Construction Traffic Analysis: To be or Not to be
A Case Study for NC-107 Widening, Sylva NC

Presented by
Taruna Tayal,
Donald A. Bryson, PE

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Project Background and Concerns

- Major north/south transportation corridor in Jackson County
- Northern Loop around Sylva and Dillsboro
- 27,000-39,000 AADT in 2035
- Congestion
- Safety
- Prioritize improvements
- Implement traffic calming devises
- Minimize impacts to surrounding businesses
NC-107 Corridor

- Mostly commercial development
- Few educational facilities
- Approximately 95 driveways intersect this corridor
- Sparse residential and commercial development
- Fourteen signalized intersections along US 23 Business and NC 107
Modeling and Analysis
Design and Analysis

- Design – Synchronized Street
- TransModeler Micro-Simulation analysis
- Scenarios studied
  - 2015: Build and No-Build
  - 2025: No-Build and Construction
  - 2035: Build and No-Build
- Attributes Compared
  - Level of Service
  - Travel Time
  - Delay (sec/veh)
  - Queues
Modeling

- Jackson County Regional Model for Growth and Base network
- Network disaggregated in TransModeler for finer geography
- ODME in TransModeler for 2013 trip table
- Fratar for FY trip table
Findings
## Travel Time Savings and LOS

<table>
<thead>
<tr>
<th>Performance Measure</th>
<th>Time of Day</th>
<th>Direction</th>
<th>Construction Year (2025)</th>
<th>Future Year (2035)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>No Build</td>
<td>Under Construction</td>
</tr>
<tr>
<td>Travel Time (minutes) (AM Peak Hour)</td>
<td>Northbound</td>
<td>6.3</td>
<td>6.6</td>
<td>13.3</td>
</tr>
<tr>
<td></td>
<td>Southbound</td>
<td>12.6</td>
<td>9.4</td>
<td>18.7</td>
</tr>
<tr>
<td></td>
<td>Northbound</td>
<td>13.4</td>
<td>22.3</td>
<td>28.3</td>
</tr>
<tr>
<td></td>
<td>Southbound</td>
<td>12.5</td>
<td>12.7</td>
<td>19.2</td>
</tr>
<tr>
<td>Average Speed (Miles per hour) (AM Peak Hour)</td>
<td>Northbound</td>
<td>28.8</td>
<td>27.5</td>
<td>10.1</td>
</tr>
<tr>
<td></td>
<td>Southbound</td>
<td>14.4</td>
<td>19.3</td>
<td>7.0</td>
</tr>
<tr>
<td></td>
<td>Northbound</td>
<td>13.5</td>
<td>8.1</td>
<td>5.1</td>
</tr>
<tr>
<td></td>
<td>Southbound</td>
<td>14.5</td>
<td>14.3</td>
<td>6.9</td>
</tr>
<tr>
<td>LOS (AM Peak Hour)</td>
<td>Northbound</td>
<td>B</td>
<td>B</td>
<td>F</td>
</tr>
<tr>
<td></td>
<td>Southbound</td>
<td>E</td>
<td>D</td>
<td>F</td>
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<tr>
<td></td>
<td>Northbound</td>
<td>E</td>
<td>F</td>
<td>F</td>
</tr>
<tr>
<td></td>
<td>Southbound</td>
<td>E</td>
<td>E</td>
<td>F</td>
</tr>
</tbody>
</table>
Conclusion and Lessons Learned
Recommendations

- Work zone implementation strategies such as lane closures and time restrictions,
- Phase construction
  - Construction of U-turn bulb-outs
  - Southbound outside widening
  - Northbound outside widening
  - Median widening
- Left turns may be considered from NC 107 to northbound US 23 Business (Asheville Highway)
- Add roundabout at the intersection of Caldwell Street and Cherry Street
Pros and Cons

- Better Construction
- Revise interim and final design
- Help the businesses understand the impacts

- Costly Analysis
- Only Peak Hour impacts
- No Construction safety
Performance Measures & Construction Impacts
Reducing Travel Delay

- Travel time savings = critical performance measure
- Should construction impacts be considered?
- Excellent case study
  - No feasible alternate routes
  - No practical transit / TDM options
  - Simple but realistic assumptions
- Considers only travel delay benefits
DELAY REDUCTION: CONSTRUCTION IMPACTS & PROJECT BENEFITS

ANNUAL VHT SAVINGS IN 1000'S

CONSTRUCTION OPEN

2024: (160)
2025: (41)
2026: (16)
2027: 10
2028: 35
2029: 61
2030: 87
2031: 114
2032: 141
2033: 168
2034: 195
2035: 223
CUMULATIVE DELAY REDUCTION

ANNUAL VHT REDUCTIONS IN 1000'S

<table>
<thead>
<tr>
<th>Year</th>
<th>Construction Open</th>
</tr>
</thead>
<tbody>
<tr>
<td>2024</td>
<td>(160)</td>
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<tr>
<td>2025</td>
<td>(201)</td>
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<tr>
<td>2026</td>
<td>(217)</td>
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<td>2027</td>
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<td>2030</td>
<td>(24)</td>
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<tr>
<td>2031</td>
<td>90</td>
</tr>
<tr>
<td>2032</td>
<td>231</td>
</tr>
<tr>
<td>2033</td>
<td>399</td>
</tr>
<tr>
<td>2034</td>
<td>594</td>
</tr>
<tr>
<td>2035</td>
<td>817</td>
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</tbody>
</table>
EFFECT OF DISCOUNT RATE ON CUMULATIVE DELAY SAVINGS

ANNUAL TRAVEL TIME SAVINGS IN $1000S

ANNUAL SAVINGS IN 2014 DOLLARS (1000’S)

CONSTRUCTION OPEN

0%
2%
4%
8%

($5,000)
($2,500)
0
$2,500
$5,000
$7,500
$10,000
$12,500
$15,000
$17,500

2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035
US VMT (12-Month Moving Total)

http://tcsidewalks.blogspot.com/2013/03/what-does-peak-vmt-mean-for-twin-cities.html
Estimated Vehicle Miles Traveled on All Roads

- Latest down 2.43% from peak 11.2 years later
- 55 months total, 21 months to 5.0% trough
- Jun 2005

Population adjusted using the BEA Mid-month population estimates [FRED POPTHM]

Jan 1971
Other construction impacts...

- Fuel consumption?
- Economic impacts?
- Air quality?
- Safety?
Things to ponder:

- Construction impacts can be significant
  - New alignment vs widen existing
  - Evaluate:
    - Operational improvements
    - Demand management
    - Alternate modes
  - Is rigorous construction planning justified?

- Beware of “end-state” planning
  - Interim matters
  - Immediate vs long-range impacts

- Benefit/Cost: Simple ↔ Complicated

- What about uncertainty?
Questions / Comments

23 offices throughout the east coast
www.vhb.com

Taruna Tayal | ttayal@vhb.com | 919.741.5525
Donald A. Bryson | dbryson@vhb.com | 919.334.5615