SHRP 2 Reliability Project L38C

Knowledge Transfer Webinar

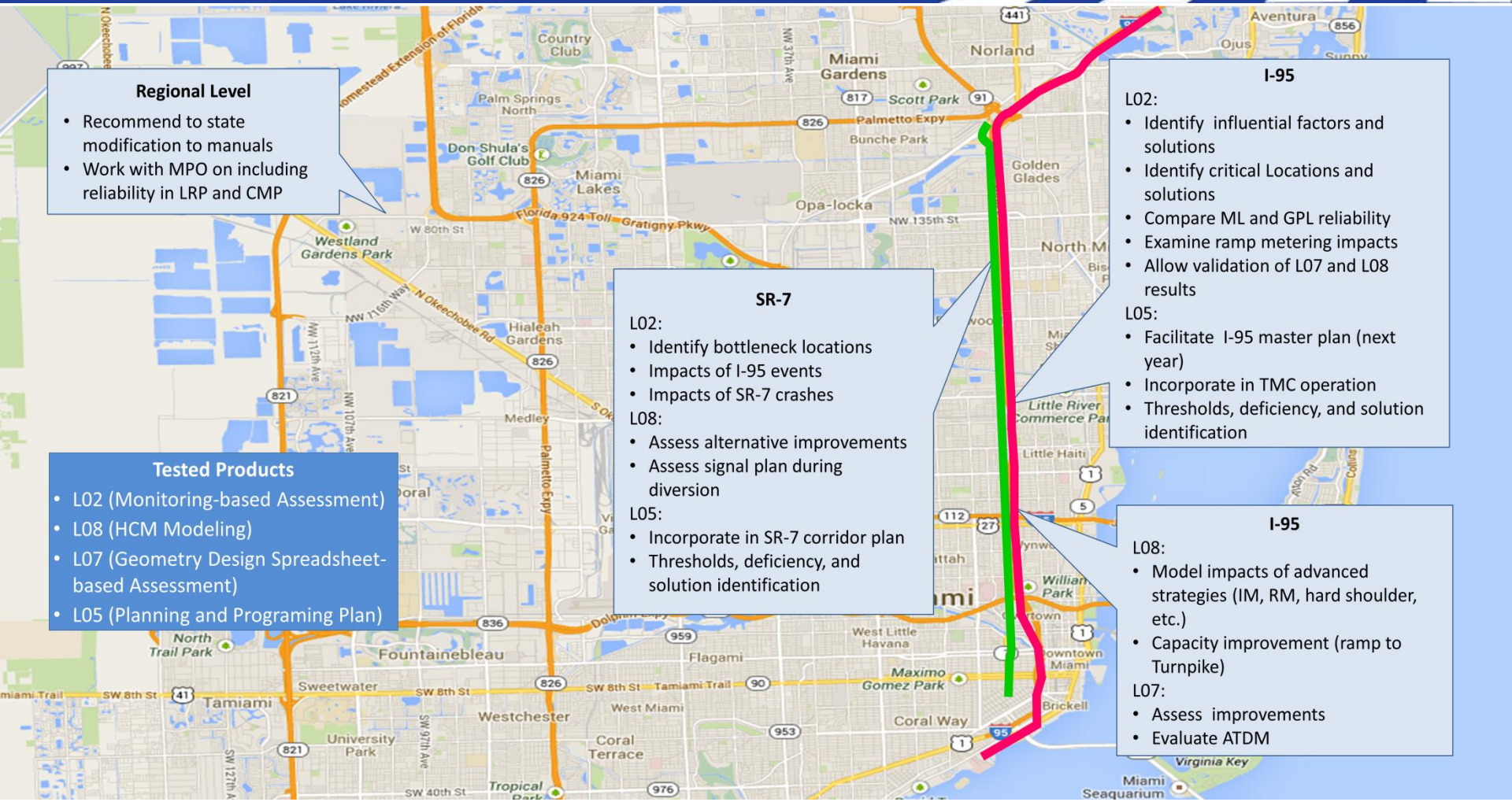
March 13, 2014

Florida International University
AECOM
Florida Department of Transportation

TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

SHRP 2
STRATEGIC HIGHWAY RESEARCH PROGRAM
Accelerating solutions for highway safety, renewal, reliability, and capacity

