Minutes – Standing Policy Committee on Infrastructure Renewal and Public Works – May 19, 2020

REPORTS

Item No. 20 Traffic Signals Performance – Henderson Highway (Elmwood-East Kildonan Ward)

STANDING COMMITTEE DECISION:

The Standing Policy Committee on Infrastructure Renewal and Public Works concurred in the recommendation of the Winnipeg Public Service and received the report as information.

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DECISION MAKING HISTORY:

Moved by Councillor Browaty,

That the recommendation of the Winnipeg Public Service be concurred in.

Carried

STANDING COMMITTEE RECOMMENDATION:

On March 3, 2020, the Standing Policy Committee on Infrastructure Renewal and Public Works concurred in the recommendation of the East Kildonan-Transcona Community Committee and directed the Winnipeg Public Service to report back on the matter within 90 days.

STANDING COMMITTEE RECOMMENDATION:

On February 3, 2020, the East Kildonan-Transcona Community Committee passed the following motion:

BE IT RESEOLVED THAT the Standing Policy Committee on Infrastructure Renewal and Public Works be requested to direct the Winnipeg Public Service to conduct a traffic study on the performance of traffic signals during the morning rush hour at the following intersections:

1. Henderson Highway and Johnson Avenue

2. Henderson Highway and Hespeler Avenue

ADMINISTRATIVE REPORT

Title: Traffic Study – Traffic Signals Performance on Henderson Highway between Hespeler Avenue and Johnson Avenue During the Morning Rush Hour

Critical Path: Standing Policy Committee on Infrastructure Renewal and Public Works

AUTHORIZATION

Author	Department Head	CFO	CAO
D. Patman, P. Eng.	J. Berezowsky	N/A	M. Ruta, Interim CAO

EXECUTIVE SUMMARY

In 2018, as part of a corridor review for Henderson Highway, the Traffic Signals Branch reviewed the signal timing at the intersections of Henderson Highway and Johnson Avenue and Henderson Highway and Hespeler Avenue. The traffic signal coordination between Johnson Avenue and Hespeler Avenue was a focal point of the study and different strategies were considered before settling on the current implementation.

The intersection of Henderson Highway and Johnson Avenue is found to be over capacity and, without a physical increase in traffic capacity or a reduction in traffic volumes, the delay experienced by motorists has been reduced to the furthest extent possible with signal timing changes.

RECOMMENDATIONS

1. That this report be received as information.

REASON FOR THE REPORT

On the March 3, 2020 the Standing Policy Committee on Infrastructure Renewal and Public Works concurred in the recommendation of the East Kildonan-Transcona Community Committee and directed the Public Service to report back within 90 days on a traffic study to evaluate the performance of the traffic signals during the morning rush hour at the following intersections:

1. Henderson Highway and Johnson Avenue

2. Henderson Highway and Hespeler Avenue

IMPLICATIONS OF THE RECOMMENDATIONS

There are no implications to receiving this report as information.

HISTORY/DISCUSSION

BACKGROUND INFORMATION

Henderson Highway is a major north-south corridor that intersects with Hespeler Avenue from the west and Johnson Avenue from the east just north of the Disraeli Bridge, as seen in Figure 1 below. Hespeler Avenue forms a T-intersection with Henderson Highway (Henderson & Hespeler) connecting the Harry Lazarenko Bridge and Main Street to the west. Johnson Avenue forms a T-intersection with Henderson Highway (Henderson & Johnson) linking the River East South neighbourhood from the east.

Figure 1: Study Area

Traffic congestion is routinely observed for southbound Henderson Highway, eastbound Hespeler Avenue and westbound Johnson Avenue during the morning rush hour period, Monday through Friday, 7:00 a.m. to 9:00 a.m.

TRAFFIC CHARACTERISTICS

Table 1 below summarizes the traffic characteristics of Henderson Highway, Hespeler Avenue and Johnson Avenue in the subject area.

Table 1: Summary of Traffic Characteristics

Road	Cross Section	Regional Street	Truck Route	Transit Route	Average Weekday Daily Traffic	Posted Speed Limit (km/h)
Henderson Highway	Six-lane divided	Yes	Yes	Yes	38,300 to 47,800	60
Hespeler Avenue	Four-lane undivided	Yes	Yes	Yes	24,700	50
Johnson Avenue	Four-lane undivided	Yes	Yes	Yes	8,000	50

During the morning rush hour period, parking is only permitted in the northbound curb lane between Hespeler Avenue and Johnson Avenue and along the westbound curb lane on Hespeler Avenue. All median openings along Henderson Highway between Hespeler Avenue and Johnson Avenue prohibit turning during the morning rush hour period for the northbound direction. Left turns are only prohibited at Poplar Avenue for the southbound direction.

