Making Decisions from Traffic Models Workshop

March 20-21, 2007
Sacramento, CA
Agenda

Projects Presented

• Interstate 80 – New Jersey
• Pulaski Skyway – New Jersey
• Doyle Drive – San Francisco
  – Project still looking at IPA
  – Staging not at issue yet
I-80 Construction
Staging Impact Analysis
Introduction: I-80 Construction Staging

- PB developed construction staging plans
- Construction contractor proposal to change and combine stages
  - Cut construction time in half (from 6 to 3 months)
- NJDOT asked PB to evaluate congestion impact of contractor’s proposal versus proposed staging
- Evaluation of impact of proposal using operational modeling techniques
Scenarios Examined: I-80 Construction Staging

- Existing Conditions
  - Two 12’ Lanes with shoulders Local
  - Two 12’ Lanes with shoulders Express

- PB Staging Alternative
  - Two 11’ Lanes without shoulders Local
  - Two 12’ Lanes with shoulders Express

- Contractors Staging Alternative
  - Close Local
  - Three 11’ Lanes without shoulders Express
I-80 Eastbound

Existing Conditions

Note:
Not Drawn to Scale
I-80 Eastbound
Parsons Brinckerhoff Construction
Staging Section

Note: Not Drawn to Scale
Operational “Tool”: I-80 Construction Staging

NJDOT Liked:

• Operational Analysis tool
• Applicable to freeway segments
• Accounts for capacity reductions on mainline and ramps due to geometric changes during construction
• Capable of evaluating staging
• Addresses lane closures/crossovers
• Produces numerous measures of effectiveness
Results Summary

• Existing Conditions
  • Average speed 36 mph
  • Average trip time 10 minutes
  • Total throughput to I-80 and Route 17 – 5440 vph

• PB Staging Alternative
  • Average speed 33 mph
  • Average trip time 11 minutes
  • Total throughput to I-80 and Route 17 – 5380 vph

• Contractors Staging Alternative
  • Average speed 16 mph
  • Average trip time 23 minutes
  • Total throughput to I-80 and Route 17 – 4300 vph
Pulaski Skyway
Emergency Repairs
Construction Staging
Support
Study Area - Pulaski Skyway Construction Support

NJTPK Eastern Spur
Route 7
Pulaski Skyway
Route 1&9 Truck
NJTPK Extension
Objective - Pulaski Skyway Construction Support

To perform rehabilitation on the Pulaski Skyway while minimizing or mitigating delays due to congestion to commuters in the corridor and region.
Concerns - Pulaski Skyway Construction Support

- Maintaining vital linkages to/from Jersey City and New York City
- Peak period disruptions (congestion, detours, lane closures or reductions)
- Disruptions to local residents and businesses
- Safety on local and regional roadways
- Adjacent Construction projects (simultaneous critical staging)
1. Existing Traffic Counts
2. Regional Travel Demand Model
3. Regional Construction Projects Tracking Tool
4. Highway Capacity Software
5. Operational Model
1. Existing Traffic Counts
   ✓ Time of Day
     • Morning, Evening, Overnight
   ✓ Day of Week
     • Weekday
     • Friday
     • Saturday
     • Sunday
Toolbox - Pulaski Skyway Construction Support

US 1/9 South (MP: 51.2) at Ramps to Pulaski Skyway NB (3P6D502) (Average)

Volume

0 500 1000 1500 2000 2500 3000 3500

Hour

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23

Peak Period

AM Peak
PM Peak
Average Mon-Thu
Average Fri
Average Sat-Sun
2. Regional Travel Demand Model
   ✓ Comparison of screenline volumes
   ✓ LOS on screenline crossings

3. Regional Construction Projects Tracking Tool
   ✓ Cooperation with Traffic Operations and Project Managers
   ✓ Track other regional projects
   ✓ Look at critical staging on other projects
   ✓ Measure impact on Pulaski Construction Staging
Toolbox - Pulaski Skyway Construction Support

2008 Construction Projects with Traffic Implications
Regional Demand Model used to frame big picture issues and patterns

• Scenarios
  – Closure of Pulaski during peak periods
  – Closure of Pulaski during night-time
  – Closure of Pulaski over weekends
  – Closure of eastern end and use of Broadway ramps for detoured traffic
  – Close Kearny entrance ramp and detour to Fish House and Route 7
  – Overnight Southbound closure until next Evening Peak Period
  – Closure of one lane and reduce width of remaining travel lane
Highway Capacity Software

