



An Alternative Look at Arterial Performance Measures



I-95 CORRIDOR COALITION

Introduction

Outsourced vehicle probe data is available from multiple vendors on most major arterial facilities.



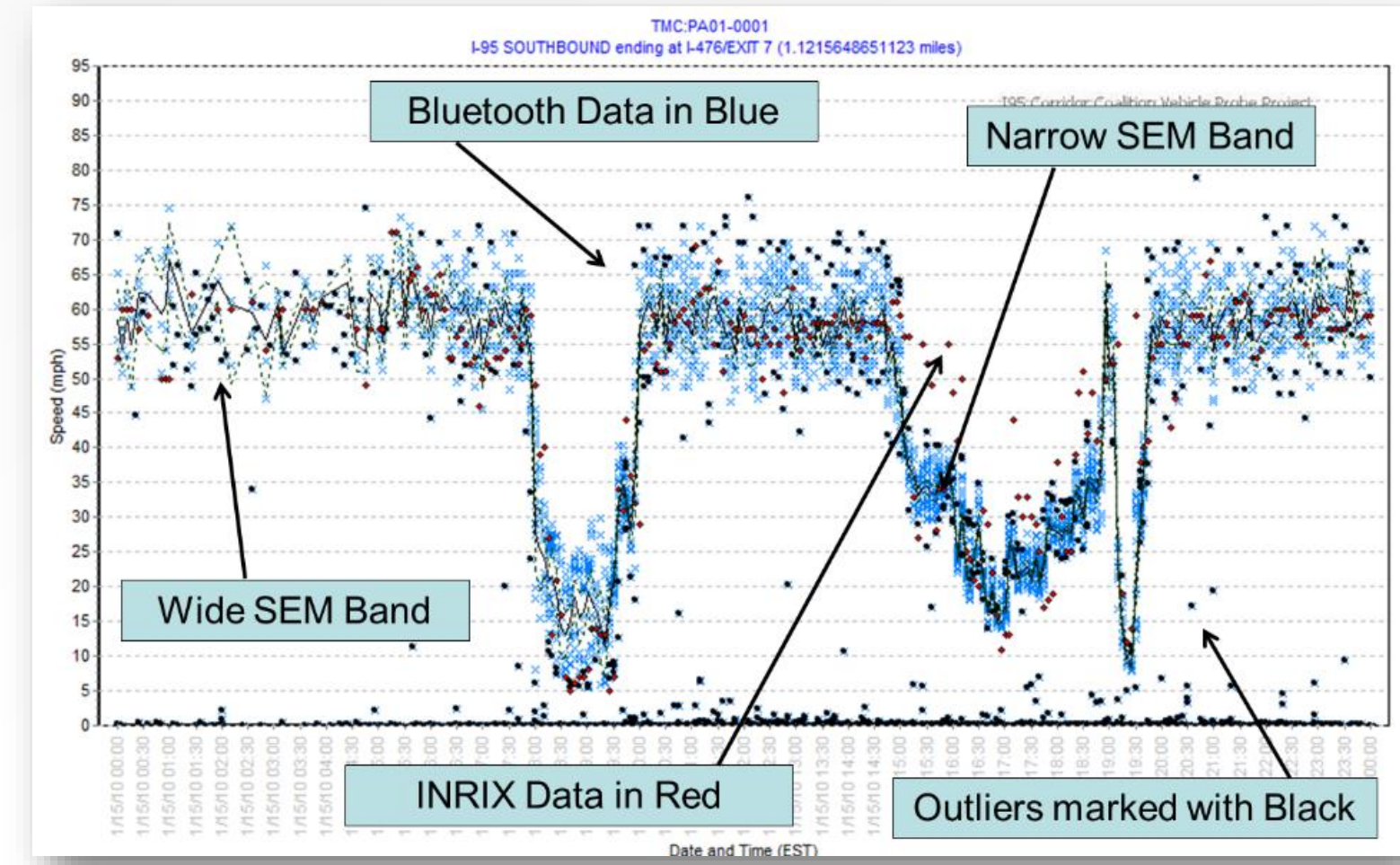
Typical busy arterial (Source: Bay News 9, 2012)

Validation studies have shown that arterial probe data does not necessarily reflect reality due to fundamental differences between arterials and freeways. Through three distinct phases, CATT's arterial validation program has matured to offer practitioners guidance on whether arterial probe data should be used for performance monitoring and an alternative way to generate arterial performance measures.