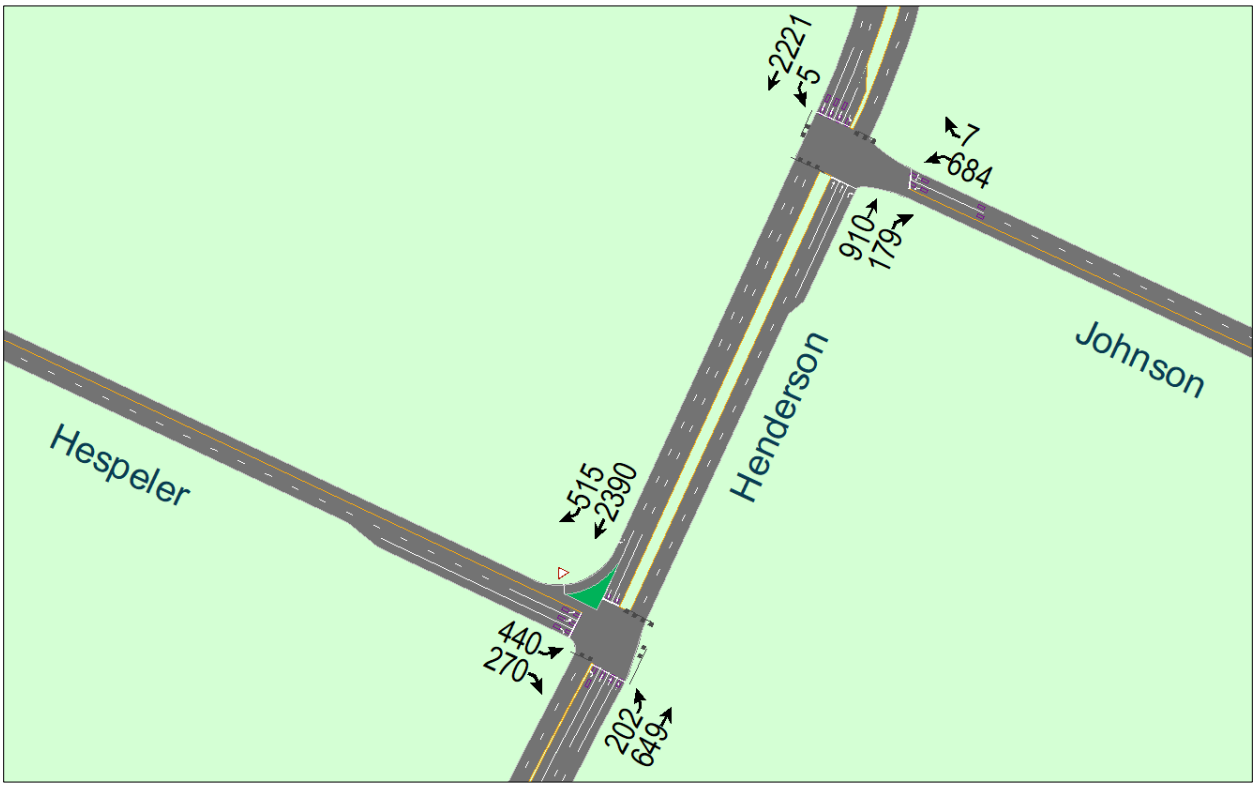

Figure 2: Synchro Model and Balanced AM Peak Hour Traffic Volumes

Figure 2, above, shows the lane designations at each intersection as well as the balanced vehicle volumes for each movement in the AM Peak Hour, identified as 7:30 a.m. to 8:30 a.m., based on 2014 and 2019 counts. Note that the model does not necessarily reflect the physical number of lanes but rather shows available travel lanes, eliminating parking lanes, transit lanes and minor median openings.

Henderson & Johnson forms a T-intersection with three northbound through lanes, three southbound through lanes, a single southbound left turn lane, a westbound left turn lane, and a shared westbound left and right lane. Pedestrians are prohibited on the south crosswalk. This intersection is semi-actuated, meaning the westbound direction has vehicle detection and will only be served on demand up to a specified maximum. Pedestrians must use a push button to cross Henderson Highway.