✓ Analysis at ramps and key intersections due to detours
5. **Operational Model**

- Analyze staging specifics on the Skyway
- Bottleneck analysis at touch down points
- Queues – how much more time spent in congestion?
- Communication through visualization as well as analytical outputs
Construction Staging
Method

- Created operational model of Pulaski Skyway
- Used existing counts to estimate Skyway (ultimate) throughput during peak periods
- Modeled existing conditions using “on-the-ground” throughput
- Closed 1-travel lane and reduced the width of the remaining travel lane
- Modeled existing demand on reduced cross-section
- Model outputs reduced throughput on new scheme
- Unmet demand becomes backup queue
Pulaski Skyway Construction Support – Toolbox
WILL GO TO LIVE DEMONSTRATION AT THIS POINT
<table>
<thead>
<tr>
<th>Period</th>
<th>Time of Week</th>
<th>Time of Day</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM and PM Peak Periods</td>
<td>Weekday</td>
<td>6am to 9am; 4pm to 7pm</td>
<td><strong>Not recommended</strong> for construction during weekday peak periods; detoured traffic causes failures all along the corridor screenline crossings in the <em>eastbound</em> direction in the morning and <em>westbound</em> direction in the evening</td>
</tr>
<tr>
<td>Overnight Period</td>
<td>Weekday</td>
<td>9pm to 5am</td>
<td><strong>OK for construction:</strong> worst volume at setup time 9pm but trails off until about 5am; reduced volume on all screenline crossings means that detoured traffic should not cause significant delays</td>
</tr>
<tr>
<td>Night-Time Friday to Monday Morning</td>
<td>Weekend</td>
<td>9pm Friday to 5am Monday</td>
<td><strong>OK for construction:</strong> the <strong>biggest block of time</strong> (56 hours) amongst alternatives; worst volume during PM hours on weekends but volumes are well below weekday peaks; reduced volume on all screenline crossings means that detoured traffic should not cause significant delays</td>
</tr>
<tr>
<td>Period</td>
<td>Time of Week</td>
<td>Time of Day</td>
<td>Recommendations</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>----------------</td>
<td>----------------------</td>
<td>---------------------------------------------------------------------</td>
</tr>
<tr>
<td>Off Peak Night to Next Afternoon</td>
<td>Weekday</td>
<td>9pm to 4pm</td>
<td><strong>Not recommended</strong> for construction; even off-peak direction volumes are high enough to cause failures along the corridor screenline crossings</td>
</tr>
<tr>
<td>Close EB Kearny entrance ramp and detour traffic onto Fish House Road</td>
<td>All Periods</td>
<td>All Times</td>
<td><strong>OK for construction</strong>; detour accounts for only 30 vehicles in the AM and about 80 vehicles in the PM on weekdays; should not add any significant delays on Fish House Road; No delays seen on weekends</td>
</tr>
<tr>
<td>One-Lane Closure with Reduced width on remaining travel lane</td>
<td>All Periods</td>
<td>All Times</td>
<td><strong>Not recommended</strong> for construction; operational analysis indicates a &quot;best case&quot; queue of 2 1/2 to 3 miles in two lanes for the worst peak periods</td>
</tr>
<tr>
<td>Close eastern end of Skyway and Reroute Traffic to Broadway Ramps</td>
<td>Weekday</td>
<td>6am to 9am / 4pm to 7pm</td>
<td><strong>Not recommended</strong> for construction; detoured traffic causes failure and long queues on ramps in AM and along Route 1&amp;9T southbound in the PM</td>
</tr>
</tbody>
</table>

**pb**
Limitations/Shortcuts Next Steps

- Project done in a limited time frame
- Recognize that we have limited traffic count data for all time periods
- Recognize that the travel demand model is limited to *weekday commuter travel* so weekend forecasts need to be considered with care
- Analysis done only on facility (no detour routes)
Limitations/Shortcuts Next Steps

• Concept Development and Feasibility Assessment stages longer duration (2.5 years)
• Connection of other area operational models to increase area wide coverage
• Increased coverage will enable analysis of local detour routes
  – Identify capacity issues of detour area (e.g. available capacity; time of day)
  – Identify undesirable local road detours (e.g. neighborhood streets)
Pros/Cons of Larger Network

Further Benefits
• Increased geographical coverage
• More system performance measures
• Ability to test detour routes

Issues
• Increased data required for calibration/validation
• Increase in time required for calibration/validation
Future Developments

• NJDOT developing a Statewide Weekend Model Framework
• Models that can address ITS
• Real Time Traveler Information