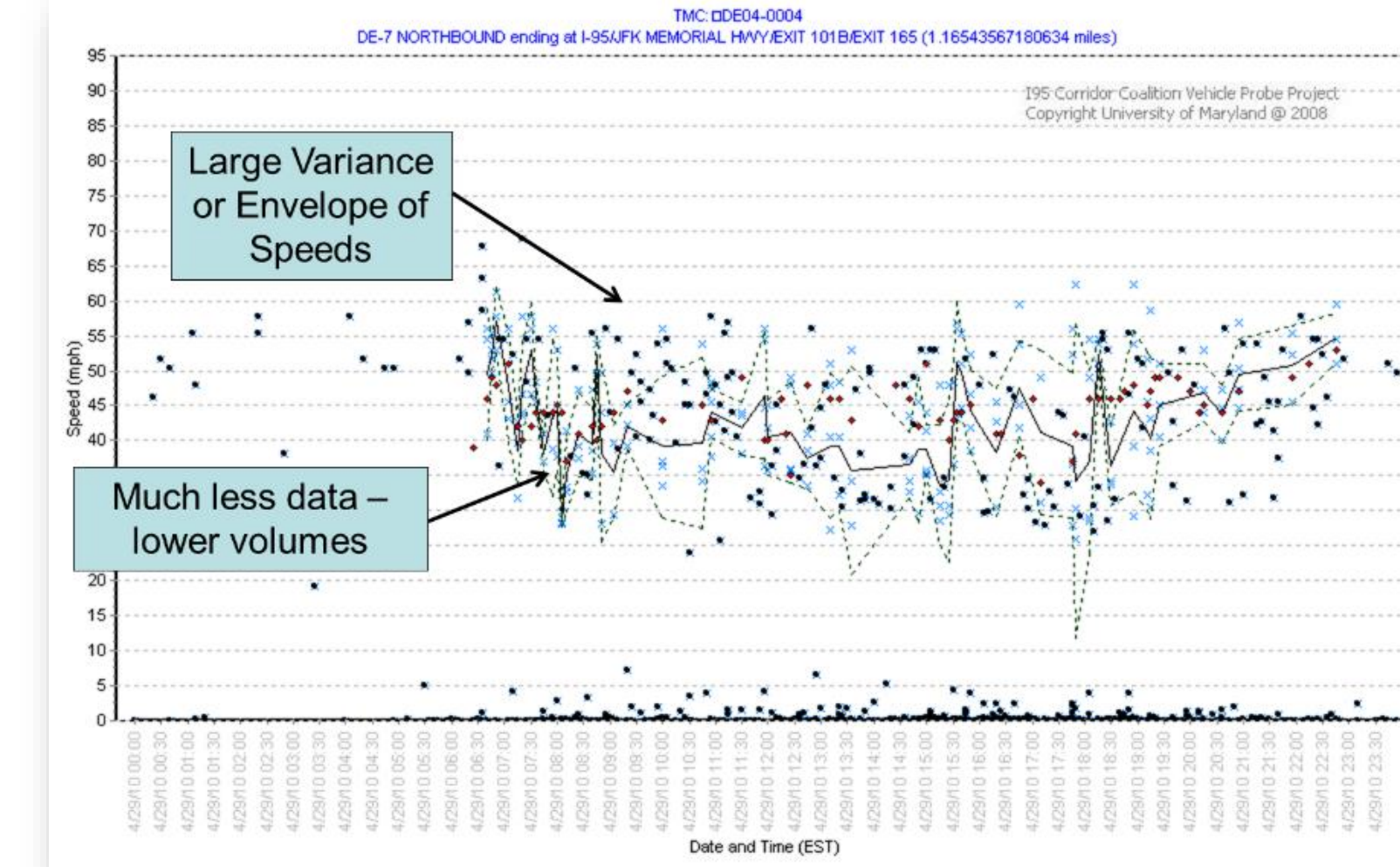
1st Phase Freeways ≠ Arterials

	Freeways	Arterials
Volume	2200 vphpl	1400 vphpl on green
Speed Range	20-70 mph	10-45 mph
Freeflow	65 mph	Unknown
Congestion Types	Recurring / Non-recurring	Cycle Failure / Mid-Block Friction
Congestion Signature / Incident	Slowdowns < 55 mph	Difficult to recognize
Flow characteristic	Uniform	Higher Variance, Frequently Bi-Modal

The traditional probe data validation method (comparing Bluetooth to probe data) did not work on arterials. Another validation method was needed to truly capture arterial data quality.

