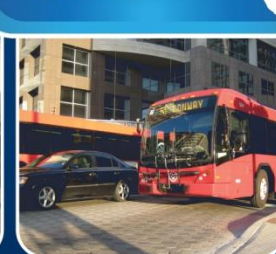
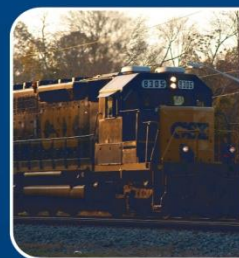


Reliability and Safety Prediction for Planning

presented by
Rich Margiotta, Cambridge Systematics

Beth Alden, Hillsborough County

December 7, 2016



Background



- Describe the effort to inject operations and safety into the Hillsborough long range plan update
- Needed a tool to predict travel time reliability and safety measures
- Desire to make available to all Florida MPOs

Background



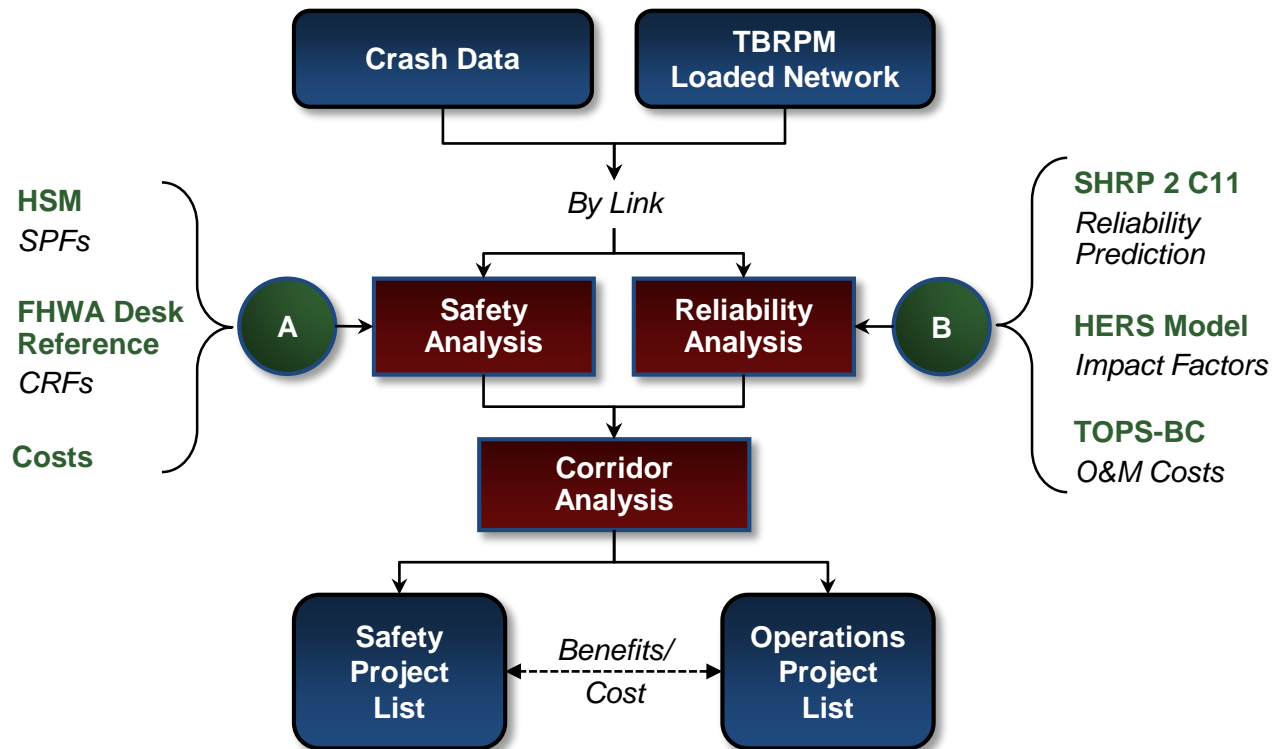
- FDOT funded a project to implement ***Travel Time Reliability*** tools developed under the Strategic Highway Research Program 2 (SHRP2)
- One of these was the SHRP2 Project C11 tool, a sketch planning tool for studying reliability impacts and costs for individual projects
- Team decided to be more useful, the tool could be updated and extended to work with a travel demand forecasting model

Background (cont.)



