

Date: February 27, 2019 **File:** 2018-5290

To: Ryan Cook, Town of Pelham

From: Jeff Suggett, M. Sc.

Project: Traffic Studies

Subject: Review of Intersection Pedestrian Signals

MEMO

Ryan:

The purpose of this memorandum is to report findings of our review of operations at three (3) intersections on Pelham Street that are currently controlled by Intersection Pedestrian Signals; Pelham Street and Church Hill; Pelham Street and Pancake Lane/John Street; and, Pelham Street and Bacon Lane/Spruceside Crescent. This is in response to the Town's request that Associated Engineering (AE) investigate whether the intersection pedestrian signals are warranted and whether there are any operations or safety issues associated with them.

1 DESCRIPTION / BACKGROUND

The intersections being reviewed all intersect with Pelham Street south of Regional Road 20 within a space of approximately 1.6 kilometres. The intersection of Pelham Street and Church Hill is located closest to Regional Road 20 and in the built-up area of the Community of Fonthill. The intersections of Pelham Street and Pancake Lane/John Street and Pelham Street and Bacon Lane/Spruceside Crescent are located further south in a mainly residential area.

Each intersection has an intersection pedestrian signal. The intersecting road is controlled by a stop sign and the main road (Pelham Street) is controlled by the signals. Painted crosswalks are provided across the main road and pedestrians can cross with the right-of-way when the display shows the "Walk" indication.

Previous Studies

In previous studies recently completed by AE for the Town of Pelham, a traffic operations assessment was conducted at the intersections of Pelham Street and Church Hill/Pelham Street and Pelham Town Square. The intersections of Pelham Street and Pancake Lane/John Street and Pelham Street and Bacon Lane/Spruceside Crescent were evaluated for the need for regular traffic signals (traffic signal warrant).

Pelham Street and Church Hill

The recommendation of the previous study indicated that consideration be made to enhance pedestrian safety within the vicinity of the intersection by prohibiting vehicle parking on Pelham Street within 30 metres of the signal (i.e., 30 metres from the crossing). Observations showed that legally parked vehicles were obscuring sightlines for both pedestrians crossing and vehicles approaching this intersection.

Pelham Street and Pancake Lane/John Street

The recommendation of the previous study indicated that regular traffic signals are not justified based on the typical vehicular volumes entering the intersection, which were too low to meet the two (2) warrant criteria of the *Ontario Traffic Manual Book 12: Traffic Signals* (Book 12) – only 61% and 72% met.

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Pelham Street and Bacon Lane/Spruceside Crescent

The recommendation of the previous study indicated that regular traffic signals are not justified based on the typical vehicular volumes entering the intersection, which were too low to meet the warrant criteria of Book 12 – only 40% and 50% met.

Intersection Pedestrian Signals Justification

According to *Ontario Traffic Manual Book 12– Traffic Signals* (Book 12)¹, the need for an Intersection Pedestrian Signal is determined based on the traffic volume on the road, pedestrian volumes and the amount of pedestrian delay (inability for pedestrians to find safe gaps - Justification 6), as presented in Figures 22 and Figure 23 of Book 12. Higher traffic volumes will result in a reduction in gap availability, making it more difficult for a pedestrian to safely cross the roadway. A review of Figure 22 provided in Book 12 indicate the warranting conditions for an Intersection Pedestrian Signal are not met, based on the traffic counts undertaken in November 2018, as there is insufficient pedestrian volume, as shown in **Appendix A**. While not formally evaluated, it was also noted that there are insufficient pedestrian crossing volumes for an intersection pedestrian signal to be justified (based on Figure 23), as pedestrian volumes fall well below the minimum threshold (200 pedestrians crossing in an eight-hour period).

2 DATA REVIEW / FIELD VISITS

In order to gain insights into pedestrian crossing behaviour and overall gap availability, a gap study was undertaken at each location to determine the number of safe gaps a pedestrian would have to cross the roadway. The methodology used was adapted from the *Crossing Guard Guide* produced by the *Ontario Traffic Council*².

Gap studies at each of the study intersections were requested from Pyramid Traffic Inc. and were conducted on Wednesday, January 16, 2019 during the AM-, Mid- and PM-peak hours for each location for a total study time of three (3) hours. The study involved collecting information about vehicle gaps on Pelham Street, of the number of pedestrians crossing and whether pedestrians were pushing the button (compliance) or crossing without the benefit of the traffic signal (non-compliance). Gap availability was only collected during periods of time when the signal was green on Pelham Street (allowing traffic to proceed). The gap study field sheets are provided in **Appendix B**.

