MAP-21 INTERSTATE RELIABILITY MEASURE TARGET SETTING METHODOLOGY

Presentation to Commonwealth Transportation Board

Traffic Engineering Division, VDOT

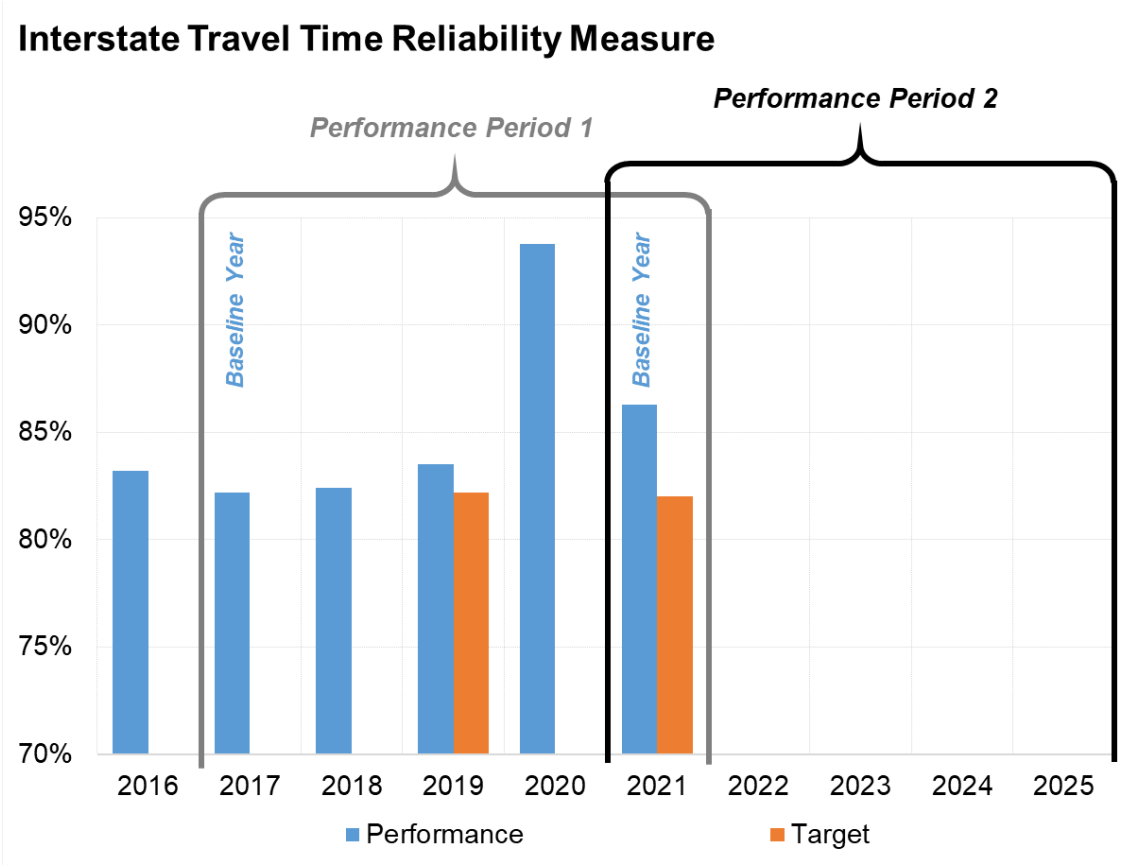
March 15, 2022

Presentation Outline

- Federal Performance Measure
  - Definition & Understanding
- Target Setting
  - Past and Future Data
  - Modeling
  - Prediction
- Next Steps
- Questions

MAP-21 Requirement for Interstate Reliability Measure

- **States:**
  - Establish Interstate Travel Time Reliability Measure targets for 2 and 4 years at Statewide and MPO levels
  - If necessary States may adjust target at 2 years
- **FHWA:**
  - Assess whether State achieved or made significant progress towards targets every 2 years
  - If not, States must report the actions it will take to achieve targets.



