and stop-and-go bottlenecks that I-95 travelers encounter approaching Fredericksburg area
- Speed limits are always enforceable, whether they are posted on an electronic or static sign
- Virginia State Police will use mobile technology to monitor variable speed limits, and enforce them as needed
- The system has been intensively tested since late fall using current traffic data, including Thanksgiving week, to demonstrate ability to predict and react to emerging conditions on the road
- A soft launch will let motorists adjust to the presence of the electronic signs for several days, with consistent posted limits, before activation of variable speeds
- Action step: Visit improve95.org/vsl

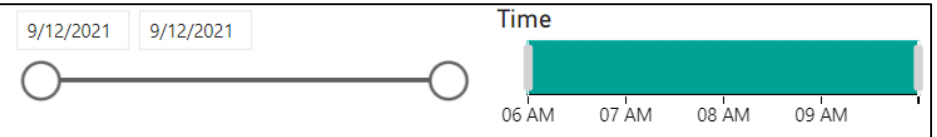
Active System Management

I-95 Variable Speed Limit System

Performance Overview







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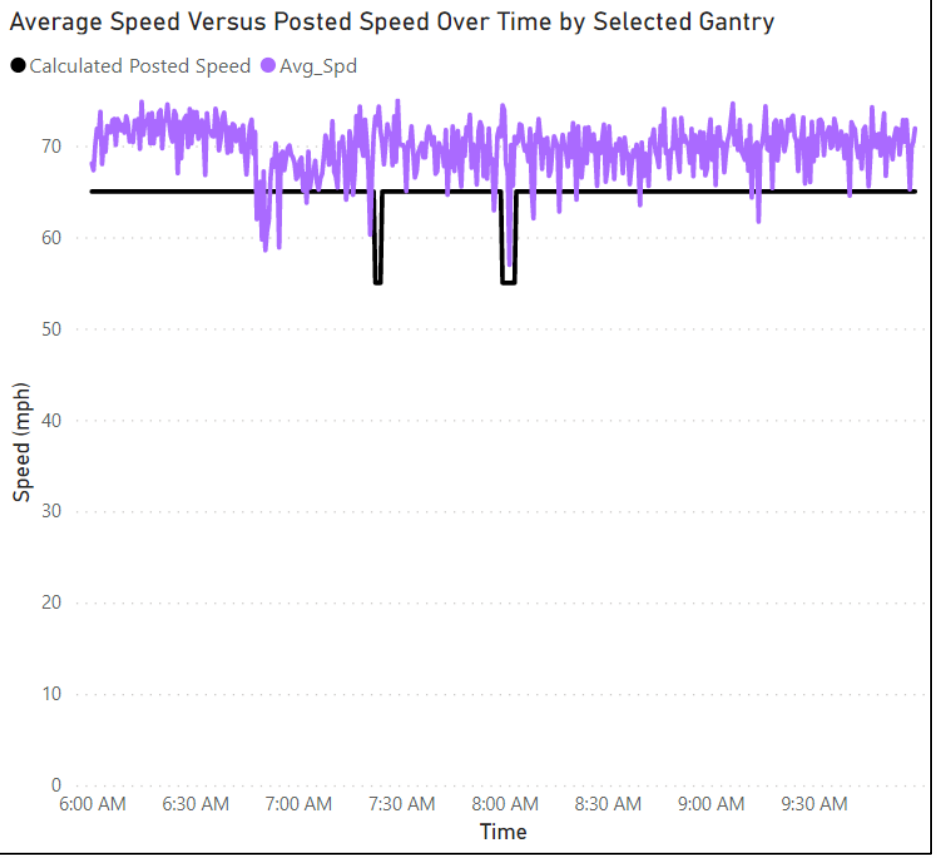

Plan for Building on the I-95 VSL Deployment

Near Term

- Leverage the large volume of corridor individual vehicle data using AI and machine learning techniques to:
  - Better understand impact of weather, incidents, and work zones on roadway capacity and flow
  - Develop predictive methods to better identify precursors to crashes and congestion so interventions could be applied before conditions worsen
  - Refine methods to evaluate future VSL deployments

Longer Term

- Explore opportunities to use connected and automated vehicles (CAVs) to provide infrastructure light speed harmonization
  - Reduce infrastructure by using CAVs as sensors and distributing messages in-vehicle
  - Provide speed guidance to automated vehicles so speeds are controlled to maximize system effectiveness by increasing compliance with speed limits

Questions on Topics Covered

High-Level Background

Significant congestion; high travel time variability; high crash rates

Algorithm

What makes this system different; How the system will work; Pre-Deployment Testing

Go-Live Timeline

Soft launch and go-live; Go-Live data is January/February 2022; System monitoring and management

Public Outreach

A roll-out plan is in place to educate drivers on the system

Research Opportunities

AI/Machine Learning on weather impacts; Connected and autonomous vehicles