Agenda

- Existing systems and Challenges
- Why Smart Signals?
- Debunking the Myths of Smart Signals
- Implementation Results
- Smart Signal Operations
- Conclusion
Existing Systems and Challenges

- MDOT SHA maintains 3000+ signals statewide
- Controllers - Econolite ASC/3 or Econolite Cobalt
- Detection – Video camera, non-invasive micro loop probes, inductive loop, radar-based detection, thermal detection
- Communication – Telephone Service with Dial-Up Modems and Ethernet Based High Speed Data Communications with Cellular Modems
- Old ATMS (Aries) over 20 years old.
Existing Systems and Challenges

- Outdated communication and ATMS
- Cannot adapt to fluctuations in traffic and non-recurrent congestion events such as temporary work zones, special event, crash etc.
- Existing system cannot respond to early onset of peak period or extended peak periods.
- No way to monitor system performance to prioritize timing reviews.
Why Smart Signals?

To utilize cutting edge technology to effectively modernize and manage our system

SMART SIGNALS

• Adaptive Signal Control Technology
• Upgraded Communication
• Signal Performance Measures
• SPaT Challenge
Traditional Signal Systems vs. Smart Signal Systems

**TRADITIONAL SIGNAL SYSTEMS**

- Requires Engineers to Study & Retime
- Pre-Programmed Static Signal Timing & Phasing
- Delays Increase as Volumes Change

**SMART SIGNAL SYSTEMS**

- Real-Time Updating & Adapting to Traffic
- Constantly Adjusting Signal Timing & Phasing
- Delays are Managed Continuously
Delay Increases as Volumes Increase

Along signalized corridors
Delay increases as Volume increases

For old Signal Systems, Engineers can periodically Retime the system to improve Delay

Smart Signals adjust in real-time to minimize Delay

SHA - Office of Traffic and Safety
Benefits to SMART SIGNALS

Motorist Cost Savings

Agency Cost Savings

Improves the Environment & Reduces Fuel Emissions

Reduce Complaints & Frustrations

Up To 15% Crash Reduction

Improves Safety

Delay Reduction 10%-50%

Reduce Travel Time

Reacts to Unforeseen Congestion

Continually Adjusting

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WHAT ARE SMART SIGNALS?
Debunking Myths:

1. Everyone Gets Green All the Time.
   (Traffic Will Still Have to Stop But Delay Is Minimized)

2. You Are Saving Hours of Commute Time **Per Day**.
   (You’re Saving Minutes Per Day—Annual Time & Money Savings Are Significant)

3. All Corridors Should be Smart Signal Corridors.
   (Smart Signals are Most Cost Effective Along Congested Corridors With Highly Variable Traffic Volumes)

4. Smart Signals Are Ideal For Urban Downtown Areas.
   (Smart Signals Are Not Recommended For Corridors With High Pedestrian Volumes)
Implementation Results: Update

- Studies of 5 Corridors Completed
- Conducting Studies of 20 Corridors with Over 180+ Signals

<table>
<thead>
<tr>
<th>Signal System</th>
<th>No. of Signals in System</th>
</tr>
</thead>
<tbody>
<tr>
<td>US 1/MD 175 Jessup</td>
<td>16</td>
</tr>
<tr>
<td>MD 24/US 1 Bus Bel Air</td>
<td>14</td>
</tr>
<tr>
<td>MD 2 Brooklyn Park</td>
<td>4</td>
</tr>
<tr>
<td>MD 139 Towson</td>
<td>3</td>
</tr>
<tr>
<td>US 40 Catonsville</td>
<td>11</td>
</tr>
</tbody>
</table>
Case Study: **MD 139 (Towson)**

### Average Reduction in Corridor Travel Time (sec/veh) 3 Hour Period

<table>
<thead>
<tr>
<th></th>
<th>AM Peak</th>
<th>Midday Peak</th>
<th>PM Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AM Peak</strong></td>
<td>7 secs.</td>
<td>8 secs.</td>
<td>0.5 secs.</td>
</tr>
<tr>
<td><strong>Midday Peak</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PM Peak</strong></td>
<td></td>
<td></td>
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### Average Reduction in Total Delay 3 Hour Period