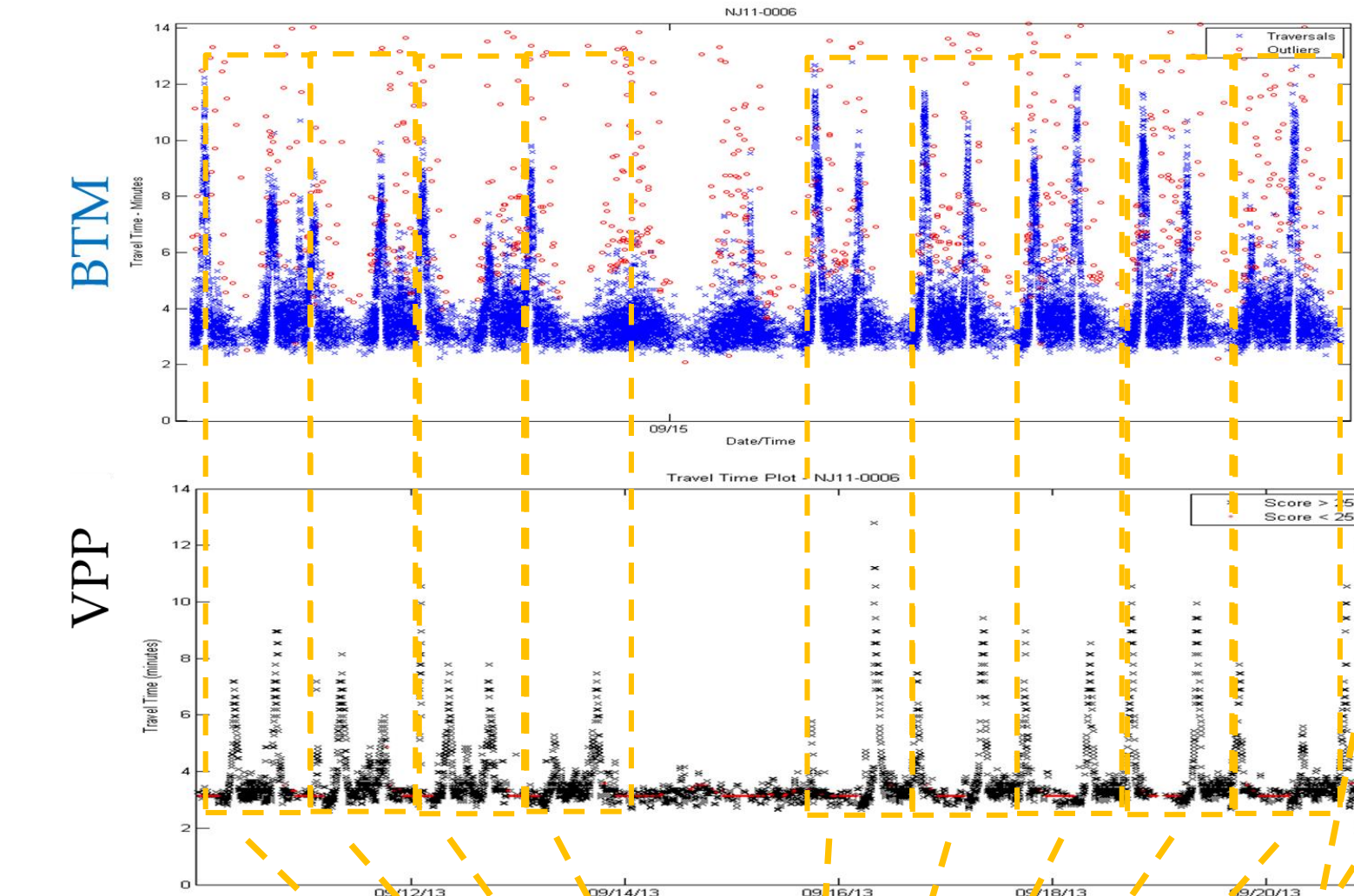


Traditional Validation (Freeway)

