Highway 9 Adaptive Control System in Norman, Oklahoma

OTEA Fall Meeting
October 20, 2015
The Presenters

• David Riesland—Traffic Engineer for the City of Norman

• Jeff O’Brian—Business Development with Econolite in Arlington, Texas
The Project

- State Highway 9 east from I-35 has long served as one of the main access avenues to special events at OU.
- The concept of adaptive control adjusts the cycle length and/or the splits “on the fly” to improve mainline flow.
- State Highway 9 is access controlled, for the most part, and appears to be an ideal candidate for adaptive control.
The Project Location

- Signalized Intersections
Initial Steps

• The City of Norman contacted Econolite in early 2013 to price an adaptive system on Hwy 9.
• The timing, if approved, would create a capital project in the next budget cycle.
• Initial estimates came in at just under $50,000 for a six intersection system.
• The Norman City Council approved, as part of the City’s FYE 2014 budget, a $50,000 capital project to create a six-signal adaptive system on Hwy 9.
Initial Steps (Cont.)

- Once Council had approved the FYE 2014 Budget, the City went back to Econolite to create a contract for the work
- In July/August, 2014, it was determined that the initial estimate had failed to include radar units needed to detect the length of potential queues upstream from each signalized intersection
  - The cost of the project rose to $105,000
Initial Steps (Cont.)

• With the estimate for the necessary queue detecting radar equipment in hand, staff went back to Council requesting the additional $55,000 in funding needed to implement the project.

• Council unanimously approved the increase in the contract amount, as well as for the contract with Econolite, on October 14, 2014.
Initial Steps (Cont.)

• From the beginning, the City desired a mechanism to measure the effectiveness of the adaptive system

• BlueTOAD units were being used by Econolite in Stillwater to measure travel times along specific corridors

• Norman would be allowed to borrow the BlueTOAD devices to measure travel times

• Travel time data could be collected before and after adaptive system deployment
Construction Timeline

- Dec. 22-23, 2014: City forces pulled wire and installed cabinet equipment—Avg. high temperature was 50.5°
- Dec. 26 and 29, 2014: City forces pulled wire and installed cabinet equipment—Avg. high temperature was 53°
Construction Timeline (Cont.)

- Jan. 5-6, 2015: City forces pulled wire and installed cabinet equipment—Avg. high temperature was 43°
- Jan. 7-9, 2015: City forces and Econolite installed radar units and programmed—Avg. high temperature was 32.7°
Construction Timeline (Cont.)

- Jan. 12, 2015: City forces worked with Econolite installing BlueTOAD
- High temperature was 34°

- Enjoy some photos of the installation!
• Now, on to the technical elements, Jeff.
• Centracs ATMS in Norman
• Remote access to controllers, timing, Video (via Ethernet)
• Add Centracs Adaptive Module
• What else is needed?
• Detection & Measurement – (BT)

IT'LL BE FUN THEY SAID
Centracs Adaptive

- Original ACS Lite sponsored by FHWA
- Focus on arterial management
- Adjusts Offsets and Splits based on monitored traffic flow (detection)
- Works with existing coordination
Centracs Adaptive

- Splits adjusted based on phase utilization
- Phase utilization determined from stop bar detection
- Unused split time reallocated to busier phases
- Offset adjusted based on green arrival profile
- Flow profile developed from advance detection
- Offset adjusted to optimize vehicles arriving on green
- Changes to split and offset are made in small increments (2-6 seconds)
Detection

- Adaptive requires stop bar detection & at Max queue length detection on mains (lane by lane)
- Existing Autoscope detection (stopbar)
- Need detection beyond max queue lengths
Detection

• Max Queue Lengths at about 1000’
Detection
While we were at it...