Project Scope



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Reliability Needs and Issues

- Southeast Florida is one of the most congested regions in the nation
- The selected corridor of parallel freeway, managed lane, and arterial is the most critical in Miami
  - Highly unreliable in the peak periods (95% TTI from 2.5 to 2.7)
  - Advanced management strategies implemented
- Advanced planning, TMC operations, TSM&O program
  - Reliability starts appearing as a goal but has not been used in the decision making process
- Project focuses on operation and planning for operations and management

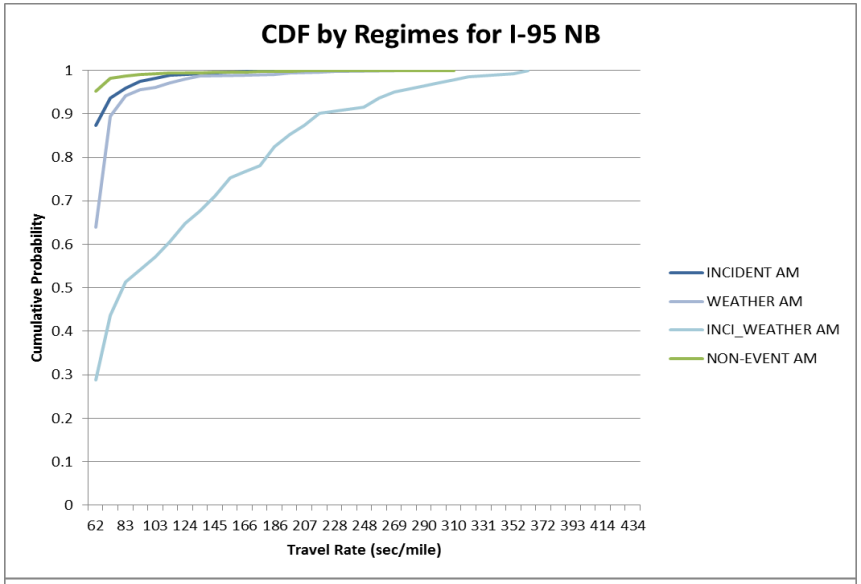
L02 Product

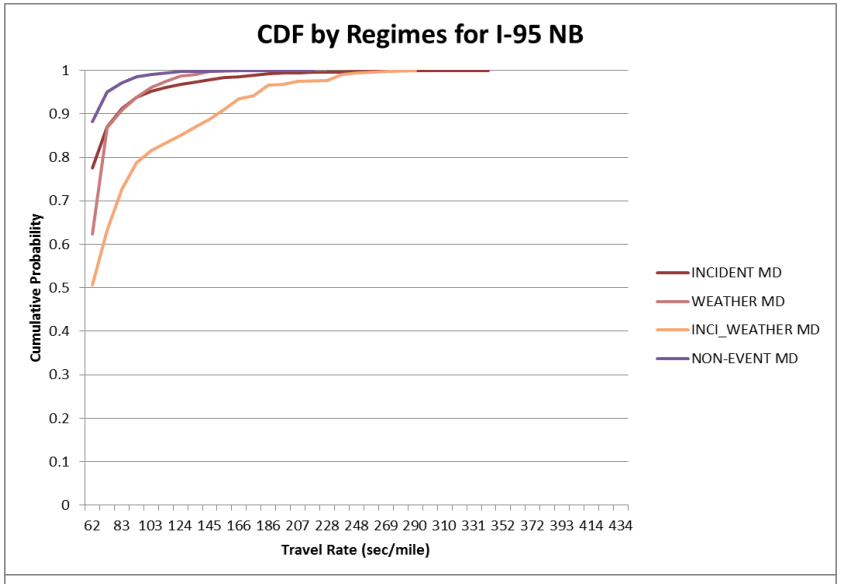
- New measures and visualization techniques can be used as a powerful component of performance assessment and management
- When used for operations, should be combined with other reliability measures and other operation statistics and visualization
- Availability of data extraction and fusion tool helped significantly
- Automation is recommended and will be done soon
- Analysis by TOD period is preferred to allow separating different patterns as much as possible