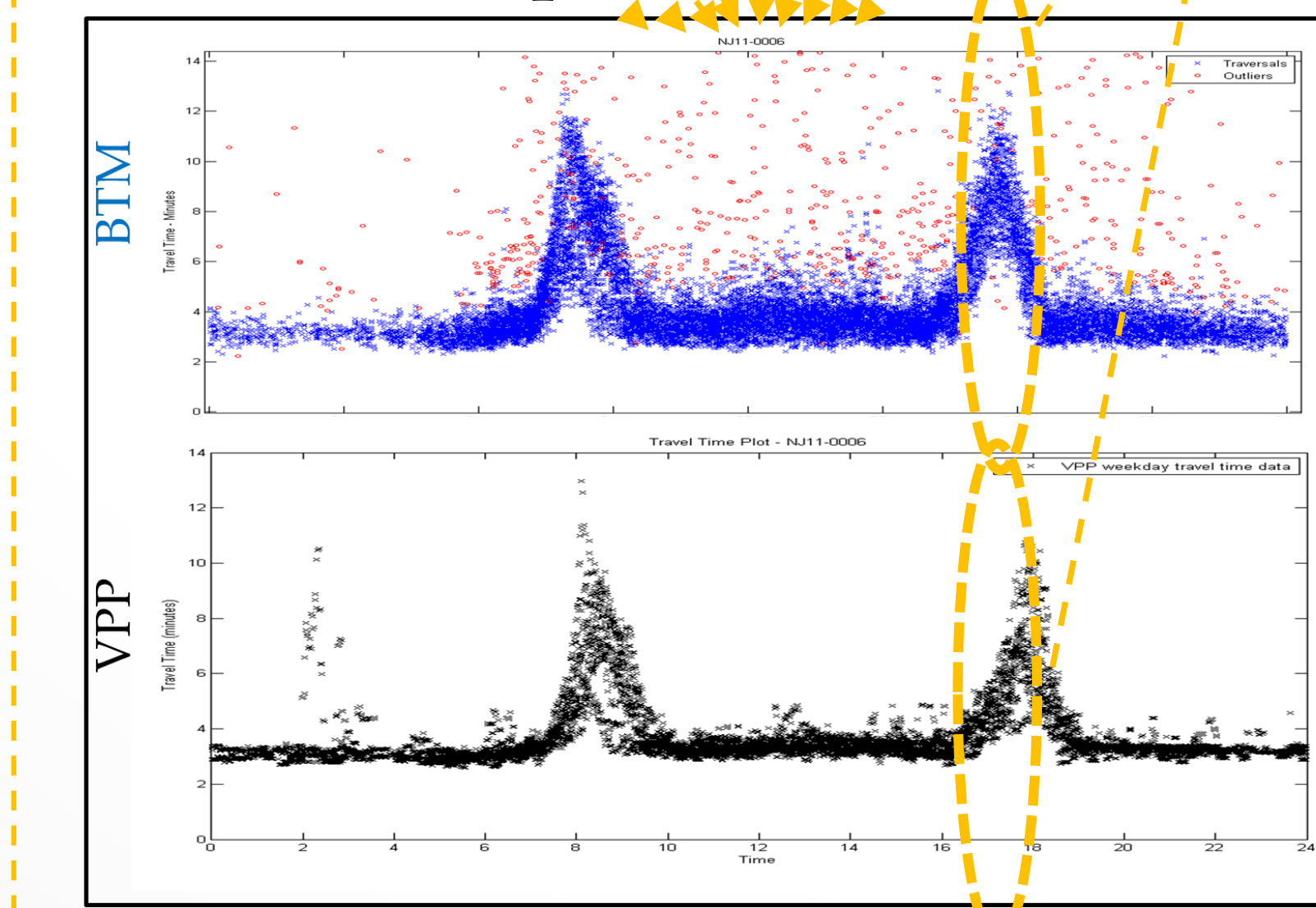


Traditional Validation (Arterial)