Henderson & Hespeler also forms a T-intersection with a single protected-permissive northbound left turn lane, three northbound through lanes, two southbound through lanes, a single southbound right turn only lane except for buses and cyclists, two eastbound left turn lanes and a single eastbound right turn lane. Pedestrians are prohibited on the north crosswalk. This intersection is semi-actuated, meaning the eastbound and northbound left directions have vehicle detection and will only serve these movements on demand up to a specified maximum. Pedestrians must use a push button to cross Henderson Highway.

South of Hespeler Avenue the southbound curb lane is designated as a Diamond Lane for use by transit buses, bicycles and taxis during the morning and afternoon rush hours, Monday through Friday, 7:00 a.m. to 9:00 a.m. and 3:30 p.m. to 5:30 p.m. The Diamond Lane extends from Hespeler Avenue along Henderson Highway approximately 300 metres, ending at the exit to Midwinter Avenue and the beginning of the Disraeli Bridge.

Two pedestrian corridors are located on Henderson Highway near the subject site. One at Carmen Avenue, approximately 135 metres north of Johnson Avenue, and one at Dearborn Avenue, approximately 175 metres south of Hespeler Avenue.

TRAFFIC SIGNAL TIMING

A traffic signal timing corridor review of Henderson Highway was completed in June 2018 by the Transportation Division Traffic Signals Branch, including the Henderson & Johnson and Henderson & Hespeler intersections. The signal timing plans for the AM Peak Period at the subject intersections have not be altered since that time, other than for short term temporary lane closures and incidents as reported by the Transportation Management Centre.

Henderson & Johnson operates with a 120 second cycle length between 6:00 a.m. and 9:00 a.m. Monday through Friday. The number of seconds allocated to each phase is shown in Figure 3, below. Approximately 74 percent of the cycle is allocated to southbound traffic and 26 percent to westbound traffic.

When a pedestrian crosses Henderson Highway at Johnson Avenue, the westbound phase allocation increases from 26 percent to 30 percent (+4 percent) in order to provide enough time for pedestrians to safely cross Henderson Highway. This results in a 4 percent decrease in green time for southbound traffic during that cycle. This setup is referred to as a pedestrian overrun.

Since conducting the corridor review, two 311 cases were received for traffic signal timing concerns at Henderson & Johnson. Both were in response to shorter than normal westbound

green time that was a result of a temporary timing change related to an incident on Henderson Highway. As a result, no action was taken.

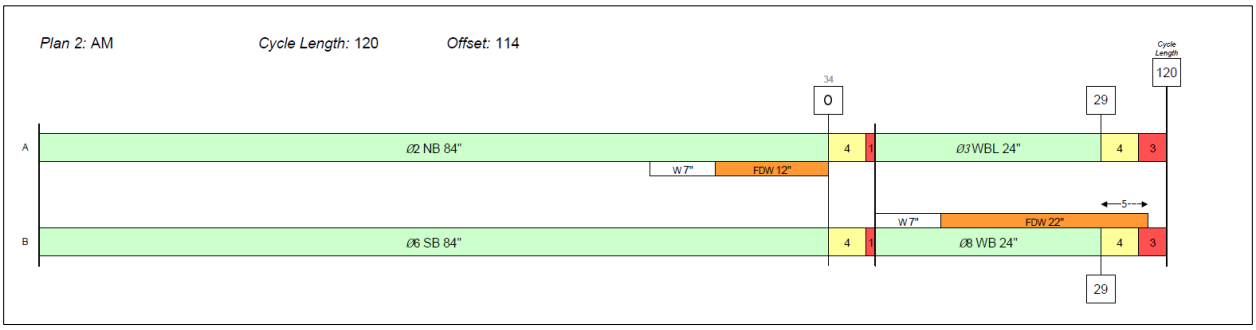

Figure 3: Henderson & Johnson Weekday Morning Traffic Signal Timing Plan

Henderson & Hespeler operates with a 120 second cycle length between 6:00 a.m. and 9:00 a.m. Monday through Friday. The number of seconds allocated to each phase is shown in Figure 4. Approximately 70 percent of the cycle is allocated to southbound traffic, 17 percent to northbound left traffic and 13 percent to eastbound traffic. Between 8:30 a.m. and 9:00 a.m. an alternate signal timing plan runs, increasing the northbound left green time by 2 seconds and decreasing the southbound green time by 2 seconds, or approximately 2 percent.