- Hillsborough County agreed to be the test case
- Team developed an analysis procedure to work with the loaded network file from the TBRPM
 - Allows the consideration of Operations and Safety projects to address deficiencies
 - Produces reliability and crash-related performance measures
 - Safety prediction was added because of the high interest for the LRTP update
- Analysis incorporated into *Imagine 2040*

Basic Structure



Reliable travel means that unpredictable circumstances do not cause lengthy, unpredictable, and frustrating delays.

Unpredictable Circumstances...

Inclement Weather



Fluctuations in Demand



Crashes



Work Zones



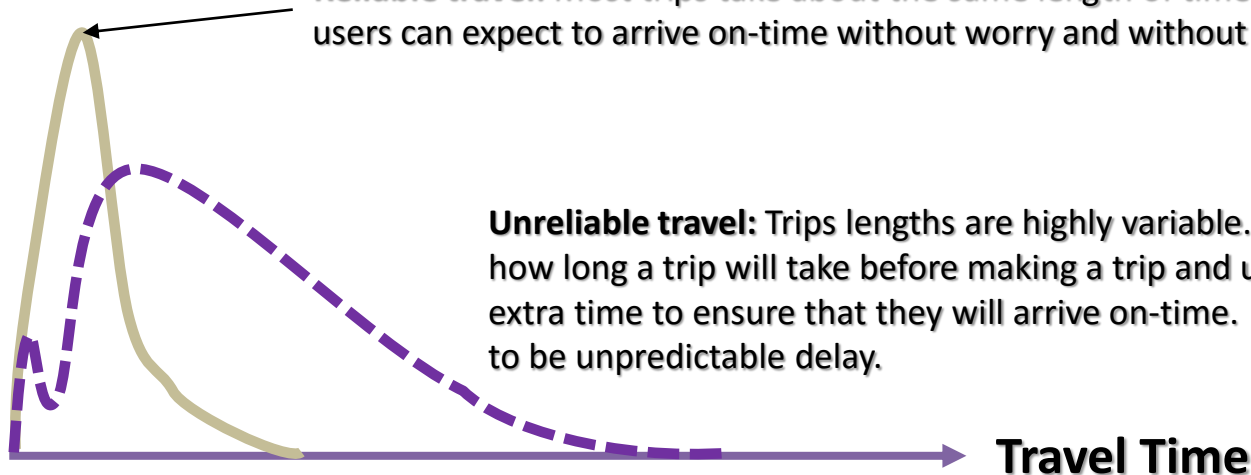