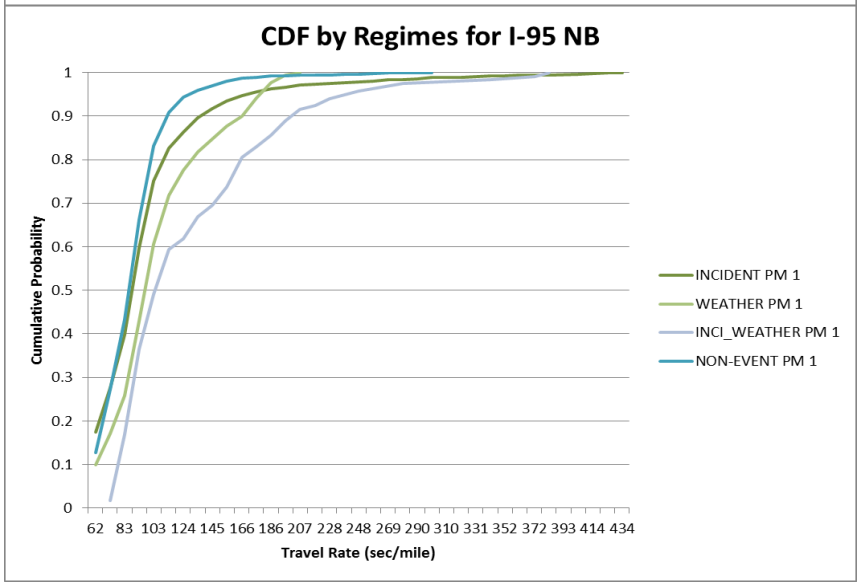
L02 Product

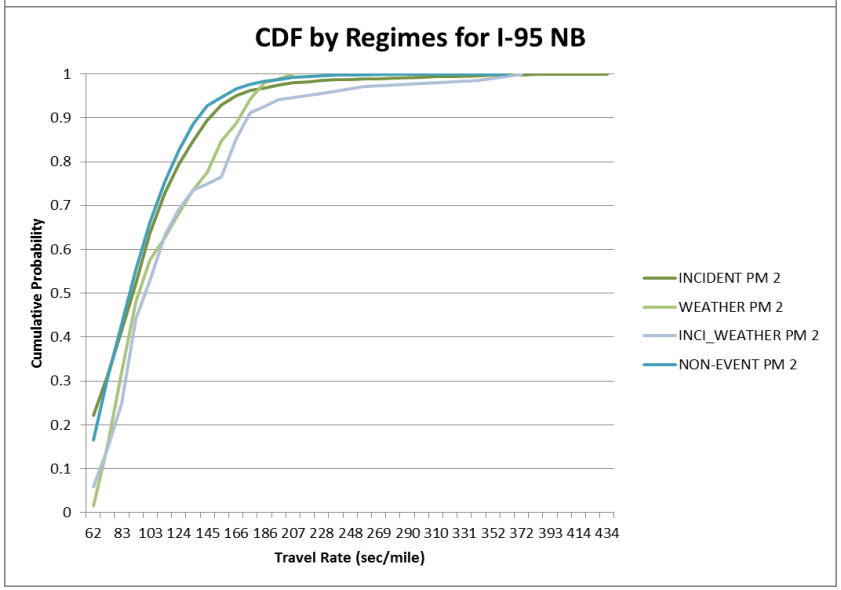
- Use in operation and management requires more details
  - E.g., variation of measures by 5 minute intervals
  - Segregation by incident and rain severity
  - Inclusion of event combinations (e.g., rain plus incident)
- Separating the impact of individual event vs. total contribution
- Required knowledgeable trained staff to analyze results
- Percentage contribution adjustment to isolate the effect of recurrent congestion
- In general, allows clear identification of operation issues and solutions to the issues