The summary of the gap study results is shown in **Table 2-1** at each location. A safe gap is defined as the period of time a pedestrian would require to safely cross the road, in consideration of a 1.0 m/s walking speed and the total width of the crosswalk (with a 4 second perception-reaction time). During each 5-minute period assessed at all locations, there was a minimum of 4 safe gaps (when the signal was green). The average number of safe gaps per 5-minute periods (for the periods when the signal was green) ranged between 5.5 – 7.2.

¹ Ontario Traffic Manual Book 12 – Traffic Signals, Ontario Ministry of Transportation, 2012

² Crossing Guard Guide, Ontario Traffic Council, 2017

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Table 2-1 Gap Study Summary

Location	Safe Gap (seconds)	Average Safe Gaps per 5 Minute Period (With Green Signal)	Total Pedestrians Crossing in 3 Hours	Number of Pedestrians that Pushed Button	Number of Pedestrians that did not Push Button
Pelham Street and Church Hill	12	7.2	27	10	17
Pelham Street and Pancake Lane/John Street	14	5.5	6	3	3
Pelham Street and Bacon Lane/Spruceside Crescent	14	6.6	4	1	3

The results of the gap studies show that pedestrian crossing volumes at all locations are relatively low and that the average number of safe gaps per 5 minutes is adequate. This suggests that under free flow conditions, during the peak hour periods reviewed, there is sufficient gap availability to cross Pelham Street. If the intersection pedestrian signal was absent, pedestrians would still have no difficulty crossing the roadway.

The number of pedestrians crossing the location at Church Hill was noted to be 27 pedestrians over the 3-hour period reviewed, or roughly one every six minutes. It was noted that there were a very small number of pedestrians crossing the other two locations. A total of 6 and 5 pedestrians respectively, crossed Pelham Street at the Pancake Lane/John Street and Bacon Lane/Spruceside Crescent locations. The higher number of pedestrians at the Church Hill location is expected, given the built-up nature of the surrounding area. The other two locations are in a residential area (single family dwellings) with no elementary schools in the immediate area.

The final key observation made with the gap study was the lack of use of the push button. At the three locations combined, less than half of the pedestrians pressed the push button. This further confirms the lack of need for an intersection pedestrian signal. It also emphasized the need for the public to be further educated on the legal, correct and appropriate use of intersection pedestrian signal.

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2.1 Other Field Observations

Additional field observations were made on Friday, February 1, 2019 to review sightlines at each location, traffic signs, pavement markings and the condition and operation of the signal and signal hardware. Pictures illustrating the crosswalks at each of the Study intersections is provided in **Figure 2-1**.



Pelham Street and Church Hill



Pelham Street and Pancake Lane/John Street



Pelham Street and Bacon Lane/Spruceside Crescent

Figure 2-1 Views of Crosswalks

Observations during the field visit on February 1st reaffirm that visibility for pedestrians and vehicles at Pelham Street and Church Hill was obscured as documented in our previous study. This is due to the presence of legally parked vehicles (2-hour parking permitted) within the functional area of the intersection on the Pelham Street approaches. Visibility was adequate at the intersections of Pelham Street and Pancake Lane/John Street and Pelham Street and Bacon Lane/Spruceside Crescent on the north and south approaches to the intersection pedestrian signals.

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Observations made during the field visit regarding traffic signs, pavement markings and the condition and operation of the signals were compared with the requirements of *Ontario Traffic Manual Book 15: Pedestrian Crossing Treatments* (Book 15) and the components for intersection pedestrian signals specified in *Table 9*. Each location met most of the requirements or desirable components, however a number of common deficiencies to each location were not met. Table 9 of Book 15 is provided in **Figure 2-2**.

Table 9: Components for Intersection and Mid-block Pedestrian Signals

Required Components	Desirable Components	Optional Components
<ul style="list-style-type: none"> Traffic Signal Heads as required Approach Markings (Stop Line, No-Passing zone, and Turn Lanes markings, as required) Crosswalk Markings Advanced Stop Bar at Crosswalk with mandatory Stop Here on Red Signal Sign (Rb-78) Stop Here On Red sign (Rb-78) on the near side of an IPS with vehicle and pedestrian heads installed on the far side Pedestrian Control Indications with AODA compliant Pedestrian Signal Pushbuttons and Pedestrian Pushbutton Symbol Sign (Ra-12) Stop sign (Ra-1) on the cross street for IPS 	<ul style="list-style-type: none"> Raised refuge island (for road cross-sections with more than two lanes and two-directional traffic) with mandatory: <ul style="list-style-type: none"> Pavement markings on approaches to obstructions Keep Right Sign (Rb-25, Rb-125) Object Marker Sign (Wa-33L) Stopping prohibition for a minimum of 30 m on each approach to the crossing, and 15 m following the crossing Parking and other sight obstructions prohibition within at least 30 m of crossings 	<ul style="list-style-type: none"> School Crossing Guard Pedestrian Count Down Signals Pedestrian Countdown Signal Information Sign Auxiliary Signal Heads Type 12 Signal Head (300 mm red / amber / green lens) Ladder Crosswalk Markings Textured Crosswalk Raised Crosswalk Cross on Walk Signal Only Sign (RA-7) Cross Other Side Sign (Ra-9) Do Not Cross Here Sign (Ra-9a) No Right Turn on Red sign (Rb-79) Pedestrian Must Push Button to Receive Walk Signal (Ra-13) Safety elements including Barricades, Pedestrian Fencing, Gates, Walls, Bollards, and Barriers