Poorly Timed Traffic Signals



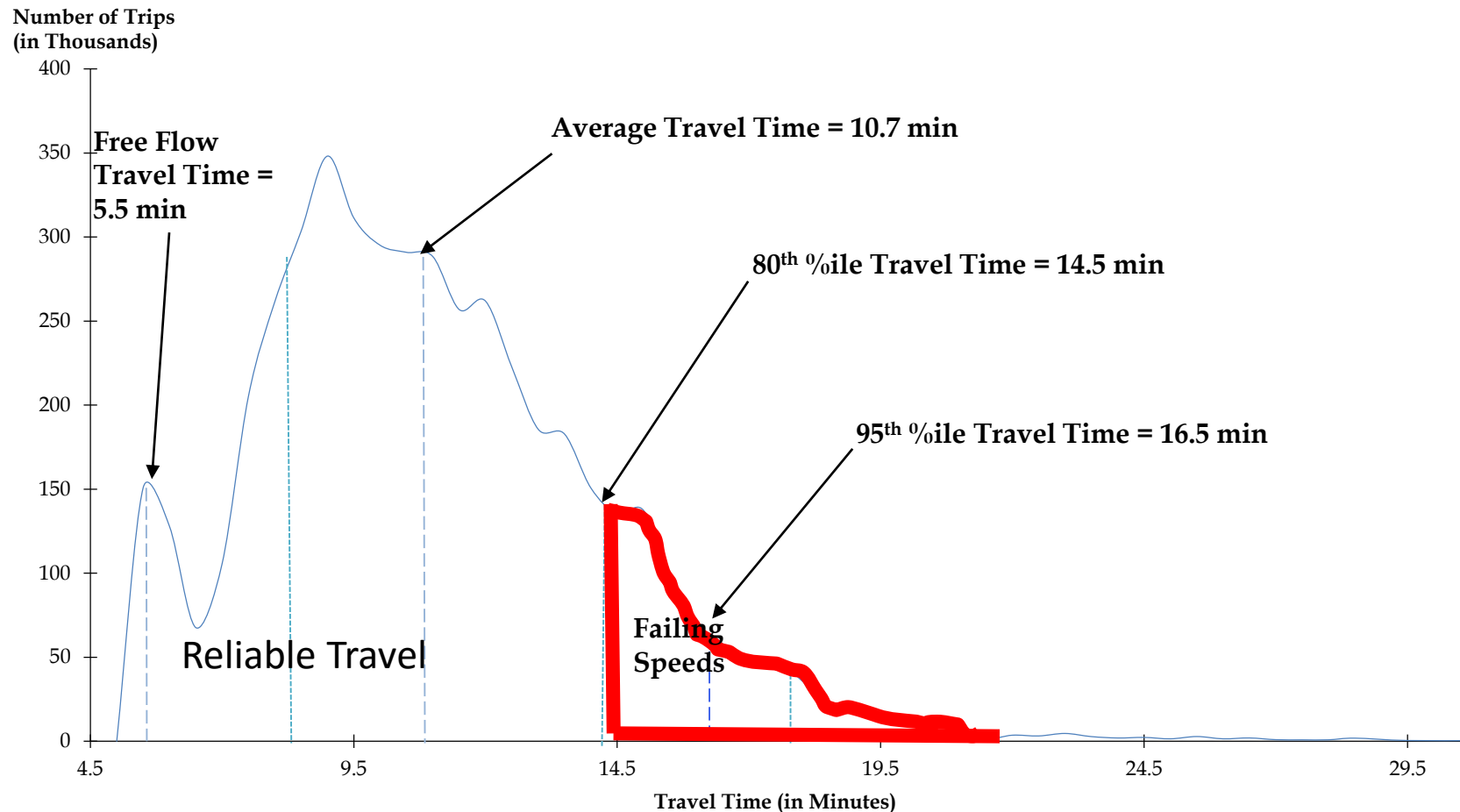
...Do Not Cause Unpredictable Delays.

Reliable travel: Most trips take about the same length of time. Under these conditions, users can expect to arrive on-time without worry and without unexpected delay.

Unreliable travel: Trips lengths are highly variable. It is difficult to judge how long a trip will take before making a trip and users often will build in extra time to ensure that they will arrive on-time. These users *expect* there to be unpredictable delay.



Travel Time Reliability



The ratio of actual travel time to free flow travel time is 2.63 ($14.5 / 5.5 = 2.63$ travel time index (TTI))

