Report to Council

Date:	July 21, 2025
To:	Council
From:	City Manager
Subject:	Adaptive Signal Timing Trial
Department:	Infrastructure Operations

Recommendation:

THAT Council receives, for information, the report from the Infrastructure Operations Department dated July 21, 2025, on the results of the Adaptive Signal Timing Trial;

AND THAT Council directs staff to further expand the Adaptive Signal Timing Project;

AND FURTHER THAT staff report back as the project progresses to include various corridors.

Purpose:

To receive the Adaptive Signal Timing Trail report and to direct staff to further expand this project across suitable corridors throughout the city and to report back.

Council Priority Alignment:

Transportation

Background:

In June 2025, the city concluded a 9-month pilot of Adaptive Signal Timing technology on Springfield Road (Leckie to Spall) using the NoTraffic System. Traffic signals at five consecutive intersections (Spall, Cooper, Dilworth/Benvoulin, Durnin, Leckie) were managed in real-time by the NoTraffic System. Signals typically utilize preprogrammed schedules. Performance was evaluated by comparing midweek travel data with the adaptive system active (June 10–12, 2025) against a baseline with standard timing (June 7–9, 2025). Travel times were measured using Google Maps data, capturing 40 samples per day between 6 AM and 10 PM. This methodology ensured an external and unbiased before-and-after comparison of corridor travel time performance.

Introduction:

Traditional traffic signal timing involves pre-set schedules where the duration of time allocated to different directions are based on historical traffic data and patterns. Separate timing plans for morning, afternoon and weekend periods reflect typical traffic patterns seen during these periods.

Traffic signal coordination is also used in some corridors and aligns the timing of traffic signals along a corridor to coordinate green lights between intersections, allowing more vehicles to travel through multiple intersections without stopping. This coordination is based on fixed schedules and estimated travel times between intersections with limited ability to adapt to real-time traffic conditions.

As technology has progressed over the past few years, adaptive signal timing has become a viable and affordable solution by means of combining the power of video processing, sensors and algorithms.

The result is that the control unit dynamically adjusts the traffic light phases based on real-time traffic data and can share this data with adjacent intersections to inform them what traffic flows are approaching.

This data processing capability within and between traffic signals allows the system to monitor traffic flow and optimize signal timings to reduce delays and make sequencing decisions to improve traffic movement in real time. For example, if a particular intersection experiences a sudden increase in traffic, the adaptive system can quickly allocate more green time to alleviate congestion. If traffic volumes are suddenly reduced in one direction, the system can reallocate additional time to where it's needed. This approach enhances overall traffic efficiency, reduces travel times, delay and emissions, without compromising traffic safety.

Discussion:

The Adaptive Signal Timing Trial delivered significant improvements in traffic flow along the Springfield corridor:

- Faster Travel Times on Springfield:
    - Drivers experienced measurably quicker trips. Averaged over the day, eastbound travel times dropped ~4% (about 20 seconds shorter per trip on average), and westbound times dropped ~1% (~4 seconds saved).
    - During the busiest afternoon period, eastbound Springfield was about 5% faster (23 seconds reduction during PM peak), and westbound saw savings up to 32 seconds in the midday period when congestion was previously worst.
    - Overnight and early-morning travel remained around 4.6–4.8 minutes end-to-end, essentially unchanged free-flow conditions, indicating the adaptive system had no negative effect on off-peak traffic. During uncongested periods, less change was expected.
    - These individual vehicles time savings are accumulated by the over 30-35,000 daily users of the Springfield corridor.
- Less Delay and Stop-and-Go: By allocating green time more efficiently, the system cut down on overall delays. Springfield's traffic delays were reduced at nearly all times of day. On average, Springfield drivers now spend significantly less time waiting at lights –equivalent to an estimated 39,000 hours of travel time saved per year across the corridor, which equals an annual reduction in emissions of 131.5 tonnes of CO_2^{e-}.The afternoon peak benefited the most, with delay reduced

~5% for eastbound Springfield, while midday and Saturday improvements were also notable. These efficiency gains mean lower driver frustration and more predictable travel.