Figure 2-2

Book 15 Requirements for Intersection Pedestrian Signals

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The existing crosswalk pavement markings are not appropriate and are for those used at rural supervised school crosswalks as shown in Figure 45 of *Ontario Traffic Manual Book 11: Markings and Delineation* (Book 11). The appropriate markings are specified in Section 6.2.4.4 of Book 15 and consist of solid white lines spaced a minimum of 2.5 metres apart. As an option and for enhancement purposes, ladder crosswalk markings can be utilized as specified in section 6.2.4.5, Figure 12 of Book 15. The Ontario Traffic Manual illustrations are provided in **Figures 2-3 and 2-4**.

Figure 45 – School Crosswalks for Supervised Crossing

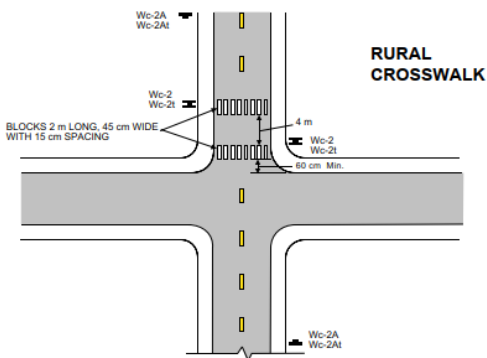


Figure 2-3

Book 11 Markings for Rural Supervised Crossings

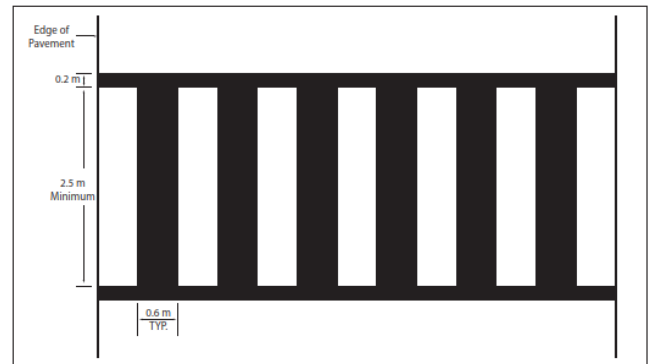


Figure 12: Pavement Markings for Ladder Crosswalk

Figure 2-4

Book 15 Ladder Crosswalk Markings

There are no signed parking or stopping prohibitions within 30 metres of the crosswalk approaches and 15 metres beyond the crosswalk. This is to ensure clear sightlines for drivers approaching the intersection (on Pelham Street or turning from the crossing roadway) and for pedestrians crossing Pelham Street.

There are no signs that reinforce to pedestrians the appropriate side to cross (i.e., the Ra-9a), given that the proportion of non-compliance is high (observations from the gap studies). An illustration of the Ra-9a “Cross Other Side” sign is provided in **Figure 2-5**.

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Figure 2-5
Ra-9a “Cross Other Side” Sign

Other site-specific issues observed include:

- Short-term parking (2 hours) permitted on both sides of Pelham Street within the 30 metre approaches to the crosswalk at Church Hill as documented earlier in this report and;
- Accessibility issues at Pelham Street and Bacon Lane/Spruceside Crescent with respect to the push-button location. It was noted at the time of the site visit that snow had not been cleared near the steel pole to which the push-button was installed (south-east corner) which made access difficult. A picture is provided in **Figure 2-6**.

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Figure 2-6

Push-Button Accessibility south-east corner of Pelham Street and Bacon Lane/Spruceside Crescent

3 CONCLUSIONS/RECOMMENDATIONS

A review of the warranting conditions for the three intersection pedestrian signals indicates that they are not currently warranted based on the November 2018 traffic counts. In addition, the gap analysis indicates that there is a sufficient amount of available safe gaps for pedestrians to cross the roadway without the benefit of the intersection pedestrian signals. However, given the capital investment put into their installation, it is recommended that they remain in place, and measures be undertaken to improve their safety and conformance to Book 15 as well as educating the public on their correct use. To enhance safety and conform to engineering guidelines as well as to maximize their use and encourage compliance, the following site-specific (and general) measures are recommended at each of the following pedestrian signals:

Pelham Street and Church Hill

1. Prohibit vehicle parking on both sides of Pelham Street within 30 metres of the crossing and install the corresponding parking prohibition signs;
2. Remove existing crosswalk markings and replace with markings specified in Section 6.2.4.4 of Book 15 (the existing crosswalk surface is textured so ladder markings are not recommended);

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3. Install Ra-9a signs on the south side of the intersection as specified in Table 9 of Book 15 under "Optional Components".