Current Project



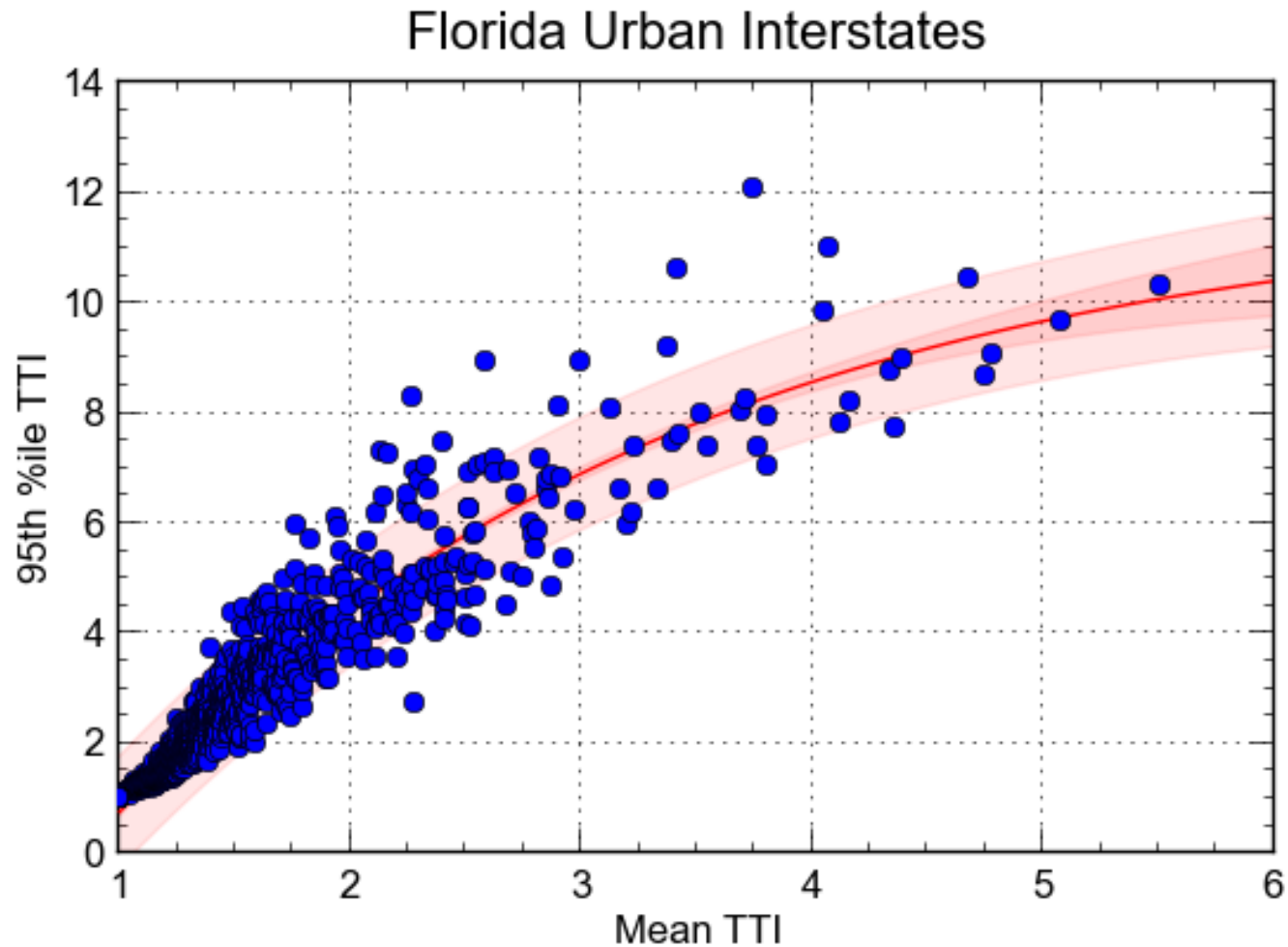
- FDOT received a grant from FHWA to implement formally the SHRP2 tools, including:
 - Develop user-grade tool for the C11 sketch planning TDF post-processor; update relationships
 - Make available to all Florida MPOs
 - New *Highway Capacity Manual* reliability procedure
 - Adding reliability and operations considerations to the FDOT planning and project programming

