Georgia’s First DDI: How’s it Doin’ Now?

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DIVERGING DIAMOND INTERCHANGES (DDI)
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- Imported from France; First in USA – Springfield, Missouri (2009)
- Improves safety and mobility, typically at a much lower cost compared to conventional interchange design
  - Reduces conflict points by 50%; virtually eliminates many of most severe crash types (Crossing reduced from 10 to 2)

<table>
<thead>
<tr>
<th>Vehicle-Vehicle Conflict Points</th>
<th>Conventional Diamond Interchange</th>
<th>Diverging Diamond Interchange</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crossing</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Merging</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Diverging</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>26</td>
<td>14</td>
</tr>
</tbody>
</table>
DDI CONSIDERATIONS

• Alternative if:
  – Heavy volumes of left turns on to and off of freeway ramps.
  – Moderate but unbalanced crossroad traffic volumes through the interchange.
  – Left turn related safety concerns at the interchange intersections.
  – A need for additional capacity without widening the roadway and bridge.
ASHFORD DUNWOODY RD @ I-285 DDI

- Georgia’s first Diverging Diamond Interchange (DDI)
- Dream of the PCIDs, GDOT, and DeKalb County
- PCID used SRTA Grant for design
- $4.6 Million in GDOT Funded Construction Costs
- Opened to traffic in mid-2012
- 55,000 vpd cross the bridge
LOCATION

Ashford Dunwoody DDI
LOCATION

Ashford Dunwoody DDI
CURRENT
PUBLIC OUTREACH

Can you DDI?
ARRIVE CROSSEOVER DRIVE
PUBLIC OUTREACH
STIRIPING AND SIGNAL HEADS
PTOP

• Perimeter Traffic Operations Program (PTOP)
• Began late 2012
• Active Management of 100 signals in Brookhaven, Dunwoody, and Sandy Springs – PCID is client
OPERATIONAL STRATEGIES

• DDI was focus for early stages of PTOP
• Embrace the Half Cycle
• Solve the Weave
• Progression Priorities
EMBRACING THE HALF CYCLE

- At core, DDIs are simple 2-phase intersections
- Full cycle could show problems during peak conditions
- Half Cycle allows for clearing of bridge and storage between Hammond / Lake Hearn and I-285
- Tested during Holiday timings, late 2012
- Fully implemented in early 2013
EMBRACING THE HALF CYCLE

- Constant flow of traffic from Hammond; limited storage with full cycle
- Queuing on ramps and across bridge observed
- Full cycle too long on WB ramp without weave
- NB queue excessive due to long off ramp split
THE WEAVE
THE WEAVE
THE WEAVE
THE WEAVE

72 seconds of weave a cycle*; 29 minutes of weave per hour

* Approximately 1 second of start up loss time of WB right turn is accounted for.
SIMTRAFFIC - BEFORE
THE WEAVE – HALF CYCLE

Reduction in weave by over 63%, with an observed increase in overall DDI traffic signal timing efficiency.

* Approximately 1 second of start up loss time of WB right turn is accounted for.
VIDEO- AFTER
CURRENT OPERATIONS

• Embraced half cycle all times-of-day (except Off)
  – Eliminate the weave all times of day except AM
  – Could not drop below 75s or cycle length is too small

• Half cycle allows for simplicity of progression design
  – Keep it Simple - 2 ways are most efficient:
    • Progress lefts off interstate
    • Progress thrus across DDI / Lefts onto interstate
CURRENT OPERATIONS

• Progress lefts off interstate into District
CURRENT OPERATIONS

- Progress thru across DDI / Lefts onto interstate
  - PM Plan only until 5:30, than progression priorities change

Free flow left, but queuing in shared thru-left lane limits free flow
RESULTS

• 22% decrease in Travel Times from previous interchange
• 47% decrease in Average Time Stopped
• Less overall delay for all users
• Ramps rarely queue beyond gore
• Fantastic public opinion of DDIs – studies show approval is > 95% after opening
PTOP LESSONS LEARNED

• Synchro vs VISSIM
• “Coordination” with Ramp Meters
• 1 cabinet vs 2 cabinet setup
• Timing as a system – not just the DDIs
  – DDI timing must be part of a larger system timing effort in order to maximize efficiency of DDI
• Can’t time I-285 @ 400
• Be on the lookout for NCHRP 03-113
I-285 @ 400 INTERCHANGE

I-285 at SR 400
Interchange Reconstruction
PI 0000784

Artistic View Looking West along I-285
SPECIAL THANKS/SOURCES

• FHWA –
  http://safety.fhwa.dot.gov/intersection/innovative/crossover

• Bill Ruhsam, PE, PTOE – Michael Baker International
  – PM of ADR DDI design
THANK YOU!