Moving Ahead for Progress in the 21st Century (MAP-21) Law

Measure:

Percent of Person Miles Traveled on the Interstate that are Reliable or Interstate Travel Time Reliability Measure

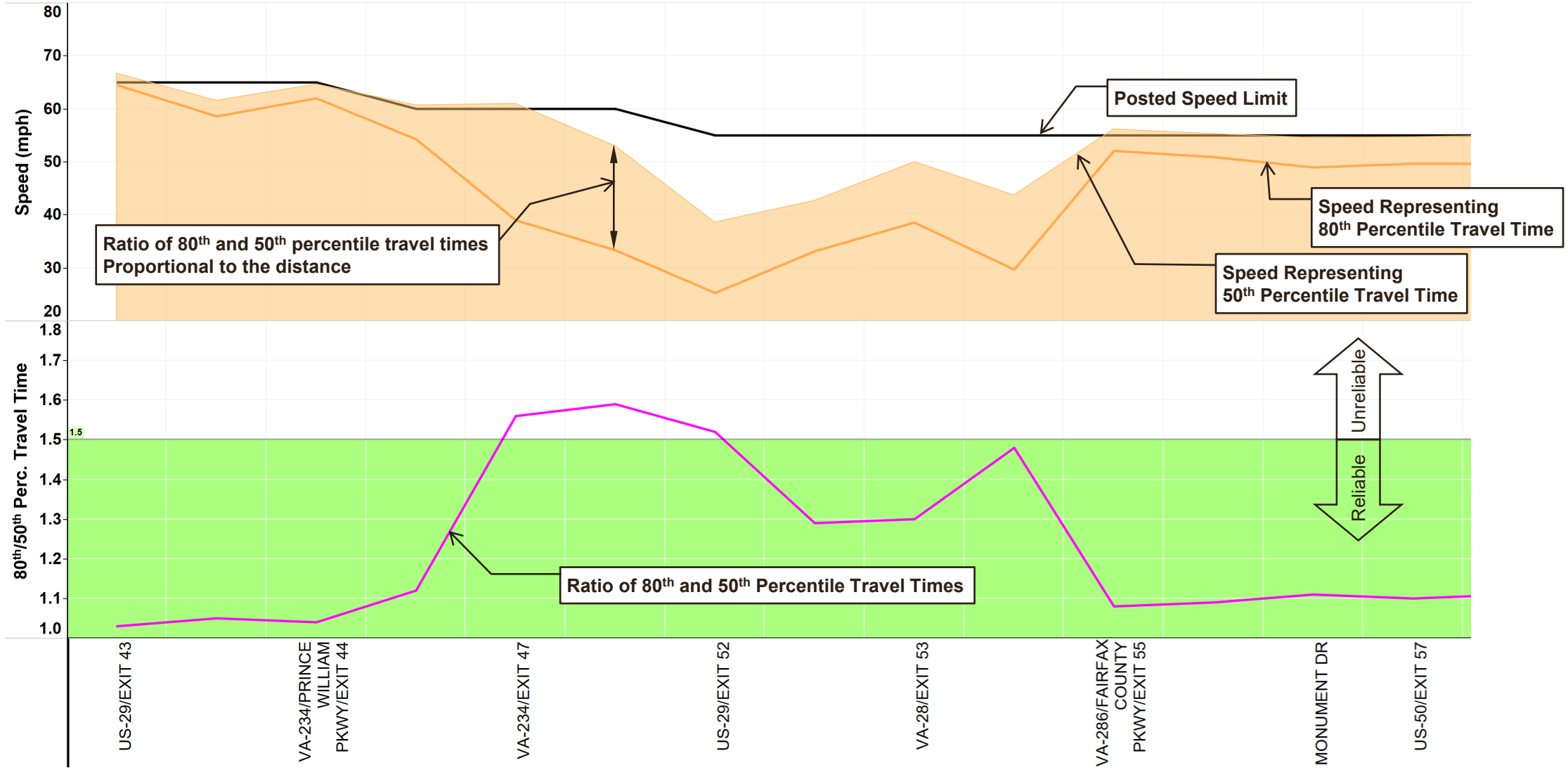
Formula	Condition for a Segment to be *Reliable*
$$Interstate\ Travel\ Time\ Reliability\ Measure = 100 \times \frac{Total\ Reliable\ Person\ Miles\ on\ Interstate}{Total\ Person\ Miles\ on\ Interstate}$$	$\frac{80th\ Percentile\ Travel\ Time}{50th\ Percentile\ Travel\ Time} < 1.5 \rightarrow$ *In ALL 4 Time Periods** *Example of Reliable Trip: You add no more than 50% additional time to your normal travel time to arrive on-time 80% of the times*