Post-Processor Improvements

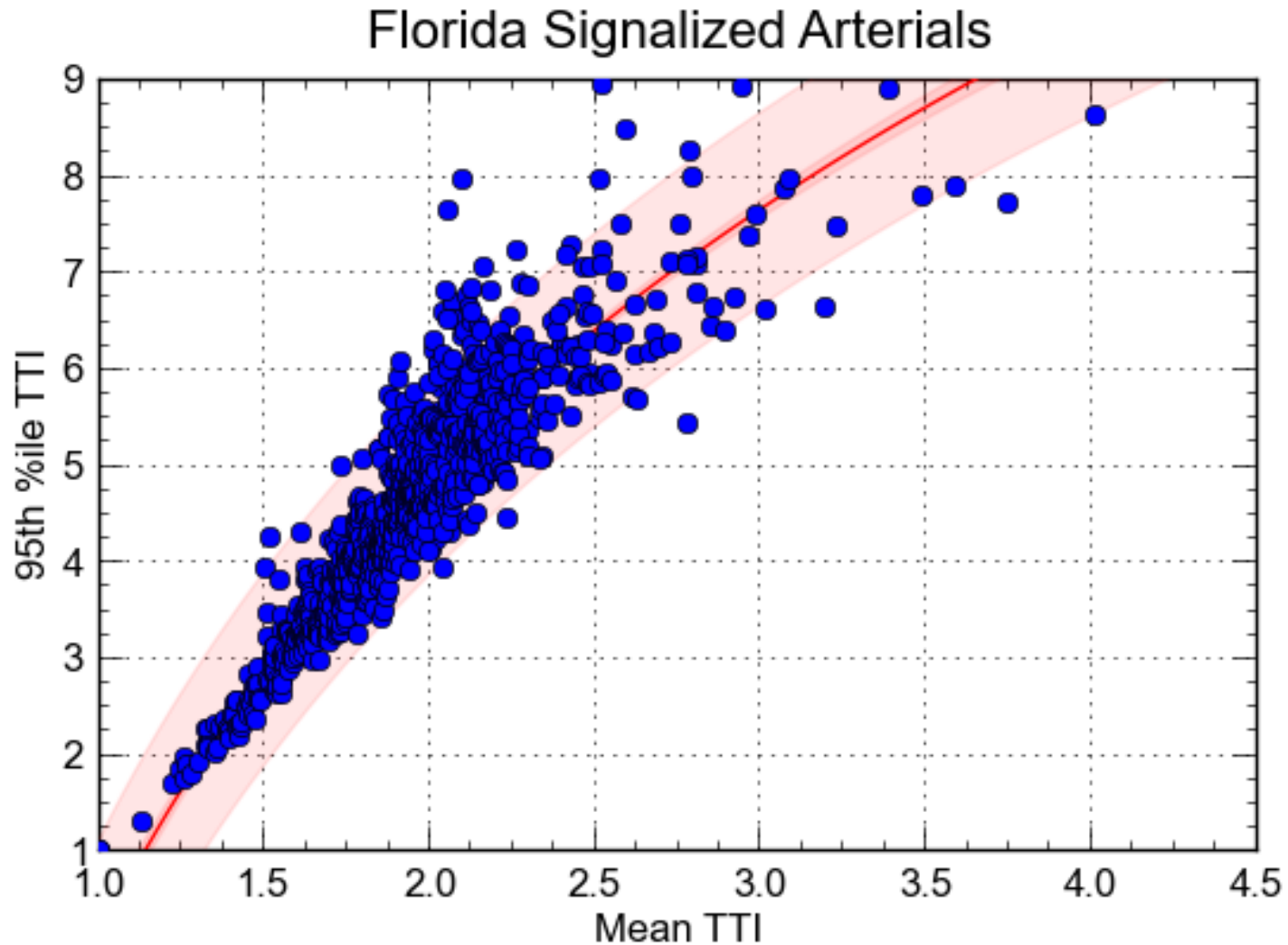


- Revised the reliability prediction algorithm with NPMRDS to include signalized arterials
- Incorporated recently developed Florida-specific Safety Performance Functions
- Expanded range of operations and safety project types
- Accessible now by planners rather than researchers