L02 Results

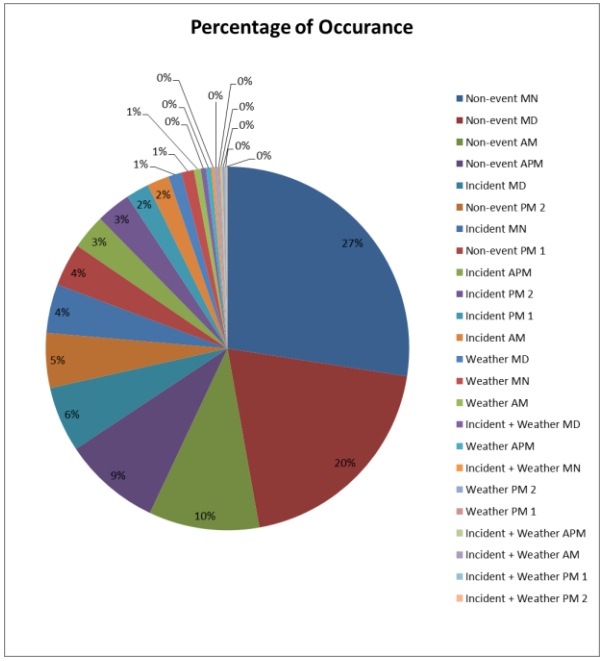

CDF by Regimes for I-95 NB
Cumulative Probability
Travel Rate (sec/mile)
INCIDENT AM
WEATHER AM
INCI_WEATHER AM
NON-EVENT AM

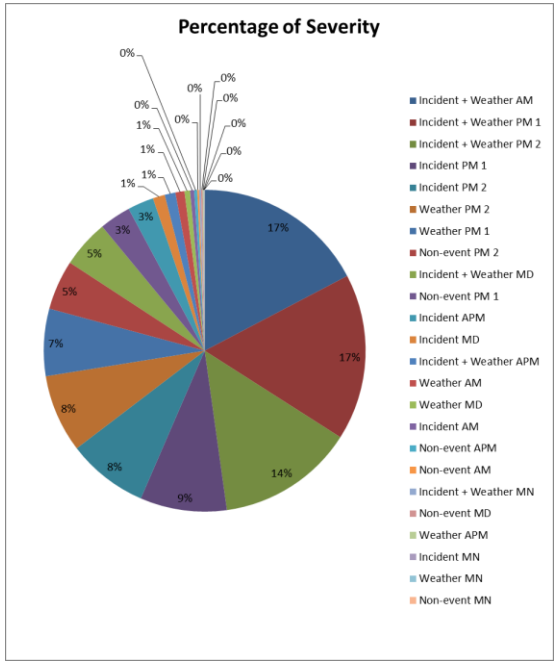

CDF by Regimes for I-95 NB
Cumulative Probability
Travel Rate (sec/mile)
INCIDENT MD
WEATHER MD
INCI_WEATHER MD
NON-EVENT MD

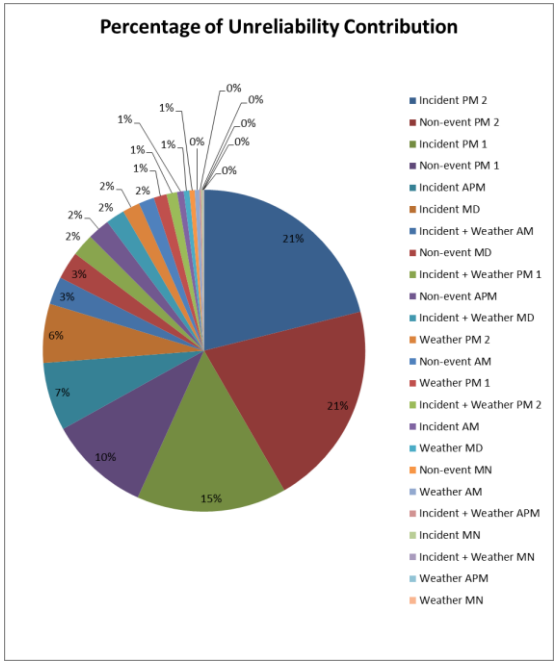

CDF by Regimes for I-95 NB
Cumulative Probability
Travel Rate (sec/mile)
INCIDENT PM 1
WEATHER PM 1
INCI_WEATHER PM 1
NON-EVENT PM 1


CDF by Regimes for I-95 NB
Cumulative Probability
Travel Rate (sec/mile)
INCIDENT PM 2
WEATHER PM 2
INCI_WEATHER PM 2
NON-EVENT PM 2

L02 Results (Con't)







- Examples of identified potential reliability improvement strategies
  - Earlier activation of ramp metering for PM peak period
  - Activation of ramp metering during lane blockage incidents and heavy rain conditions
  - Improved tolling strategy based on demand
  - Positioning response vehicles and investigation sites and screens
  - Capacity improvements