<table>
<thead>
<tr>
<th></th>
<th>AM Peak</th>
<th>Midday Peak</th>
<th>PM Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AM Peak</strong></td>
<td>1.5 hrs.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Midday Peak</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PM Peak</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SHA - Office of Traffic and Safety
Data Conclusions: **MD 139 (Towson)**

6 gallons **Per day**

That's Equivalent to:

- 2,190 Gallons per year
- 438 Home Depot Buckets per year
- 27 Bathtubs per year

**$337,000**

Total Annual Savings

**$114,000**

Total Annual Savings
Case Study: MD 2 (Brooklyn Park)

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Average Reduction in Corridor Travel Time (sec/veh)</th>
<th>Average Reduction In Total Delay (3 Hour Period)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM Peak</td>
<td>17 secs.</td>
<td>3.5 hrs.</td>
</tr>
<tr>
<td>Midday Peak</td>
<td>10 secs.</td>
<td>2.6 hrs.</td>
</tr>
<tr>
<td>PM Peak</td>
<td>28 secs.</td>
<td>12.3 hrs.</td>
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</tbody>
</table>
Data Conclusions: MD 2 (Brooklyn Park)

20 gallons Per day

That’s Equivalent to:

- 7,300 Gallons per year
- 1,460 Home Depot Buckets per year
- 91 Bathtubs per year

$337,000

Total Annual Savings

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<table>
<thead>
<tr>
<th>Highway</th>
<th>Annual Savings</th>
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</thead>
<tbody>
<tr>
<td>US 40</td>
<td>$470k</td>
</tr>
<tr>
<td>US 1</td>
<td>$970k</td>
</tr>
<tr>
<td>MD 24</td>
<td>$582k</td>
</tr>
<tr>
<td>MD 2</td>
<td>$337k</td>
</tr>
<tr>
<td>MD 139</td>
<td>$114k</td>
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</table>
Upcoming SMART SIGNAL Corridors

### CORRIDORS ADAPTIVE READY

<table>
<thead>
<tr>
<th>Signal System</th>
<th>No. of Signals in System</th>
</tr>
</thead>
<tbody>
<tr>
<td>US 301 Bowie</td>
<td>6</td>
</tr>
<tr>
<td>MD 2 Annapolis Harbor</td>
<td>4</td>
</tr>
<tr>
<td>MD 3 Crofton</td>
<td>12</td>
</tr>
<tr>
<td>MD 22 Aberdeen</td>
<td>8</td>
</tr>
<tr>
<td>US 13 Business North Salisbury</td>
<td>5</td>
</tr>
<tr>
<td>MD 202 Landover</td>
<td>5</td>
</tr>
</tbody>
</table>

### CORRIDORS IN CONSTRUCTION

<table>
<thead>
<tr>
<th>Signal System</th>
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</tr>
</thead>
<tbody>
<tr>
<td>US 301 Waldorf</td>
<td>20</td>
</tr>
<tr>
<td>MD 198 West Laurel</td>
<td>2</td>
</tr>
<tr>
<td>MD 108 Olney</td>
<td>11</td>
</tr>
<tr>
<td>US 40 Ellicott City East</td>
<td>5</td>
</tr>
<tr>
<td>MD 140 Westminster</td>
<td>13</td>
</tr>
<tr>
<td>MD 450 Parole</td>
<td>10</td>
</tr>
<tr>
<td>MD 2 Severna Park</td>
<td>11</td>
</tr>
<tr>
<td>MD 2 Glen Burnie North</td>
<td>10</td>
</tr>
</tbody>
</table>
Smart Signal Operations
Smart Signal Operations

Most Importantly...Smart Signals Mean No More
How Smart are Smart Signals?
Hmmm... What Else?

US 301 @ Heritage Blvd/Ball Park, Heritage Boulevard (WB) – Thru

Split Trend | Wed, May 22nd, 2019

Time of day

- Spare Capacity | Count
- OK | Count
- Heavy Traffic | Count
- Split Failure | Count
- Random Arrivals | Count
Stop! I am not a traffic engineer

...(but I do love MD beaches)
THANK YOU

For more information contact:

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cward@mdot.maryland.gov