Freeway Relationship



Arterial Relationship



Post-Processor Inputs



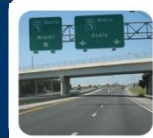
- Input screen parameters
- Loaded network file from Cube
- Corridor definition file

Corridor Definition File



ANODE	BNODE	DIRECTION	CORRIDOR	FROM_STREET	TO_STREET	CORRIDOR NAME	NO. SIGNALS
5005	5006	1	Manatee / Hillsborough Co 1 Line	Big Bend Rd	US 41 (Hillsborough Co)	5	
5006	5005	2	Manatee / Hillsborough Co 1 Line	Big Bend Rd	US 41 (Hillsborough Co)	5	
5006	5010	1	Manatee / Hillsborough Co 1 Line	Big Bend Rd	US 41 (Hillsborough Co)	5	
5010	5006	2	Manatee / Hillsborough Co 1 Line	Big Bend Rd	US 41 (Hillsborough Co)	5	
5010	5015	1	Manatee / Hillsborough Co 1 Line	Big Bend Rd	US 41 (Hillsborough Co)	5	
5015	5010	2	Manatee / Hillsborough Co 1 Line	Big Bend Rd	US 41 (Hillsborough Co)	5	
5015	5017	1	Manatee / Hillsborough Co 1 Line	Big Bend Rd	US 41 (Hillsborough Co)	5	
5017	5015	2	Manatee / Hillsborough Co 1 Line	Big Bend Rd	US 41 (Hillsborough Co)	5	

Tool Interface



Safety and Reliability TDM Model

FDOT user ▼

Run

Model Run Name

Time Period

AM Peak ▼

Run With Improvements

☒

Reliability Scenario

Safety Scenario

Reliability Analysis Periods

Input Files

Network

Please select ▼

Crash

Please select ▼

Budget Caps

Operations

\$

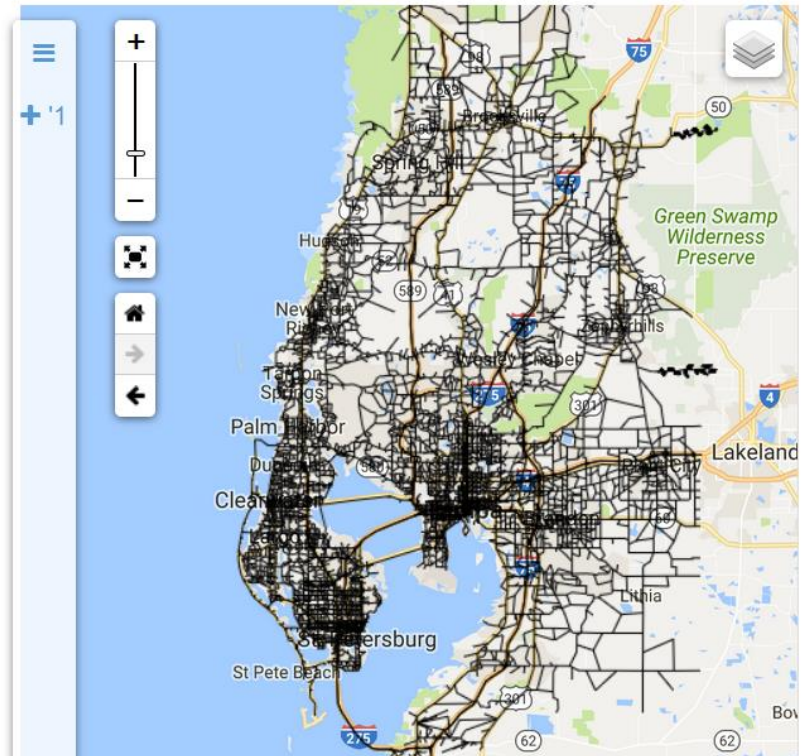
☐ Unlimited

Safety

\$

☐ Unlimited

Map



Tool Interface



Reliability Analysis Periods

Start Morning Peak at

6



AM

AM Peak Length (hours)