L05 Product

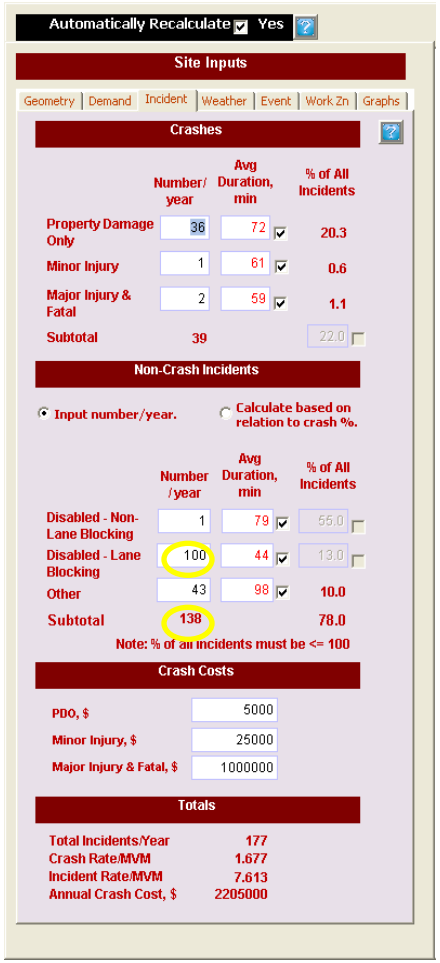
- Identify regional processes and stakeholders that benefit from products
  - MPO LRTP, TIP, CMP, UPWP
  - FDOT system planning Interchange Access Request, Highway Capacity/Level of Service, corridor and urban studies and plans
  - FDOT Project Development and Environment (PD&E)
  - FDOT TMC planning for operations and planning for operations
  - Miami-Dade County operations and planning for operations
  - Miami-Dade County Transit Authority
  - MDX and Florida Turnpike

L05 Product

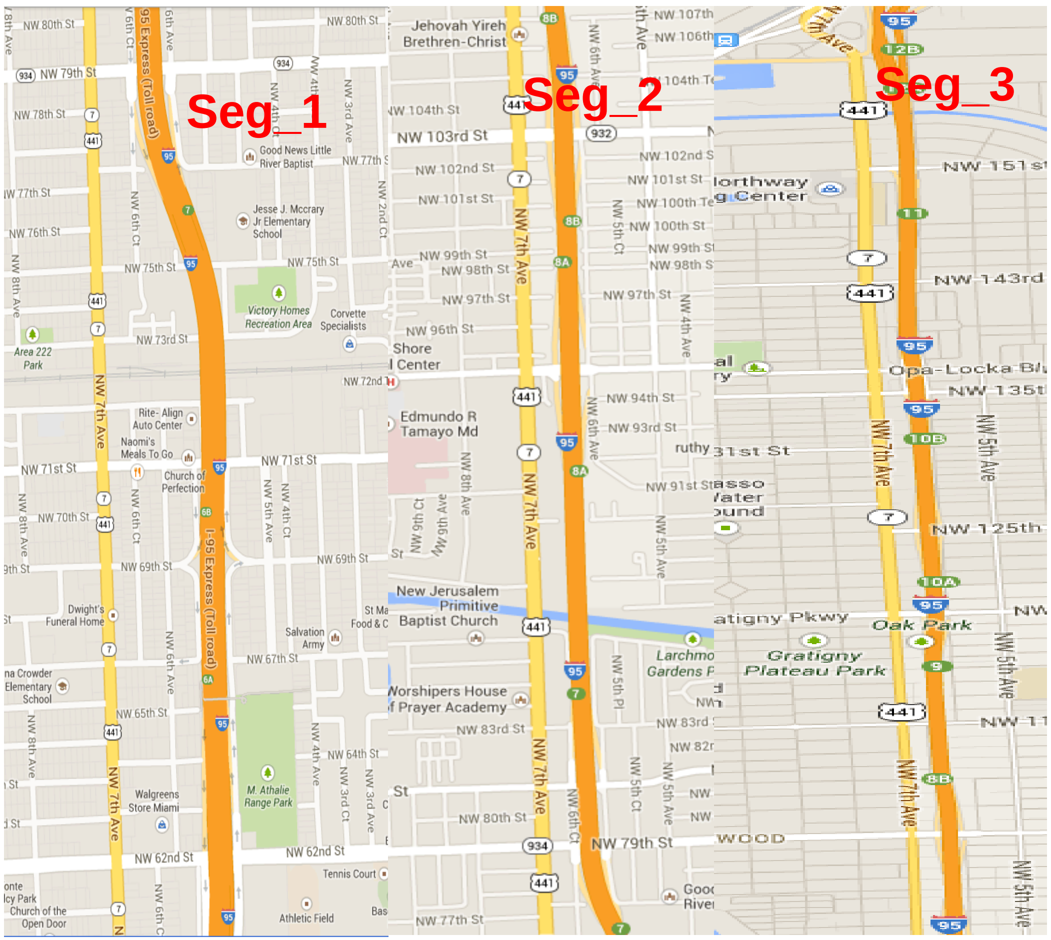
- Participate in projects that provide immediate impacts (success stories) then share information with other stakeholders
  - FDOT TMC planning for operations, operations, I-95 master plan, and SR 7 corridor studies
  - Share with MPO, County, and MDT
  - Incorporate in ITSDCAP and recommend inclusion in FITSEVAL
- Follow L05 advice to use different performance measures
- Map L38 tools to the identified processes
- L05 recommendations regarding reliability thresholds (good/fair/poor, Figure 2-2, Figure 4-2, and Figure 4-3 of the guide)
- Benefit-Cost analysis of suggested improvements with and without considering reliability