* **Time Periods:** Weekdays • AM Peak (6a - 10a) • Mid Day Peak (10a - 4p) • PM Peak (4p - 8p)
Weekends • Majority hour of Traffic (6a - 8p)

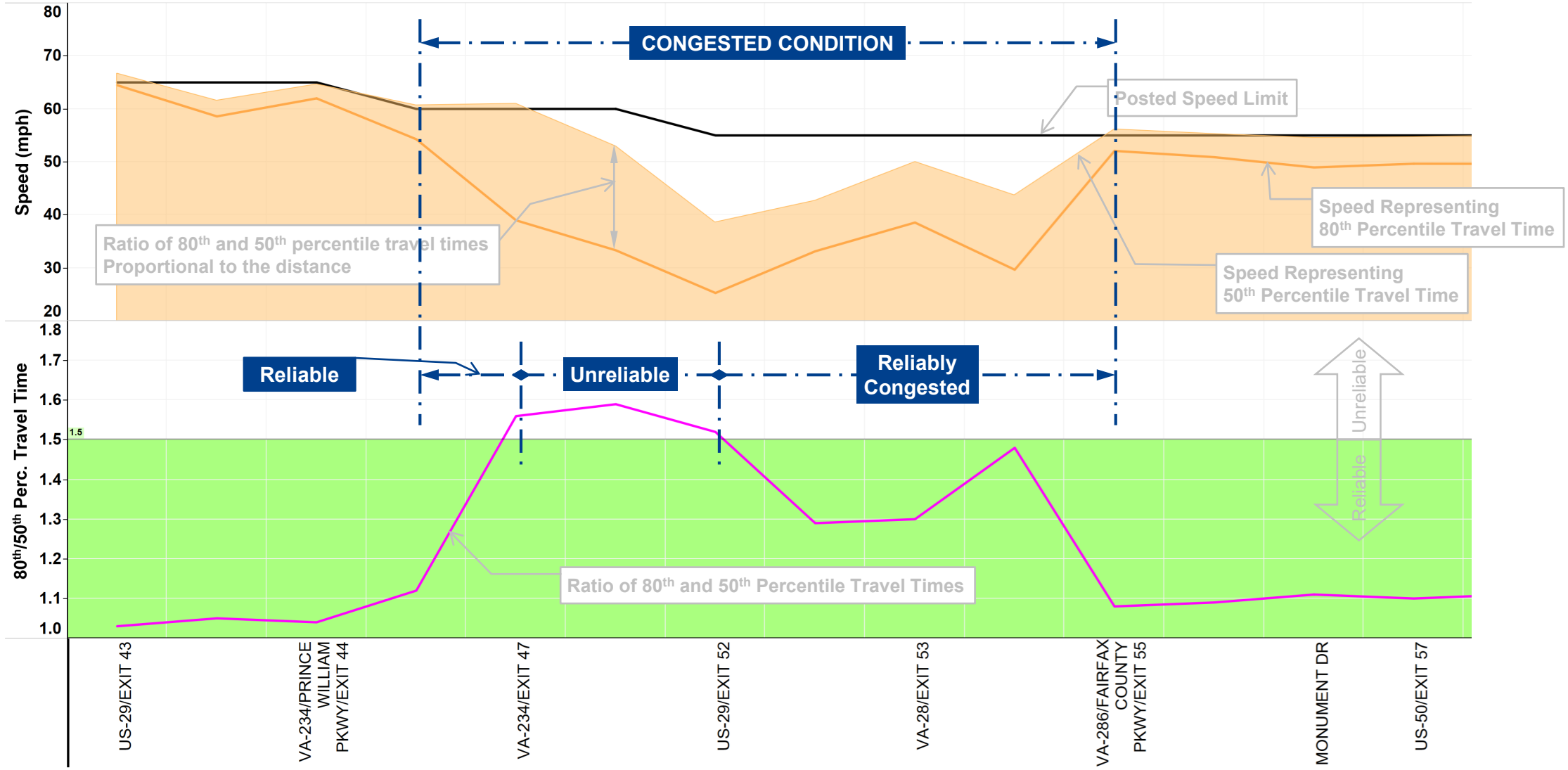
- One value calculated for the Interstate System in Virginia for a Calendar Year
  Example: Virginia's Interstate Travel Time Reliability Measure in Year 2019 was 83.55%