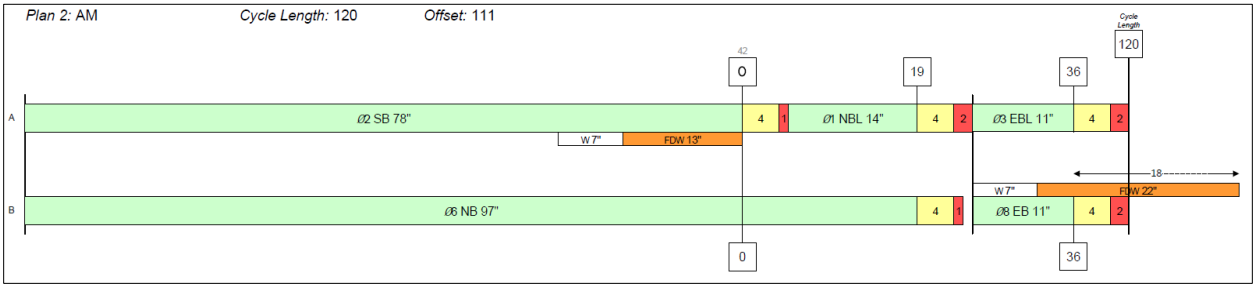

Figure 4: Henderson & Hespeler Weekday Morning Traffic Signal Timing Plan

When a pedestrian crosses Henderson Highway at Hespeler Avenue, the eastbound green time increases from 13 percent to 29 percent (+16 percent) in order to provide enough time for pedestrians to cross Henderson Highway safely. The pedestrian overrun results in a 16 percent decrease in green time for southbound traffic for one cycle. In order to compensate for this reallocation of time, eastbound green time is reduced to 5 seconds, or 9 percent, in the following cycle, thereby increasing southbound green time 6 seconds for a total phase allocation of 75 percent. This is a unique approach to signal timing and was specifically developed for this intersection to address congestion in both the southbound and eastbound directions. While this provides some mitigation for repeated pedestrian crossings, it is less effective for concurrent crossings since the signal timing is unable to recognize concurrent services. Pedestrian crossing data shows eight pedestrians crossing during the AM Peak Hour. Eight crossings per hour impacts approximately one quarter of the cycles in an hour. Counts as high as 20 pedestrians per hour were noted at other points in the AM Peak Period.

Custom settings are also in place to reallocate green time should the northbound left vehicle demand cease early. This is typically of benefit early during the AM Peak Period when traffic volumes are lower.

Since conducting the corridor review, six 311 cases were received for traffic signal timing concerns at Henderson & Hespeler. Three were concerned with southbound congestion, two were concerned with eastbound congestion and one was concerned with northbound left congestion. It should be noted that one southbound case was reported on a day that the Louise Bridge was completely closed and the other southbound case was reported on a day with poor road conditions. The third southbound case was requesting that the southbound green signal at Hespeler Avenue begin earlier so that traffic coming off of Johnson Avenue could proceed faster through the Hespeler Avenue intersection. No signal timing changes were made because adjusting the green start time in favour of Johnson Avenue traffic would be detrimental to southbound Henderson Highway vehicles.

CAPACITY ANALYSIS

The volume-to-capacity ratio (v/c ratio) is a common measure of traffic congestion at an intersection. It relates the volume of traffic wanting to travel through an intersection with the theoretical vehicle capacity of the intersection. A v/c ratio equal to 1.00 indicates the roadway is operating at capacity. A value over 1.00 indicates more vehicles want to travel through the intersection than the intersection can accommodate, resulting in traffic congestion.

Table 2 shows the v/c ratios for each movement as calculated by Synchro 10, a signal timing and analysis modelling software. The eastbound left and southbound movements have v/c ratios exceeding 1.00 and are therefore over capacity, explaining the traffic congestion experienced at the intersection. Although the eastbound right and northbound left v/c ratios are less than 1.00, fluctuations in traffic volumes may result in congestion. Further, the northbound left queue has been frequently observed to exceed the northbound left turn storage lane blocking the northbound median lane. Because northbound traffic volumes are low in the AM Peak Period this does not cause general northbound congestion; however, it does create a safety concern. Consequently it would not be advisable to reduce the green time allocated to the northbound left at Hespeler Avenue. Also note that these v/c ratios change when a pedestrian crosses Henderson Highway with the reallocation of green time, lowering the eastbound and increasing the southbound v/c ratios.

Table 2: Volume-to-Capacity Ratio for the AM Peak Hour at Henderson & Hespeler

	Eastbound Left	Eastbound Right	Northbound Left	Northbound	Southbound	Southbound Right
v/c ratio	1.47	1.02	0.86	0.17	1.10	0.47

Table 3 lists the v/c ratios for each major movement at Henderson & Johnson. The westbound movement has the only v/c ratio exceeding 1.00. However, when a pedestrian crosses Henderson Highway, the increase in green time for westbound movements reduces the v/c ratio.