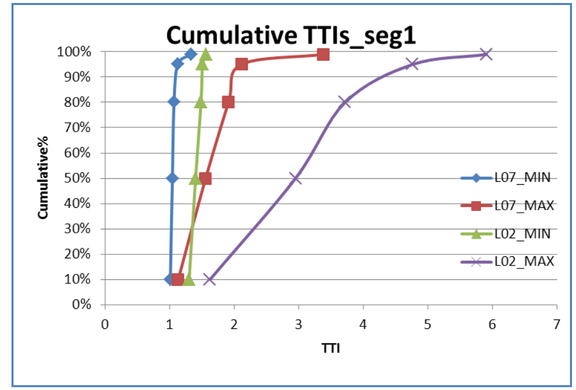
L07 Product

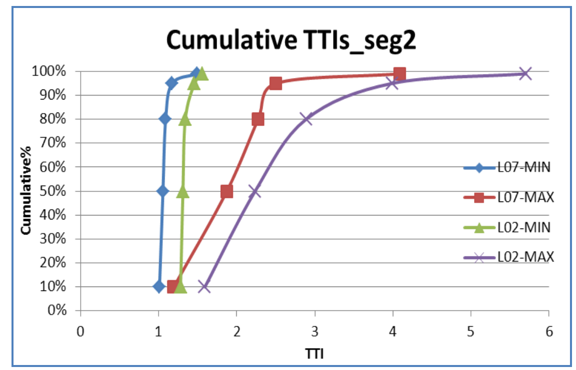
- Need to be extended to include more strategies normally considered by agencies
  - Include time-dependent strategies
- Default reliability models are applicable for 4-6 mile segments
  - New TTI models developed for local conditions
- Need to allow more flexibility in inputs such as capacity

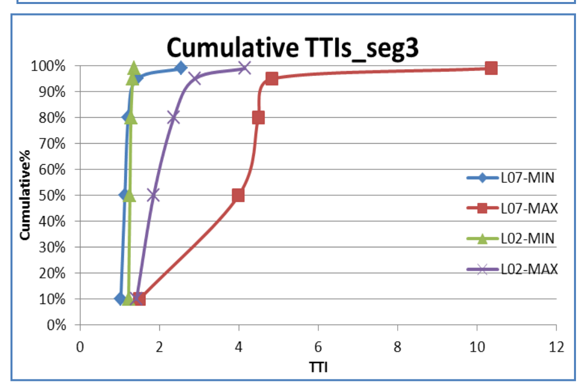


L07 Results


Seg_1
Seg_2
Seg_3
NW 7th Ave
NW 80th St
NW 79th St
NW 75th St
NW 71st St
NW 62nd St
NW 103rd St
NW 97th St
NW 79th St
Opa-Locka Blvd
Oak Park
Graticny Plateau Park
I-95 Express (Toll road)