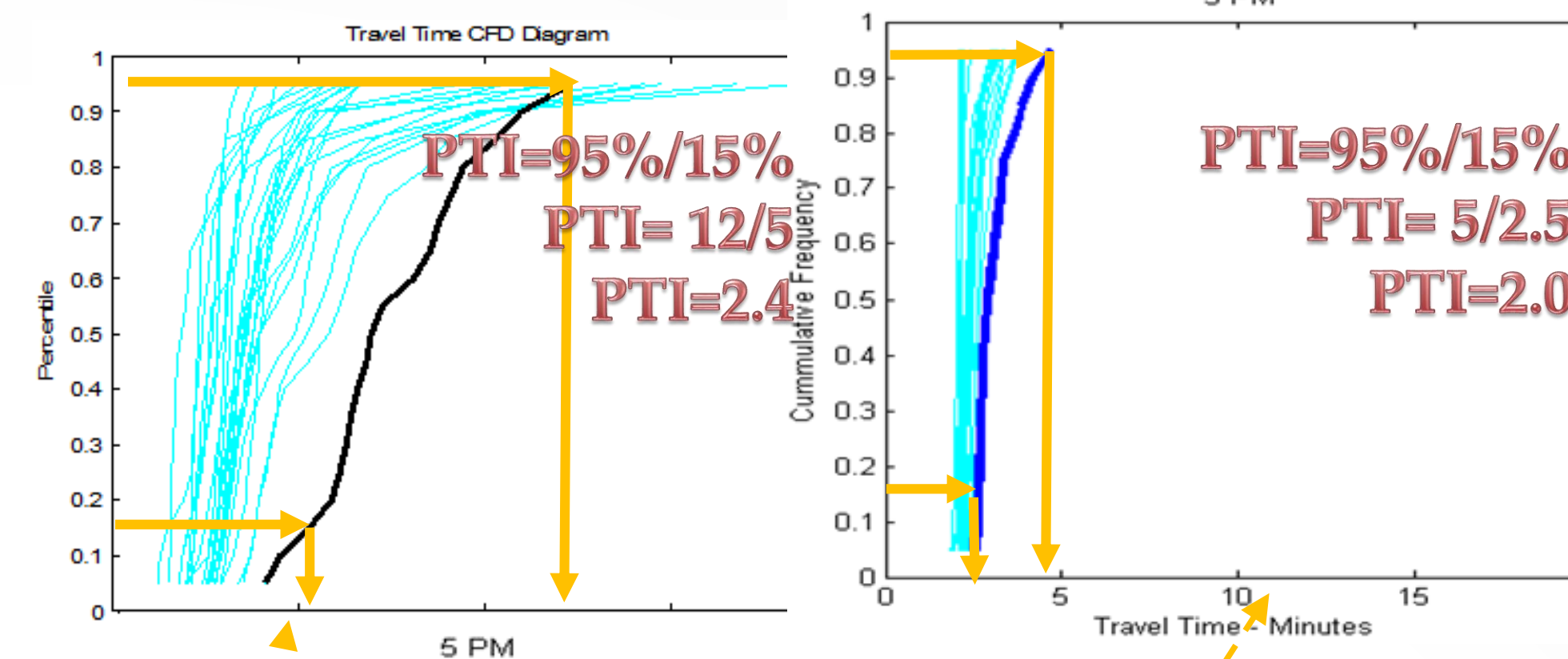
2nd Phase New Methodology



First daily scatter plots showing travel times throughout the validation period (≈2 weeks) are plotted.



Data from each weekday is superimposed on each other resulting in a data set rich enough for validation (and more).



Lastly, the scatter plots are converted into cumulative distribution functions (CDF). Once in this form, the data from each set can easily be compared and any performance measure can be derived. Based on phase two, arterials fall in one of three categories.

Likely to have accurate probe data	Possibly accurate probe data	Unlikely probe data is accurate
<ul style="list-style-type: none"> AADT >40000 2+ lanes <= 1 signals per mile Principal Arterials (HPMS) Limited Curb cuts 	<ul style="list-style-type: none"> AADT 20K to 40K 2+ lanes <= 2 signals per mile Minor Arterials (HPMS) Should be tested 	<ul style="list-style-type: none"> Low volume, < 20K AADT >=2 signals per mile Major Collectors (HPMS) Not recommended

3rd Phase Detailed Reports

The reports scrutinizes the characteristics of roadways (volume, speed limit, geometry) to provide insight on how these characteristics affect the quality of probe data, which is assessed based on counting the number of congestion events probe data was fully, partially, or unable to detect. See the below QR code to access the detailed reports:

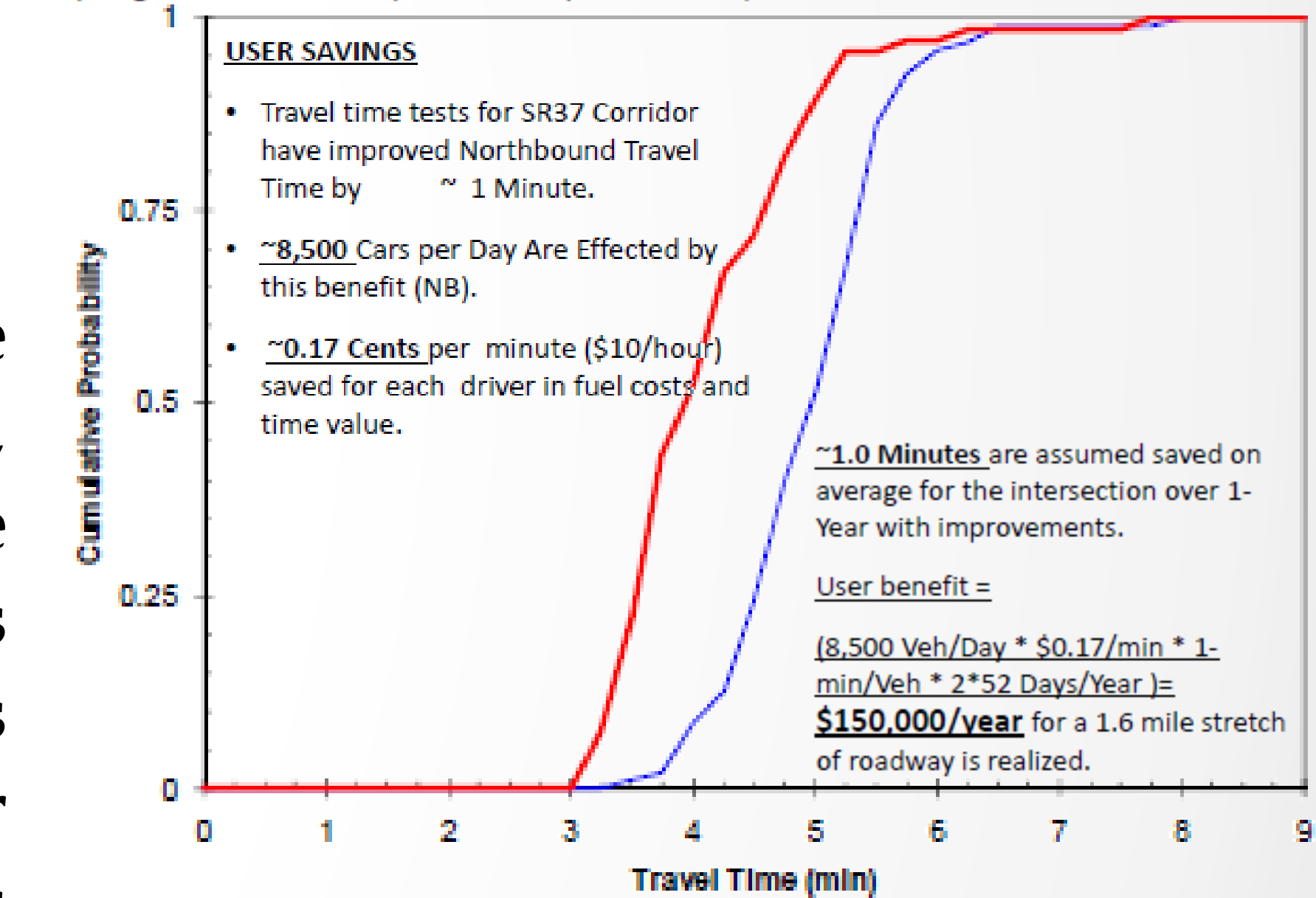


	VPP	BT
TTI	1.40	2.07
PTI	3.13	3.09
BTI	2.23	1.49
25th	3.46	5.11
50th	4.27	7.58
75th	6.33	9.18
95th	9.50	11.33
IQR	2.87	4.07

Why Not Use It All?

When using only a few percentiles to calculate performance measures, you obscure much of the data. The CDFs shown are drastically different, yet their planning time index's (PTIs) are only partially off. By using the whole CDF for data validation and performance measurement, one can get a full understanding of the data fidelity, the facility's operation, and so much more.

Business Case: SR 37 Timing Improvements



0600 - 2200 (8,500 veh)

Contacts

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Segment NU-00##	GEOMETRIC DESCRIPTION					TMC CODES			BTMData		General Description and Notes (All lengths in miles and speeds in MPH)
	Crossroads	Lanes	AADT	Signals		Begin	Len	Begin	Length		
	Starting at	Min	Min	#	Access Points	Med		End			
	Ending at	Max	Max	#/Len	Speed Limit <th>Maj</th> <th>End</th> <th>#</th> <th>End</th> <th>% Diff</th> <td></td>	Maj	End	#	End	% Diff	
US-1 Northbound in New Jersey, commonly known as Trenton Fwy or Brunswick Pike NU11-0001 to -0007											
03	US-1 Bus/Brunswick Pike	2	33352	1	9	Yes	103P04923	0.75	C	0.74	1/3 in Trenton Fwy, 2/3 in Brunswick Pike, Ends with signalized intersection with Bakers Basin Rd.
	Bakers Basin Rd/Franklin Corner Rd	3	47987	1.3	55	0	103P04924	3	D	-1.2%	
05	I-295/I-95	3	87729	0	11	Yes	103+04926	1.16	Q	1.12	Brunswick Pike, Grade separated intersection with Quakerbridge Rd/US-533
	Quakerbridge Rd	4	89635	0.0	55	0	103P04926	2	I	-3.5%	