Express Lane Network Study (ELNS)
Traffic and Revenue Validation and Forecasting
– using Activity Based Model (ABM)

November 8, 2017
NCMUG meeting
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AGENDA

- Study Background and History
- Levels of Traffic and Revenue (T&R) Studies
- Express Lane Validation
  - Focus
  - Data
  - Process
- Recommended refinements
- Observations & Lessons Learned
STUDY BACKGROUND AND HISTORY

Mobility Investment Program (MMIP)
Express Lane Network Study

Atlanta Regional Managed Lanes Implementation Plan

Legend
- Interchanges
- Bi-Directional Managed Lanes
- 1 Bi-Directional Managed Lane
- Reversible Managed Lanes
- Elevated / Converted

Capital Cost $16B
Finnable Amount $56B
Funding Gap $7B

Major Mobility Investments In Next 10 Years

www.GAroads.org
StudY Background and History

Studies
- Managed Lane System Plan (MLSP) 2007-2009
  - ARC 4-Step Model, Envision6, with HNTB Toll Diversion Module based on SP survey results
- Managed Lane Implementation Plan (MLIP) 2012-2015
  - ARC 4-Step Model, Plan2040, with HNTB Toll Diversion Module based on SP survey results
- Major Mobility Investment Program (MMIP) - Express Lane Network Study (ELNS)
  - ARC ABM Testing, Toll Diversion in both mode choice and route choice

Model Used

Express Lane Network Study will conduct a preliminary Traffic and Revenue Study to:
• Support the NEPA process for future managed lane projects
• Support individual project programming decisions
LEVELS OF TRAFFIC AND REVENUE (T&R) STUDIES

• Exploratory T&R Study (Level I)
  – Assess whether the corridor is a candidate for additional study of toll application
  – Off model investigation

• Concept T&R Study (Level II)
  – Detailed T&R forecasts and operational plan
  – Provide corridor/system level impacts and performance measures
  – Existing regional model with moderate enhancements
LEVELS OF TRAFFIC AND REVENUE (T&R) STUDIES

• Investment Grade T&R Study (Level III)
  − Extensive modifications to existing tools
  − Assess potential risks for revenue variation, including independent evaluation of economic conditions and growth
  − Detailed implementation plan with technology assessment and operations
  − Provide sufficient details and confidence to secure finance
KEY REVENUE DRIVERS AND RISKS/UNCERTAINTY

- Access and Policies
- Overall travel demand and travel patterns
- Future economic and demographic growth
- Travel time savings - tolled vs. free
- Value of Time
- Transit frequency
- Alternate/Competing transportation investment
- Off-Peak/Weekend traffic
- Technology and travel behavior change
EXPRESS LANE VALIDATION FOCUS

• System-wide level II T&R based on regional travel demand Model

• Express Lane Network Study needs to provide reasonable projections on
  – Express Lane Volume
  – Toll Rates by different time periods
  – Toll Revenue (corresponding to different toll policies)

• 2015 I-85 HOT lanes Traffic and Revenue Validation
I-85 HOT LANE OBSERVED DATA
- PROVIDED BY SRTA

• Trip toll and trip data: Average of 2015 January, March, August, and October weekdays, obtained from State Road Tollway Authority (SRTA) online dashboard data

• HOT lane total volume: average of 2015 October weekday 15-minutes incremental volume data provided by SRTA May 2016

• Daily toll revenue: average of 2015 annual data provided by SRTA July 2016

• Toll rates: calculated based on average of tolls by trip, trip distance and toll segment volumes.
**I-85 HOT LANE TRAFFIC AND REVENUE OBSERVED DATA - PROVIDED BY SRTA**

Average of 2015 January, March, August, and October Toll Rate Information

<table>
<thead>
<tr>
<th>Time of Day / Direction</th>
<th>AM NB</th>
<th>AM SB</th>
<th>PM NB</th>
<th>PM SB</th>
<th>Off-Peak NB</th>
<th>Off-Peak SB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toll Rates Per Mile</td>
<td>$0.01</td>
<td>$0.56</td>
<td>$0.54</td>
<td>$0.02</td>
<td>$0.15</td>
<td>$0.04</td>
</tr>
</tbody>
</table>

2015 October weekday I-85 HOT Lane Volume

<table>
<thead>
<tr>
<th>Segment</th>
<th>2015 Average Weekday HOT Lane Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AM NB</td>
</tr>
<tr>
<td>I-285 to Pleasantdale Rd</td>
<td>458</td>
</tr>
<tr>
<td>Pleasantdale Rd to Jimmy Carter Blvd</td>
<td>818</td>
</tr>
<tr>
<td>Jimmy Carter Blvd to Indian Trail Rd</td>
<td>871</td>
</tr>
<tr>
<td>Indian Trail Rd to Pleasant Hill Rd</td>
<td>741</td>
</tr>
<tr>
<td>Pleasant Hill Rd to Old Peachtree Rd</td>
<td>305</td>
</tr>
</tbody>
</table>
I-85 HOT LANE TRAFFIC AND REVENUE OBSERVED DATA - PROVIDED BY SRTA

Percent of Total Weekday (Mon – Fri) Revenue by Direction and by Time Period for 2015

