SPOT PRIORITIZATION FOR INTERSECTION/INTERCHANGE PROJECTS

Lee Klieman, PE, PTOE
SPOT OVERVIEW

Background

- NCDOT uses a transparent, systematic, and data-driven process for prioritizing the major capital transportation in the state and making investment decisions.

- Considers all modes:
  - Highway
  - Bicycle and Pedestrian
  - Rail
  - Transit
  - Aviation

- NCDOT is currently working on the sixth generation of the Strategic Prioritization Process, known as Prioritization 6.0 (P6.0). This latest iteration is based on North Carolina’s Strategic Transportation Investment Legislation, passed in June 2013.
INTERSECTION/INTERCHANGE PROJECTS

Highway Projects

1. Widen Existing Roadway
2. Upgrade Arterial to Freeway/Expressway
3. Upgrade Expressway to Freeway
4. Upgrade Arterial to Superstreet
5. Construct Roadway on New Location
6. Widen Existing Roadway and Construct part on New Location
7. Upgrade At-grade Intersection to Interchange or Grade Separation
8. Improve Interchange
9. Convert Grade Separation to Interchange
10. Improve Intersection
11. Access Management
12. Ramp Metering
13. Citywide Signal System
14. Closed Loop Signal System
15. Install Cameras and DMS
16. Modernize Roadway
17. Upgrade Freeway to Interstate Standards
18. Widen Existing or Construct New Local (Non-State) Roadway
19. Improve Intersection on Local (Non-State) Roadway
20. Convert Grade Separation to Interchange to Relieve Existing Congested Interchange
21. Realign Multiple Intersections
22. Construct Auxiliary Lanes or Other Operational Improvements
23. Construct Grade Separation at Highway/Railroad Crossing
24. Implement Road Diet to Improve Safety

SPOT PRIORITIZATION FOR INTERSECTION/INTERCHANGE PROJECTS
PROGRAM OVERVIEW

Project Phases

• SPOT 3.0 – June 2013-April 2014 – 285 Projects
• SPOT 4.0 – June 2015-March 2016 – 294 Projects
• SPOT 5.0 Pre-Submittal – April 2017-July 2017 – 90 Projects
• SPOT 5.0 – July 2017 – March 2019 – 291 Projects
• SPOT 6.0 Pre-Submittal – March 2019-June 2019 – 191 Projects
• SPOT 6.0 – September 2019-March 2020 - ??? Projects

SPOT PRIORITIZATION FOR INTERSECTION/INTERCHANGE PROJECTS
SPOT Prioritization for Intersection/Interchange Projects
VOLUME DEVELOPMENT

2017/2027 Volume Development

• Four Scenarios –
  – 2017 No-Build
  – 2017 Build
  – 2027 No-Build
  – 2027 Build

• Based on 2016 or 2017 NCDOT AADT Volume Data (2017/2018 in P6.0)

• Links without AADT determined by proportioning TMC volume to known AADT volume

• Turn Percentages
  – Turning Movement Count

• Conversion to Peak Hour
  – K-factor based on TMC Data
  – D-factor based on TMC Data
  – Assumes same K for AM and PM
  – AM D is inverse of PM

• Developed as Origin-Destination Matrix

• Multiple Intersections Projects have full O-D defined

SPOT PRIORITIZATION FOR INTERSECTION/INTERCHANGE PROJECTS
2017/2027 Volume Development

- 2027 Volumes developed based on Growth Rates from NC Statewide Model (NCSTM)
  - Compound Annual Growth Rate (CAGR) between 2015 and 2025 Existing + Committed (E+C) Network

- For Links not in NCSTM
  - Growth Rate based on the average rate for same functional class in each County

Table 3-1: Growth Rate by County and Functional Classification

<table>
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<tr>
<th>County</th>
<th>Freeway</th>
<th>Arterial</th>
<th>Collector</th>
<th>Local</th>
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VOLUME DEVELOPMENT

SPOT PRIORITIZATION FOR INTERSECTION/INTERCHANGE PROJECTS
**Caliper TransModeler 5.0**

- Traffic Simulation Software
- Integrates with TransCAD
- GIS Based
- Models Freeway and Arterials
- Signal Optimization
- Numerous Outputs and Measures of Effectiveness
- Models Roundabouts

- Transit Integration
- Toll Integration
- Macroscopic, Mesoscopic and Hybrid Simulation
- TransModeler SE for smaller projects

**SPOT PRIORITIZATION FOR INTERSECTION/INTERCHANGE PROJECTS**
MODEL DEVELOPMENT

Default Parameters – Consistency is Essential

- Modeled AM and PM peak hours
- Vehicle fleet based on collected data
- Truck percentages based on facility and land use type
- Speed distributions based on collected data and engineering judgment
- Facilities coded based on posted speed limit

- Signalized Intersections
  - Used Signal Plan for phasing
  - Optimized based on volumes
  - Used Standard NCDOT defaults for yellow, all-red, lost time, etc.
  - Fully actuated signals with advance detectors and stop bar detectors

- Each Model Run 10 times for each scenario
- Vehicle Hours Traveled (VHT) was the primary output
TRAVEL TIME SAVINGS

\[ TTS_{10-yr} = \left[ \min(2017 \, TT, 2027 \, TT) \times 10 + \frac{|2027 \, TT - 2017 \, TT| \times 10}{2} \right] \times CF_1 \times CF_2 \times 260 \, \text{days/year} \]

- VHT for AM and PM Peak for No-Build and Build Scenarios
- Assumes 260 weekdays per year over 10-year period
- Conversion Factor 1 – Developed to extrapolate peak hour savings to a daily value

- Conversion Factor 2 – Developed for over capacity segments
  - Compares AADT volume to capacity of segment for each approach
  - Capacity based on facility type, area type and number of lanes
  - Conversion Factor is based on percentage of segments that are considered to be over capacity
  - v/c threshold varied based on topography

SPOT PRIORITIZATION FOR INTERSECTION/INTERCHANGE PROJECTS
TRAVEL TIME SAVINGS DATA SHEET

SPOT PRIORITIZATION FOR INTERSECTION/INTERCHANGE PROJECTS
Program Management Report

• Concept Overview

• Detailed Program Management Approach
  – Volume Development Methodology
  – TransModeler Default Parameters
  – TransModeler Model Development Guidelines

• Results

  To be completed at end of P6.0
SUMMARY

Summary of Program

- Developed 960 Projects in 4 rounds of SPOT w/ 190 currently being developed in P6.0 Pre-Submittal Phase
- Each round of SPOT runs from roughly October through February (~20 weeks)
- Collect new traffic counts for all projects
- Utilizes 14 Private Engineering Firms
- Program Manager responsible for scoping, tracking progress, quality control review of volumes and modeling

Sustainable – All models can be re-used in future rounds of SPOT and for STIP Projects

SPOT PRIORITIZATION FOR INTERSECTION/INTERCHANGE PROJECTS
Questions?

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