Indiana Department of Transportation Use of Archived Work Zone Data to Adjust Project Schedules for Reduced Costs and Improved Mobility

SMARTER WORK ZONES TECHNOLOGY APPLICATION STRATEGIES

FACT SHEET

Technology applications involve deployment of intelligent transportation systems (ITS) for dynamic management of work zone traffic impacts to improve motorist and worker safety and mitigate work zone-related congestion.

This fact sheet focuses on how the Indiana Department of Transportation (INDOT) used archived work zone technology application data to benefit the agency and traveling public.

Background

The Work Zone Safety and Mobility Rule[1] requires state agencies to collect operational data to better manage resulting safety and mobility impacts in work zones. Many technologies are available for work zone data collection and recent innovations make data collection easier and less expensive. Temporary data collection technologies can support applications like queue warning systems (QWSs), traveler information, and performance measurement. INDOT leveraged archived technology application (i.e., QWS) data from one work zone in order to modify the lane closure allowances planned for a second, adjacent work zone. This allowed the project to be completed in half the time of its scheduled duration, resulting in cost savings for both INDOT and travelers due to increased construction productivity and scheduling efficiencies.

Leveraging Archived Queue Warning System Data

INDOT uses archived traffic volume count data as the basis for queue predictions when planning the timing and number of lanes that can be closed inside all Interstate work zones in the state. This is in accordance with the INDOT Interstate Highways Congestion Policy (INDOT's lane closure policy, pursuant to 23 CFR 630 Subparts J and K). The data used is collected when there are no work zone activities present that might affect reported traffic volumes.

In 2014, a two-year bridge replacement work zone began on a six-mile segment of I-94 in Northwest Indiana that reduced capacity from three to two lanes in both directions at all times. The work zone utilized a QWS that:

- Covered an 8-mile segment,
- Included QWS sensors placed in advance of the work zone to collect data to support system operations,
- Was procured as a line item in the construction contract as a per-year lump sum cost,
- Significantly decreased crashes versus the previous year and had significantly fewer queues than projected,

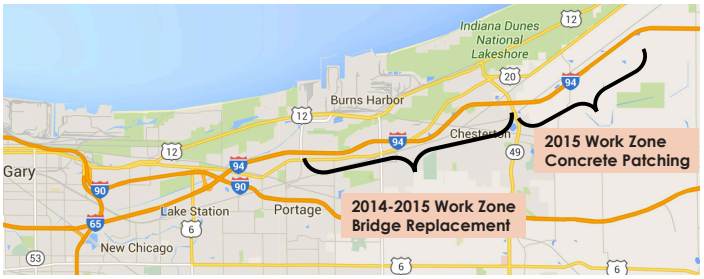

Figure 1: Location of adjacent work zones on I-94 in northeast Indiana *(Source: Google Maps)*

- Was automated and sent e-mail alerts to INDOT staff if the detected queue exceeded two miles. Queue lengths were verified in field by the freeway service patrol since the transportation management center (TMC) has few traffic cameras on this segment, and
- Archived 15-minute volume data from every sensor, which was made available to INDOT staff via an online interface.

For 2015, INDOT planned a second work zone to conduct concrete patching on a five-mile adjacent segment of I-94. Utilizing the archived traffic volume count data from several years earlier that was collected at a time without any work zone activities, along with Indiana's standard congestion management policy, INDOT determined that freeway capacity could be reduced from three lanes to two lanes in each direction, except for Friday evenings (from 5pm to midnight) in the westbound direction when three lanes were necessary to avoid excessive delay. This lane closure schedule would require concrete to be poured by Tuesday afternoon to ensure enough time for the concrete to cure by Friday afternoon for the lane to be opened to traffic. This limitation necessitated a two-year schedule for completion.