<table>
<thead>
<tr>
<th>Time</th>
<th>January 2015</th>
<th>March 2015</th>
<th>August 2015</th>
<th>October 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>North</td>
<td>South</td>
<td>North</td>
<td>South</td>
</tr>
<tr>
<td>0 - 6 AM</td>
<td>0.0%</td>
<td>0.1%</td>
<td>0.0%</td>
<td>0.1%</td>
</tr>
<tr>
<td>6 AM - 10 AM</td>
<td>0.1%</td>
<td>46.3%</td>
<td>0.1%</td>
<td>45.5%</td>
</tr>
<tr>
<td>10 AM - 3 PM</td>
<td>1.7%</td>
<td>0.5%</td>
<td>1.8%</td>
<td>0.4%</td>
</tr>
<tr>
<td>3 PM - 7 PM</td>
<td>46.5%</td>
<td>0.4%</td>
<td>46.3%</td>
<td>0.5%</td>
</tr>
<tr>
<td>7 PM - Midnight</td>
<td>4.3%</td>
<td>0.1%</td>
<td>5.3%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Grand Total</td>
<td>52.7%</td>
<td>47.3%</td>
<td>53.5%</td>
<td>46.5%</td>
</tr>
</tbody>
</table>

2015 Average Weekday Gross Revenue

| Entire Corridor | $59,800 |

Calculated based on toll rates per mile and volume: $59,092
SPEED DATA - NPMRDS

**2015 PM Peak Period Speed**

**PM Peak Period Speed Comparison**

<table>
<thead>
<tr>
<th>Corridor</th>
<th>Location</th>
<th>Time</th>
<th>2015 Hourly Speed Observed*</th>
<th>Average Speed 2015**</th>
<th>Model Speed 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-285 West Wall</td>
<td>SB at SR 280</td>
<td>3-4PM</td>
<td>54</td>
<td>37</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4-5PM</td>
<td>36</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5-6PM</td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6-7PM</td>
<td>34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I-285 East Wall</td>
<td>SB at US 29</td>
<td>3-4PM</td>
<td>44</td>
<td>31</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4-5PM</td>
<td>28</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5-6PM</td>
<td>22</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6-7PM</td>
<td>31</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I-285 Top End</td>
<td>WB at GA 400</td>
<td>3-4PM</td>
<td>39</td>
<td>30</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4-5PM</td>
<td>24</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5-6PM</td>
<td>22</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6-7PM</td>
<td>34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GA 400</td>
<td>NB at I-285</td>
<td>3-4PM</td>
<td>25</td>
<td>19</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4-5PM</td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5-6PM</td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6-7PM</td>
<td>18</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Based on National Performance Management Research Data Set (NPMRDS) – 2015 average of all weekdays Tuesday – Thursday

**Simple average across 4, 1-hour periods. Not weighted by hourly volumes.*
EXPRESS LANE VALIDATION PROCESS

- 2015 I-85 HOT lanes Traffic and Revenue Validation

Results Comparison
- ABM Original Results
- I-85 HOT Lane Observed Data (SRTA)

Area Identification
- Commercial Vehicle Trips*
- Utility expression calculator (UEC)
- Toll Diversion
- Volume Delay Functions

Recommended refinements for ELNS T&R

*Commercial vehicle trips refer to those trips that are mainly business-oriented and are not personal transportation, but do not involve a medium truck (F4 – F7 in the FHWA Vehicle Classification) or heavy truck (F8 – F13 in the FHWA Vehicle Classification).
EXPRESS LANE VALIDATION PROCESS

Results Comparison
- ABM Original Results
- I-85 HOT Lane Observed Data (SRTA)

Area Identification
- Commercial Vehicle Trips
- Utility expression calculator (UEC)
- Toll Diversion
- Volume Delay Functions

Recommended refinements for ELNS T&R
TRAFFIC & REVENUE VALIDATION ON I-85 HOT LANES

Toll Rates per Mile
ABM vs. SRTA Observed Data

Northbound

HOT Lane Total Volumes
ABM vs. SRTA Observed Data

PM Northbound
EXPRESS LANE VALIDATION PROCESS

Results Comparison

• ABM Original Results
• I-85 HOT Lane Observed Data (SRTA)

Area Identification

• Commercial Vehicle Trips
• Utility expression calculator (UEC)
• Toll Component
• Volume delay functions

Recommended refinements for ELNS T&R
**EXPRESS LANE VALIDATION PROCESS**

- Vehicle eligibility – commercial vehicles
- Parameter sensitivity analysis for utility expression calculator (UEC) in tour mode choice
- Toll rate validation with I-85 observed toll rates and sensitivity runs
- Volume-delay functions
- Willingness to pay curve in the toll diversion model
**EXPRESS LANE VALIDATION PROCESS**

**Results Comparison**
- ABM Original Results
- SRTA Observed Data

**Area Identification**
- Commercial Vehicle Trips
- UECs
- Toll Component

**Recommended refinements for ELNS T&R**
RECOMMENDED REFINEMENTS FOR ELNS T&R

• Allow commercial vehicles* to use express lanes and HOT3+ lanes
• Remove tour/trip mode choice restriction and allow all eligible vehicles to use express lanes
• Revise toll diversion curves and refine the volume delay curves based on the I-85 HOT lane observed data
• Use toll segments instead of corridor as the toll optimization basis
• Revise toll optimization to estimate the range of different revenue reflecting tolling policies
Traffic & Revenue Validation on I-85 HOT Lanes

Northbound PM

Toll Sensitivity Curves

Observed Revenue
$53,820 at toll rates of $0.55/mile
Observations and Lessons Learned

• Focus on validating the key drivers for managed lane utilization
  – Three dimensions of congestion (duration, extent, and intensity)
  – Travel time savings and travel speed

• Empirically check all modeling assumptions based on the observed data to the extent possible
  – Willingness to pay
  – Measurement of reliability
  – Benchmark forecasts against managed lanes under operation