Traffic Signal Optimization Project
South Bend, Indiana

Jeff Swenson, P.E., PTOE
Ting Wei, P.E., PTOE, AICP
Presentation Outline

• Project Background
• Project Approach
• Travel Time Evaluation
• Summary
Project Purpose

• Signal timing optimization at the busiest intersections in the City to reduce fuel consumption
• Assessment of the existing Econolite Aries Traffic Management System
• Funded by Energy Efficiency and Conservation Block Grant Program from the U.S. Department of Energy
Benefits of Signal Timing Optimization

• A cost-effective approach to improve traffic operations
  – Reduce delay at intersections
  – Improve corridor bandwidth
  – Reduce vehicle crashes
  – Reduce carbon emissions and fuel consumption
Project Approach

• Step 1: Assessment of Existing Systems
• Step 2: Data Collection
• Step 3: Signal Timing Analysis
• Step 4: Implementation
• Step 5: Post-Implementation Evaluation
Step 1: Assessment of Existing Systems

- Within the city limits: 218 traffic signals
- Under City’s jurisdiction: 163 traffic signals
- Existing Aries server: 17 zones listed, 14 zones with connectivity
- Two additional signal systems in development
Study Corridors for Signal Optimization

• Five corridors cover more than 100 intersections within the City:
  – Michigan Street/Main Street (SR 933) (N/S one-way pair through downtown)
  – Lincolnway West
  – Bendix Drive/Cleveland Road (intersecting streets)
  – Miami Street
  – Ireland Road
Step 2: Data Collection

- Existing Signal Timings
- Intersection Turning Movements during Peak Hours:
  - At only 25 selected intersections
  - Would have liked to have done more!
- Bi-directional Hourly Volumes, MACOG
  - Limited number of locations
- Travel Time along Study Corridors:
  - “Before”
  - “After”
Step 3: Signal Timing Analysis

• Synchro
  – the main modeling tool

• ITE Recommended Minimum Yellow Change & Red Clearance Intervals
  – Minimums

• MUTCD
  – increase in pedestrian clearance interval(s) can significantly impact urban signalized intersections/signal systems operations
LaSalle Street existing

LaSalle Street proposed
Step 4: Implementation

- Download new signal timings
- Software training for city staff
Step 5: Post-Implementation Evaluation

- Comparison of “Before” and “After” Travel Time along Study Corridors
  - Floating Car GPS Data
  - Bluetooth Probe Data

- Fuel Consumption and Emissions
  - On-going
Floating Car GPS Data

- Collected during AM and PM peak hours for “Before” and “After”
- More than 10 runs for each peak
- Using USB GPS receiver with in-car laptop
  - No driver interaction required during runs
  - Post-processing using Tru-Traffic 9.0
Before and After Travel Time in PM Peak

<table>
<thead>
<tr>
<th>Road</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cleveland Rd EB</td>
<td>168</td>
<td>488</td>
</tr>
<tr>
<td>Cleveland Rd WB</td>
<td>141</td>
<td>452</td>
</tr>
<tr>
<td>Bendix Dr NB</td>
<td>147</td>
<td>478</td>
</tr>
<tr>
<td>Bendix Dr SB</td>
<td>146</td>
<td>488</td>
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<tr>
<td>Lincoln Way EB</td>
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<td>304</td>
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<td>Lincoln Way WB</td>
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<td>305</td>
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<tr>
<td>Miami St NB</td>
<td>300</td>
<td>335</td>
</tr>
<tr>
<td>Miami St SB</td>
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<td>342</td>
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<tr>
<td>Ireland Rd EB</td>
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<td>217</td>
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<tr>
<td>Ireland Rd WB</td>
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<td>168</td>
</tr>
<tr>
<td>Michigan St NB</td>
<td>168</td>
<td>170</td>
</tr>
<tr>
<td>Main St SB</td>
<td>268</td>
<td>399</td>
</tr>
</tbody>
</table>
Bluetooth Probe Data

• Collected for 48-hours at each end of the study corridors for “Before” and “After”

• To supplement the floating car GPS data
  – Validate the GPS data during the peak hours
  – Provide extra information during off-peak hours

• Hardware and software by Traffax
DETECTION RATE PLOT
Station 9D5  Michigan N of Bartlett
Hour of day from 19-Sep-2011 to 21-Sep-2011
Bluetooth detections / 5 min

DETECTION RATE PLOT
Station 564  Michigan S of Chippewa
Hour of day from 19-Sep-2011 to 21-Sep-2011
Bluetooth detections / 5 min

Estimated Detection Rate: 10-15%
NB “Before” Travel Time Along Michigan Street Between Chippewa Ave and Bartlett Street

Travel Time for segment 564-9D5 to

Travel Time - Minutes
20-Sep-2011

Travel Time Data
Outliers
Mean

Average of GPS Travel Time

Total Non-Outlier MAC_ID Match: 170
Summary

• Signal timing optimization is a very competitive alternative for transportation improvements and energy conservation

• Key factors for successful signal optimization projects:
  ▪ Promote funding $$$ / creative funding
  ▪ Proper assessment of existing signal operations (Data, Data, Data)
  ▪ Continuous monitoring and preventive maintenance
One More Thing…

- Currently discuss with the City upgrading their existing Aries system to a centralized ATMS system.
Questions?

• Jeff Swenson
  jswenson@structurepoint.com
• Ting Wei
  twei@structurepoint.com