Cumulative TTIs_seg1
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Cumulative%
0
1
2
3
4
5
6
7
TTI
L07_MIN
L07_MAX
L02_MIN
L02_MAX

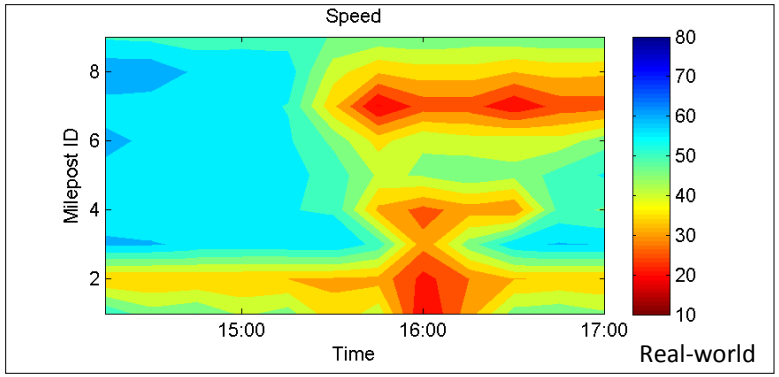

Cumulative TTIs_seg2
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Cumulative%
0
1
2
3
4
5
6
TTI
L07-MIN
L07-MAX
L02-MIN
L02-MAX

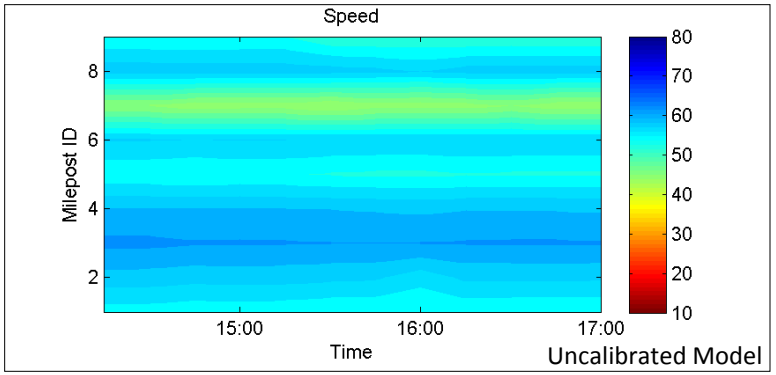

Cumulative TTIs_seg3
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Cumulative%
0
2
4
6
8
10
12
TTI
L07-MIN
L07-MAX
L02-MIN
L02-MAX