3



6AM - 9AM

Midday Length (hours)

7



9AM - 4PM

PM Peak Length (hours)

3



4PM - 7PM

Evening Length (hours)

11



7PM - 6AM

Safety

\$

☐ Unlimited

Deficiency Triggers

Operations Sort Keys

Select up to 4:

Select Key 1 (required) ▼

Safety Sort Keys

Select up to 4:

Select Key 1 (required) ▼

Tool Interface



Safety and Reliability TDM Model

FDOT user ▾



Bundles

10 ▾ records per page

Name	Category	Improvement Type(s)	N Types		
Operations Bundle - Complete Streets	Operations	Complete Streets	1		
Operations Bundle 1	Operations	Dynamic message signs; Hard Shoulder Running; Incident Management (FSP, ...	5		
Operations bundle demo	Operations	Integrated Corridor Management; Signal Coordination; and Real-Time Adapt...	3		
Safety Bundle - Complete Streets	Safety	Complete Streets	1		
Safety Bundle 1	Safety	Delineation; and Bike lanes	2		
Safety Bundle 2	Safety	Delineation; Bike lanes; and Ramp Metering	3		

Showing 1 to 6 of 6 entries

← Previous 1 Next →

New Operations Bundle

New Safety Bundle

Reliability Results



Safety and Reliability TDM Model

FDOT user ▾

Scenario: I-4 Base

Reliability Scenario: Reliability I-4 Base

Time period: PM

Operations Budget Cap: Unlimited

10 ▾ records per page

Corridor	Functional Class	Length	TTI Median	TTI Mean	TTI Pctile80	TTI Pctile95	Delay	Vmt	Vht	Space Mean Speed	Total Cost
I-4 (Hillsborough Co): FROM I-275 TO I-75	Freeway	8.043	1.539	1.887	2.376	3.795	2,361	159,678	0	46	\$0
I-4 (Hillsborough Co): FROM I-75 TO Hillsborough / Polk County Line	Freeway	18.052	2.219	2.747	3.845	6.09	8,588	294,945	0	37	\$0

Showing 1 to 2 of 2 entries

← Previous 1 Next →

Summary by Functional Class

Functional Class	Length	TTI Median	TTI Mean	TTI Pctile80	TTI Pctile95	Delay	Vmt	Vht	Space Mean Speed	Total Cost
Freeway	26.095	1.98	2.445	3.329	5.284	10,949	454,623.0	0	41	\$0

Safety Results



Safety and Reliability TDM Model

FDOT user ▾

Scenario: I-4 Base

Safety Scenario: Safety I-4 Base

Safety Budget Cap: Unlimited

Results by Corridor

10 ▾ records per page

Corridor	Functional Class	Length	VTM	Total Crashes	Fatal Crashes	Injury Crashes	PDO Crashes	Ped/Bike Crashes	Improved?	Total Cost
I-4 (Hillsborough Co): FROM I-275 TO I-75	Freeway	8.043	696,195.0	258	1	75	181	27	false	\$0
I-4 (Hillsborough Co): FROM I-75 TO Hillsborough / Polk County Line	Freeway	18.052	1,440,800.0	503	3	146	353	53	false	\$0

Showing 1 to 2 of 2 entries

← Previous 1 Next →

Summary by Functional Class

Functional Class	Length	VTM	Total Crashes	Fatal Crashes	Injury Crashes	PDO Crashes	Ped/Bike Crashes	Improved?	Total Cost
Freeway	26.095	2,136,997.031	761	4	221	534	80	false	\$0

Next Steps



- Finish testing with Hillsborough
- User and Technical Manuals
- Make available to all Florida MPOs
- Ongoing support from FDOT

Reliability and Safety Post-Processing Tool

presented to
Hillsborough MPO and FDOT

presented by
Tazeen Mahtab
Rich Margiotta



November 14, 2016

Think  Forward