Given the availability of more recent work zone data from an adjacent segment of I-94 (i.e., data collected in 2014 during the bridge replacement work zone), INDOT District Construction staff examined the more recent QWS volume data trends. Preliminary analysis showed that traffic volume trends on Friday evenings were consistent with other days, and significantly lower than the earlier archived traffic volume counts (collected during normal conditions). This data was further analyzed by INDOT Work Zone Safety Staff at the TMC in Indianapolis, who

1 23 CFR 630, Subpart J available at: http://www.ops.fhwa.dot.gov/wz/docs/wz_final_rule.pdf

also supported the request to allow lane restrictions on Friday evenings. The request was subsequently approved by an INDOT Executive. Accordingly, the lane reductions to two lanes at all times in the westbound direction allowed for concrete pours to take place any day of the week within the single closed lane. This modification greatly increased the contractor's flexibility when scheduling construction activities.

Lower traffic volumes on freeways with work zones are not uncommon in Indiana, and may have occurred on I-94 as the result of several factors:

- The presence of ongoing construction causes many travelers to avoid the route;
- The work zone was far enough from Chicago that several quality alternate routes were available;
- Media coverage of the work zone activities may have deterred travelers; and
- The portable dynamic message signs (PDMS) in the queue warning system were placed upstream of decision point exits to facilitate diversion.

Impacts from Adjusting the Lane Closure Schedule

The construction contract had been let by the time the work zone data analysis was completed. INDOT Construction staff approached the contractor about potential contract changes if Friday evening lane closures were allowable. The contractor proposed a modified schedule that shortened the work zone duration from two-years to one-year.

Coincidentally, the same contractor was awarded both projects through a competitive bid process. This helped to ensure coordination of closures and activities between the two adjacent work zones. The contractor was able to adjust the QWS at no cost to incorporate the concrete patching construction project when it began in 2015, rather than deploy a second QWS that would begin within the boundaries of each of the two work zones.

When the concrete patching work zone began in 2015, INDOT staff went to the field for the first few Friday evenings to verify that the lane closure did not cause significant queuing. As expected from the archived QWS volume and queue data, no significant queuing occurred for the duration of the project despite the lane closure.

Construction activities were able to be completed one year ahead of the original schedule per the modifications implemented between INDOT and the contractor.

Expanding Use of Work Zone Data

INDOT is dedicated to exploring new technologies and practices to solve complicated traffic problems in work zones. INDOT realizes that it is critical to minimize the duration of construction projects on a major highway like I-94 to the extent possible, especially given the number of construction projects planned. The shorter project duration resulted in cost savings in the form of reduced traveler delays and reduced INDOT staff efforts to coordinate work zone activities. As such, similar technology applications are now being considered for additional work zones in the area.

Additionally, INDOT is considering the examination of the archived work zone data to compare with projected estimates of traffic volumes for specific hours. This analysis would allow INDOT to adjust lane closure times by an hour or two, as needed, to reduce mobility impacts (e.g., lane closure times may be adjusted from 9pm-6am to 8pm-5am if data showed higher volumes during the 5am-6am hour).

The QWS deployed on I-94 was utilized effectively and likely contributed to a reduction in crashes. While the availability of archived data is not the primary purpose of a QWS, the INDOT LaPorte District Construction Staff utilized the archived QWS data to realize a secondary benefit. Analyzing the archived QWS data helped to justify a modification for a more lenient lane closure schedule on the adjacent 2015 concrete patching construction project, benefiting both the contractor and the traveling public. As demonstrated by this INDOT example, the possibility of leveraging additional sources of data to increase work time has major potential to gain efficiency and shorten work zone durations. This INDOT example demonstrates that technology applications (in this instance a QWS) can not only improve work zone safety, but also provide valuable data for analysis and evaluation purposes.

Additional resources on SWZ technology application strategies can be found at: https://www.workzonesafety.org/swz/technology_application

For additional information, please contact:

Jonathon Kruger
INDOT LaPorte District Construction Area Engineer
219-851-2092
jkruger@indot.IN.gov

Todd Peterson
FHWA Office of Operations
202-366-1988
Todd.Peterson@dot.gov

Jawad Paracha
FHWA Office of Operations
202-366-4628
Jawad.Paracha@dot.gov

Every Day Counts (EDC), a State-based initiative of FHWA's Center for Accelerating Innovation, works with State, local and private sector partners to encourage the adoption of proven technologies and innovations aimed at shortening and enhancing project delivery.

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