Target to be calculated for Interstate Travel Time Reliability Measure

Example: I-66 EB AM Peak (6 AM – 10 AM)



Example: I-66 EB AM Peak (6 AM – 10 AM)



Target Setting Steps

A. Prepare Input Data for Variables

B. Develop Model for Prediction

C. Validate Model

D. Prepare Future Years' Data

E. Predict Interstate Travel Time Reliability Measure for future years

A

Interstate Speed and Travel Time – Potential Influencers

Roadway Geometry

- **Segment Length**
- **FHWA Network**
- Number of Lanes
- Terrain

Traffic

- **Annual Average Daily Traffic (AADT)**
- **Occupancy Factor**
- Growth Rate of Daily Vehicle Miles Traveled
- Volume Capacity Ratio (v/c)
- Heavy Vehicle %

Urban Category

- Urbanized
- Urban Cluster
- Rural

Event

- Crashes
- Incident Duration
- Adverse Weather

Operations Improvement Program

- Safety Service Patrol

Roadway Improvement Types

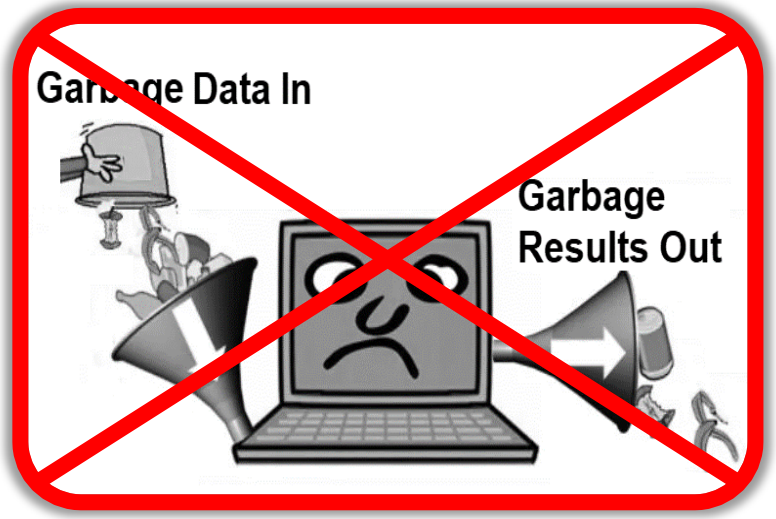
- Capacity Improvement
- Acceleration/ Deceleration Lane Extension