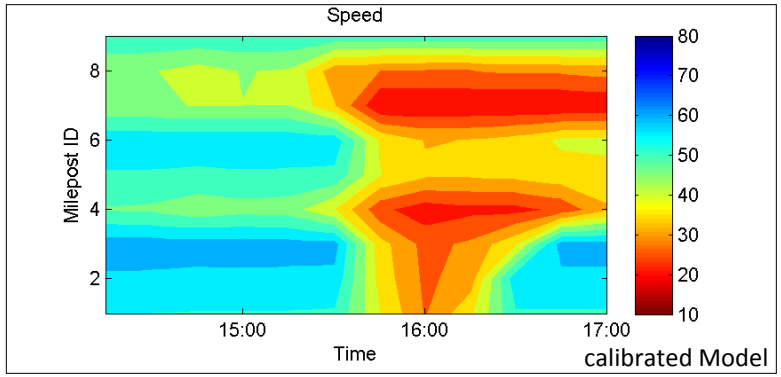
L08 Product

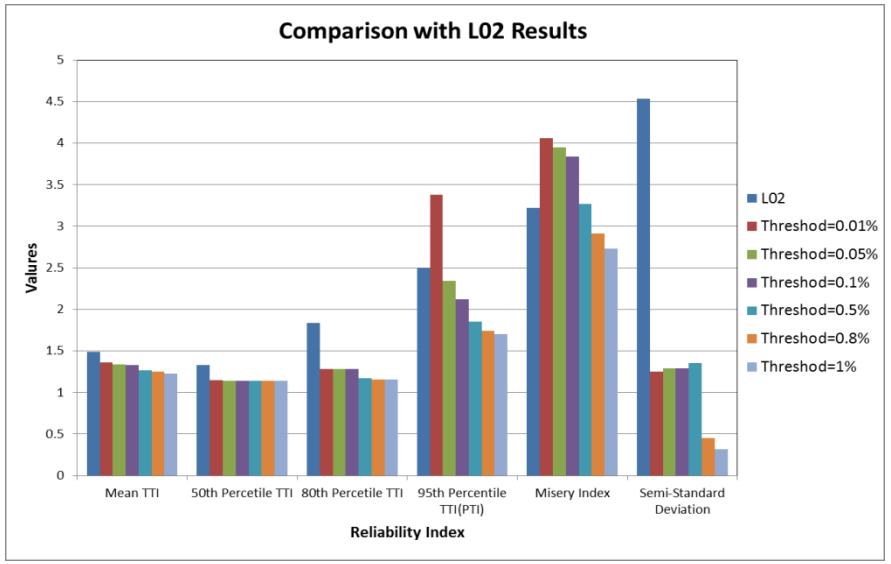
- Traffic modeling using L08 tools should be calibrated to reflect observed operations
- Scenario generator parameter updates allow producing results closer to real-world
- Generally 95% TTI is better replicated in FREEVAL than 80% TTI, possibly due to the many factors not recorded and accounted for in and out of the corridor
- Limited ability to assess ATDM strategies
- Diversion during incidents is not allowed
- Calculation of reliability measures should be by time intervals for traffic operations
- Anticipated change to the ramp modeling in FREEVAL may allow better assessment of ramp metering

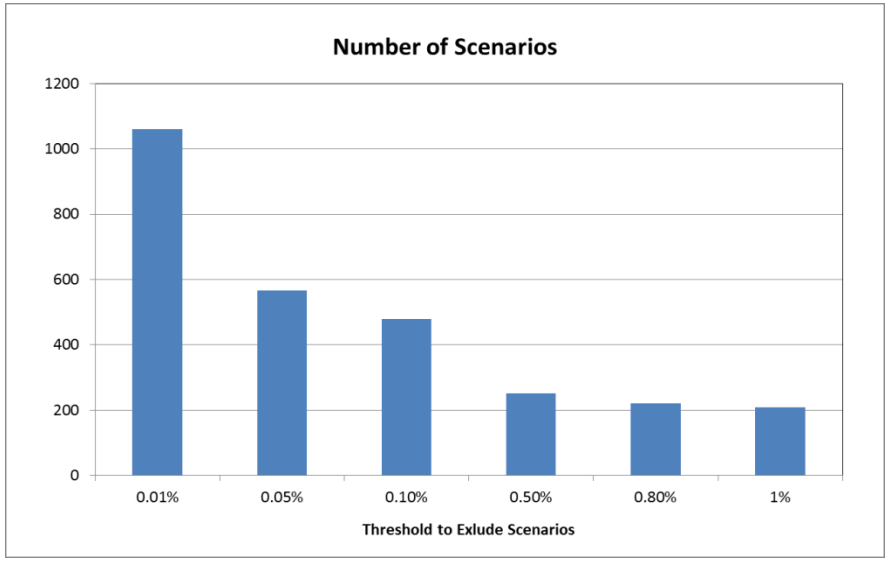
L08 Results


Speed
Milepost ID
8
6
4
2
15:00
16:00
17:00
Time
80
70
60
50
40
30
20
10
Real-world


Speed
Milepost ID
8
6
4
2
15:00
16:00
17:00
Time
80
70
60
50
40
30
20
10
Uncalibrated Model


Speed
Milepost ID
8
6
4
2
15:00
16:00
17:00
Time
80
70
60
50
40
30
20
10
calibrated Model


Comparison with L02 Results
Values
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Mean TTI
50th Percetile TTI
80th Percetile TTI
95th Percentile TTI(PTI)
Misery Index
Semi-Standard Deviation
Reliability Index
L02
Threshod=0.01%
Threshod=0.05%
Threshod=0.1%
Threshod=0.5%
Threshod=0.8%
Threshod=1%


Number of Scenarios
1200
1000
800
600
400
200
0
0.01%
0.05%
0.10%
0.50%
0.80%
1%
Threshold to Exlude Scenarios

Bundling Recommendations

- L02 to assess existing conditions
- Enhanced version of L07 or L08 to assess alternatives
  - Well calibrated model
  - Utilize local parameters in scenario generator
- L05 Guidance