Table 3: Volume-to-Capacity Ratio for the AM Peak Hour at Henderson & Johnson

	Westbound	Northbound	Southbound
v/c ratio	1.12	0.38	0.75

COORDINATION

Both intersections operate with a 120 second cycle length during the AM Peak Period, as do all of Henderson Highway intersections, allowing for coordination. When travelling southbound on Henderson Highway, the signals are timed such that the vast majority of vehicles arriving at Johnson Avenue on a green signal will arrive downstream at Hespeler Avenue on a green signal. However, because the green time is 6 seconds shorter for southbound Henderson

Highway at Hespeler Avenue, a portion of southbound traffic will pass through Johnson Avenue and arrive at a red signal at Hespeler Avenue. This issue increases when a pedestrian crosses Henderson Highway at Hespeler Avenue, growing the green time discrepancy to 24 seconds.

The westbound green signal for Johnson Avenue concurrently spans the green signal for both the northbound left and eastbound movements at Henderson & Hespeler. The leading eastbound left vehicles at Henderson & Hespeler arrive at Henderson & Johnson just as northbound turns green, assuming the northbound left previously served its full duration.

The presence of the two pedestrian corridors on Henderson Highway, both north and south of the subject site, affects coordination along the route. The random activations interfere with coordination and contribute to the experienced congestion.

TRAFFIC SIGNAL TIMING DISCUSSION

This section of the Henderson Highway corridor has been analyzed extensively by the Public Service and many alternative signal timing approaches have been considered.

Starting the southbound Henderson & Hespeler green earlier would allow the southbound green at Johnson Avenue to extend further past the end of the southbound green at Hespeler Avenue. This would allow more southbound Henderson Highway traffic to fill up the storage space between Hespeler Avenue and Johnson Avenue, thereby hindering westbound Johnson Avenue traffic which currently relies on this storage capacity to travel through the intersections. An earlier shift would also cause eastbound left traffic on Hespeler Avenue to arrive at a red signal on northbound Henderson & Johnson.

Starting the southbound Henderson & Hespeler green later would give southbound Henderson Highway traffic at Hespeler Avenue nowhere to go when they initially have a green signal. This would be exacerbated when a pedestrian crosses Henderson Highway at Hespeler Avenue.

Because all legs at Henderson & Hespeler are over capacity, as noted above through either modelling or site observation, in order to increase the green time at this intersection for southbound Henderson Highway traffic, the cycle length would need to increase. Increasing the cycle length and allocating any additional time to southbound Henderson Highway would increase congestion for the northbound left and eastbound movements since they would be required to wait longer before being served. Increasing congestion on these legs will result in vehicle queues that frequently exceed storage lanes for both the northbound left and eastbound right. Exceeding the storage lane for the eastbound right will block an eastbound left lane, further exacerbating congestion and safety concerns.

The current operation attempts to balance the needs of all users. Without a physical increase in traffic capacity or a reduction in traffic volumes, the delay experienced by motorists has been reduced to the furthest extent possible.

FINANCIAL IMPACT

Financial Impact Statement **Date:** April 28, 2020

Project Name:
Traffic Study – Traffic Signals Performance on Henderson Highway between Hespeler Avenue and Johnson Avenue During the Morning Rush Hour

COMMENTS:

There is no financial impact associated with the recommendation of this report.

"Original signed by J. Peters, CPA, CGA"
J. Peters CPA, CGA
Acting Manager of Finance & Administration

CONSULTATION

This Report has been prepared in consultation with: N/A

OURWINNIPEG POLICY ALIGNMENT

The recommendations of this report are aligned with the key strategic goal of a safe, efficient and equitable transportation system for people, goods and services in the Sustainable Transportation Direction Strategy that supports OurWinnipeg.

WINNIPEG CLIMATE ACTION PLAN ALIGNMENT

Signal timing changes such as those identified here are intended to relieve congestion and reduce delay on the transportation network without requiring additional facilities, and directly relate to 3.1 Increase Use and Efficiency of Public Transit Systems and 3.5 Reduce Traffic Congestion.

SUBMITTED BY

Department: Public Works
Division: Transportation
Prepared by: Greg Blatz, P. Eng., Supervisor of Traffic Signals Systems
Date: April 29, 2020