Based on Influencers, Identified 30 Independent Variables

A

Data Collection, Exploration, and Preparation

Data collected for Potential Influencers for years 2017 to 2024



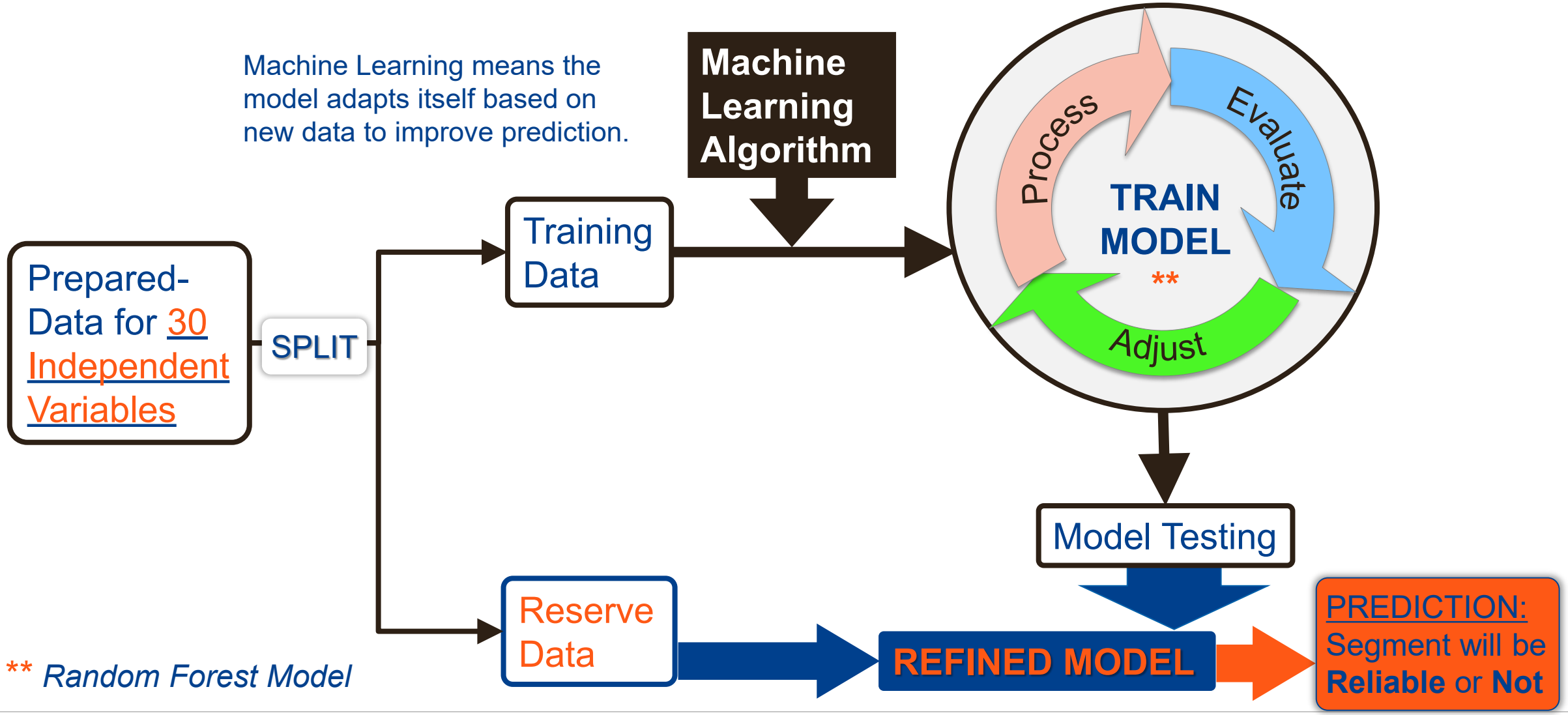
- **Data Cleaning**
  - Identify Incomplete, Inaccurate and/or Inconsistent data
  - Replace, modify, or delete as necessary
- **Data Exploration and Visualization**
- **Data Organization**

Prepared Data for 30 Independent Variables

B

Model Development

Machine Learning means the model adapts itself based on new data to improve prediction.