- Intersection Performance: All five signalized intersections saw overall improvement in delay, though gains varied by location. The largest benefits were concentrated at the busiest junctions
    - approximately 40% of the total delay reduction occurred at Springfield & Dilworth/Benvoulin
    - 30% reduction at Springfield & Cooper
    - 25% reduction at Springfield & Spall
    - In contrast, the smaller Springfield & Leckie intersection saw minimal change (<5% of savings).
    - Minor movements, like certain side-street left turns, occasionally saw small increases or mixed results, but these were limited in scale and did not outweigh the broader improvements.
    - Overall, every intersection operated more efficiently under adaptive control than before.
- Minimal Impact on Side Streets: Crucially, the main corridor gains were achieved without significant detriment to cross-street traffic. On average, cross-street delays increased only by about 2–5 seconds per vehicle, which is a small and acceptable trade-off for the substantial Springfield corridor benefits. Throughout the day, side-street wait times sometimes varied (small increases or decreases in the range of ±5–15 seconds). The most pronounced side-street impact observed was northbound on Benvoulin Rd at Springfield, which at certain times saw up to ~27 seconds of additional delay; however, its average increase over the day was just ~2 seconds per vehicle. In summary, cross-corridor traffic flow was only mildly affected, indicating the adaptive system struck a good balance between Springfield and side streets.
- All pedestrian crossings continued to be served normally. The report also noted no change in pedestrian wait times, meeting city guidelines.
- Broadly Consistent Trends: The pilot data showed consistent positive trends using both Google travel-time metrics and the NoTraffic System's internal measurements, with only negligible increases in delays where traffic was lighter. This reinforces confidence in the results' validity.

Recommendations:

Given the success of this pilot, staff recommend expanding the adaptive signal timing technology to additional corridors and intersections in a phased rollout. The pilot team has identified potential candidate locations for a "Step 2" expanded program in 2025–2026. Priority will be given to intersections and corridors with similar congestion patterns to maximize delay reduction benefits. Current Step 2 corridors under evaluation are:

- Springfield (Pandosy to Spall, including Baron Rd.), 7 intersections
- Spall / Enterprise (Spall / Bernard to Enterprise / Highway 33), 9 intersections
- Richter (Sutherland to Lakeshore), 4-7 intersections depending on analysis
- Various intersections/corridor portions across town based on delay data

Maximizing the efficiency of the existing infrastructure is the most cost-effective way to respond to the Council priority of traffic mobility. Advancements in traffic detection, computing power and communications have made this long-held concept effective and affordable. The trial results strongly support moving forward with a continued adaptive signal program. Council's continued support for smart transportation initiatives like these will help scale these wins citywide, delivering shorter travel times, lower vehicle emissions, and a better driving experience for Kelowna residents. In addition, this project will help to support growth and the development of housing in our urban areas, in alignment with work such as the in-progress Housing Accelerator Fund Transit Supportive Corridor Pilot Project.

Conclusion:

The adaptive signal trial on Springfield Road clearly achieved its objectives. Travel delays were reduced overall – significantly in the eastbound direction and modestly westbound. All major intersections saw improvements in vehicle flow. The net effect is a more efficient corridor, roughly 20–25 seconds saved per vehicle eastbound (4% quicker) and ~5 seconds saved westbound (1% quicker) on average, which translates to substantial time savings for the community with associated air quality improvement.

These benefits were realized without compromising side streets or pedestrian service, aside from very minor delays well within acceptable levels. This trial demonstrates that modern data driven signal control can effectively reduce congestion and improve travel reliability on busy urban corridors.

Internal Circulation:

Infrastructure Operations
Traffic Signals and Systems
Integrated Transportation
Transportation Engineering
Housing policy and Programs
Long Range Planning

Financial/Budgetary Considerations: Initial expansion of the trial to be funded by applicable grants, including the Housing Accelerator Fund, as per Finance/Planning dept guidelines.

Communications Comments:

Considerations not applicable to this report:

Legal/Statutory Authority:
Legal/Statutory Procedural Requirements:
Existing Policy:
Consultation and Engagement:

Submitted by: G Bos, Infrastructure Operations Department Manager

Approved for inclusion: M Logan, General Manager, Infrastructure