- Each intersection required detailed information about ALL timing and detection operation (stop bar video and radar)
- Information used for Adaptive configuration and evaluations
Measurement

- Installed 4 BlueTOAD’s Bluetooth devices for Travel Time/Speed history & reports
Measurement—BlueTOAD

- No data
- Above 115% of index speed
- At least 75% of index speed
- At least 50% of index speed
- Below 50% of index speed

Route ID: 19083
Current Speed: 34.0 mph
Speed Limit: 50 mph
Travel Time: 4 min 14 sec

Index determined by:
- speed limit
- avg last 12 Thursdays
- custom historical avg

Refresh Interval: No Refresh

Map data ©2015 Google Terms of Use Report a map error
Updated 9/17/2015, 11:00:50 AM
Comparison Report: Smoothed Speed (15-min)

Time Interval: 00:00:00 - 23:59:00

**Tue/Wed Feb 10/11 vs Apr 14/15**

**Tue/Wed historical avg. Jan15- Mar 6**
Field Implementation

- All deployments come with anomalies to overcome
- We had a few...
- Radar doesn’t need to be in the conventional location - just need range
Field Implementation (Cont.)

- Radar software uses aerial imagery (Google, Bing, etc...) to help with configuration
- **BUT...** it can’t tell you that things are in the path of the radar
- Had to make adjustments to accommodate obstruction
Field Implementation (Cont.)

• Plenty of security!
• Criminals on the loose!
Waiting for “ON”

• Adaptive ready for ON
• Construction at 24th and McGee
• Construction almost complete at 24th
• I-35 construction ongoing
• BlueTOAD data being collected

• Now, back to Norman’s perspective, David.
Project Challenge #1

🌟 Monroe Elementary School
Challenge #1 Issues

• Monroe Elementary School is located at 1601 S. McGee Drive in Norman with a student population of 435

• Formal attendance boundary for Monroe Elementary School extends south of Hwy 9

• All the parents arrive at Hwy 9, southbound on McGee, at essentially the same time after they pick up their children in the afternoon
Changes Resulting from Challenge #1

- Set a maximum cap that the Adaptive Control System would only be able to take up to 25% of the available split from any side street to serve main line movements.

- We continued to see improved operations on Hwy 9 but the phone quit ringing about parents with school children not being served on McGee.
Project Challenge #2

City of Norman Transfer Station
Challenge #2 Issues

- The City of Norman Sanitation Transfer Station is located at 3901 Chautauqua Ave.
- The Transfer Station operates six days a week and utilizes large trucks.
- Upon exit, these large trucks are accessing Hwy 9 via a side street.
Changes Resulting from Challenge #2

- The arrival patterns of these trucks on the Chautauqua approach to Hwy 9 is very sporadic

- We decided to implement PPLT for the two Chautauqua approaches to Hwy 9 to provide more opportunities for the left-turn traffic on both sides of Hwy 9 (this had been a frequent complaint for a few years)
Project Challenge #3

★ The University of Oklahoma
Challenge #3 Issues

- The University of Oklahoma is accessed from Hwy 9 by Jenkins, Chautauqua, and Imhoff

- When traffic leaves OU by any of the three routes, the result is the same, it is attempting to access Hwy 9 at a side street

- Many of the same problems faced in Challenge #1 and Challenge #2
Changes Resulting from Challenge #3

- Set a maximum cap that the Adaptive Control System would only be able to take up to 25% of the available split from any side street to serve main line movements

- We continued to see improved operations on Hwy 9 but the phone quit ringing quite as often about back-ups of traffic onto the OU Campus
Project Challenge #4

★ ODOT Road Construction at Hwy 9/I-35
Challenge #4 Issues

• The interchanges on I-35 at both Hwy 9 and Lindsey Street are being rebuilt by ODOT

• The construction has impacted the intersection of Hwy 9 and 24<sup>th</sup> Ave SW

• At times, portions of 24<sup>th</sup> Ave SW were closed and McGee was used as a detour route
Changes Resulting from Challenge #4

• The Adaptive Control System could not keep up with the constant changes in traffic control and the fact that southbound McGee was beginning to compete as a major movement in the corridor.

• We had no alternative but to remove the Adaptive Control System from overall control of corridor movements during those times when 24th Ave SW was closed to key movements.
One Last Lesson

- Sometimes when you’re out working in the field, the urge takes control and you have to do something quick
- If this happens to you, make sure the wind is at your back
- Right, Jeff?
Questions?