** *Random Forest Model*

C

Validation

Validation of Statewide Measure

Year	Predicted PMTR-IS	Actual PMTR-IS	Error
2017	82.71%	82.48%	0.28%
2018	82.87%	82.62%	0.30%
2019	83.30%	83.55%	-0.30%
2020	94.19%	93.80%	0.42%
2021	87.25%		

Very Small

- **Model may be used to Predict Interstate Travel Time Reliability Measure**

D

Prepare Data for Future Years

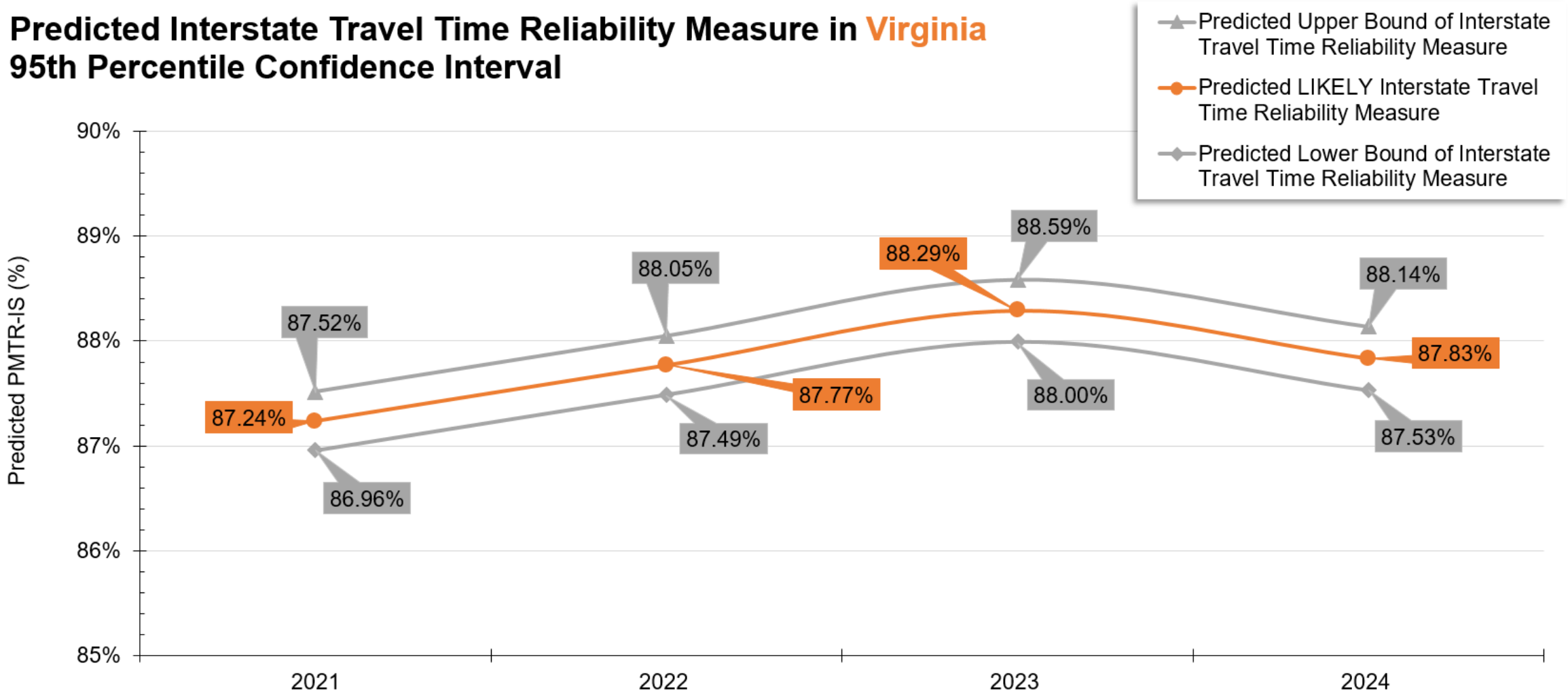
- **Future Year Number of Lanes based on Six Year Improvement Program Project Types, Completion between 2022 and 2024:**
  - Capacity Improvement
  - Acceleration/ Deceleration Lane Extension

- **Future Year v/c, AND Future Year Crashes based on:**
  - Future Year Number of Lanes
  - Projected AADT using yearly Growth Factor

❖ **Future Year Number of Lanes, Future Year v/c, and Future Year Crashes used in Model**

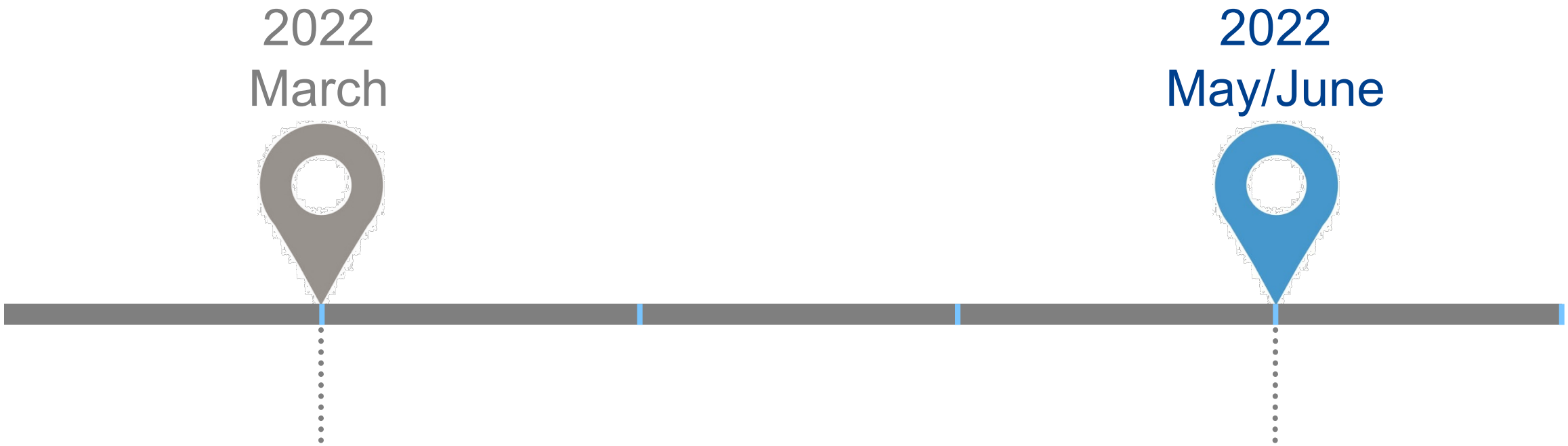
E

Interstate Travel Time Reliability Measure Prediction – Statewide



*** 2021 December Data was not available at the time of this Calculation, Model will be re-run after 2021 AADT is available**

Timeline for CTB Presentation



Statewide MAP-21 Interstate Travel Time Reliability Measure Target Setting Methodology

Statewide MAP-21 Interstate Travel Time Reliability Measure

- **2021 Reliability (Baseline)**
- **2 year Target for year 2023**
- **4 year Target for year 2025**

Reliability Measure Characteristics Needed for Virginia

MAP-21 Interstate Travel Time Reliability Measure Does Not Meet Virginia's Reliability Measure Need

- Large Time Periods (4/6/10 hrs) do not reflect peak hour travel conditions, and the Reliability fluctuations.
- One set of peak period for the entire State is not appropriate as peak period travel patterns vary by region.
- One calendar year span does not reflect seasonal variations, therefore not useful for addressing any season specific issues.
- Limited Geographical Scale (Statewide and MPO) therefore not sensitive to improvements with limited area of influence

Reliability Performance Measures for Virginia

Virginia needs appropriate Reliability Measures to:

- Compare Improvement Alternatives
- Capture Benefits of Traffic Management
- Sensitive to Investment Strategies
- Assess System Performance in Virginia

Questions?