Pelham Street and Pancake Lane/John Street

1. Consider installing parking prohibition signs on both sides of Pelham Street within 30 metres of the crossing;
2. Remove the existing crosswalk markings and replace with markings specified in Section 6.2.4.5, Figure 12 of Book 15 (ladder markings for increased awareness).
3. Install Ra-9a signs on the north side of the intersection as specified in Table 9 of Book 15 under "Optional Components".

Pelham Street and Bacon Lane/Spruceside Crescent

1. Consider installing parking prohibition signs on both sides of Pelham Street within 30 metres of the crossing;
2. Remove the existing crosswalk markings and replace with markings specified in Section 6.2.4.5, Figure 12 of Book 15 (ladder markings for increased awareness);
3. Install Ra-9a signs on the north side of the intersection as specified in Table 9 of Book 15 under "Optional Components".

General Measures

1. Ensure that during snow clearing operations, the area around the pedestrian push-button poles is cleared adequately to remain accessible to all users;
2. Develop an education program or initiative that teaches the proper use of intersection pedestrian signals. This can be achieved through the production and distribution of brochures or other media and/or delivery of presentations to the public.

Respectfully submitted,
Associated Engineering (Ont.) Ltd.



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**APPENDIX A – Ontario Traffic Manual Book
12, Figures 22 and 23**

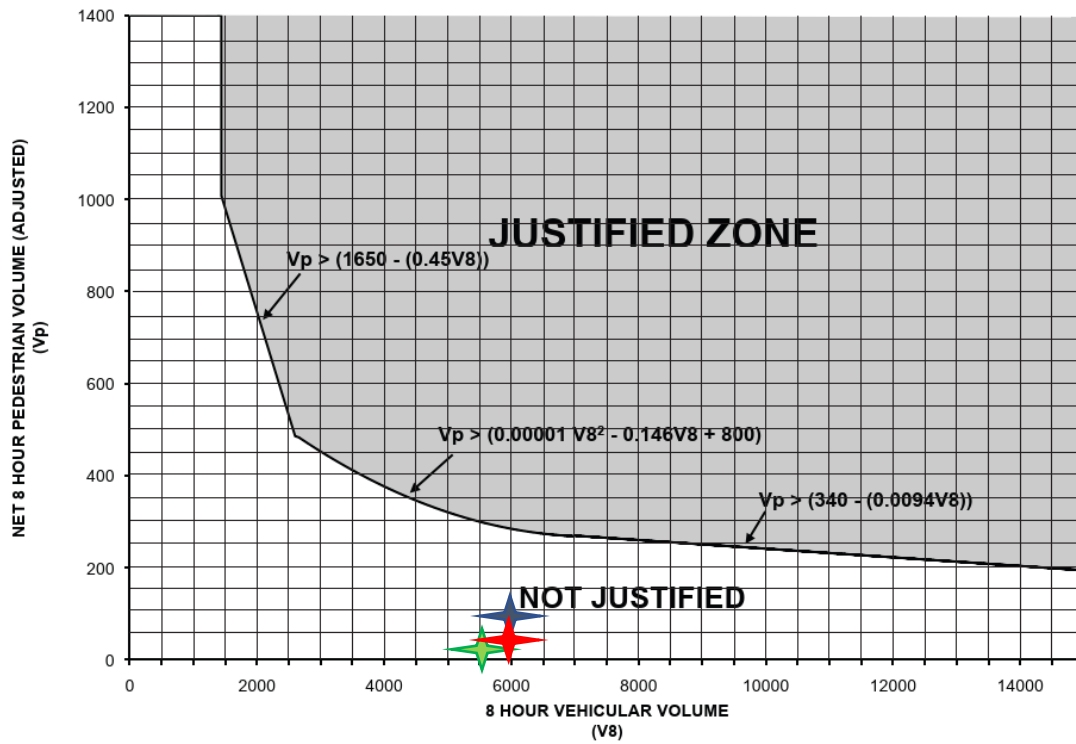





Figure 22 – Justification 6 – Pedestrian Volume

-  Pelham Street and Church Hill
-  Pelham Street and Pancake Lane/John Street
-  Pelham Street and Bacon Lane/Spruceside Crescent

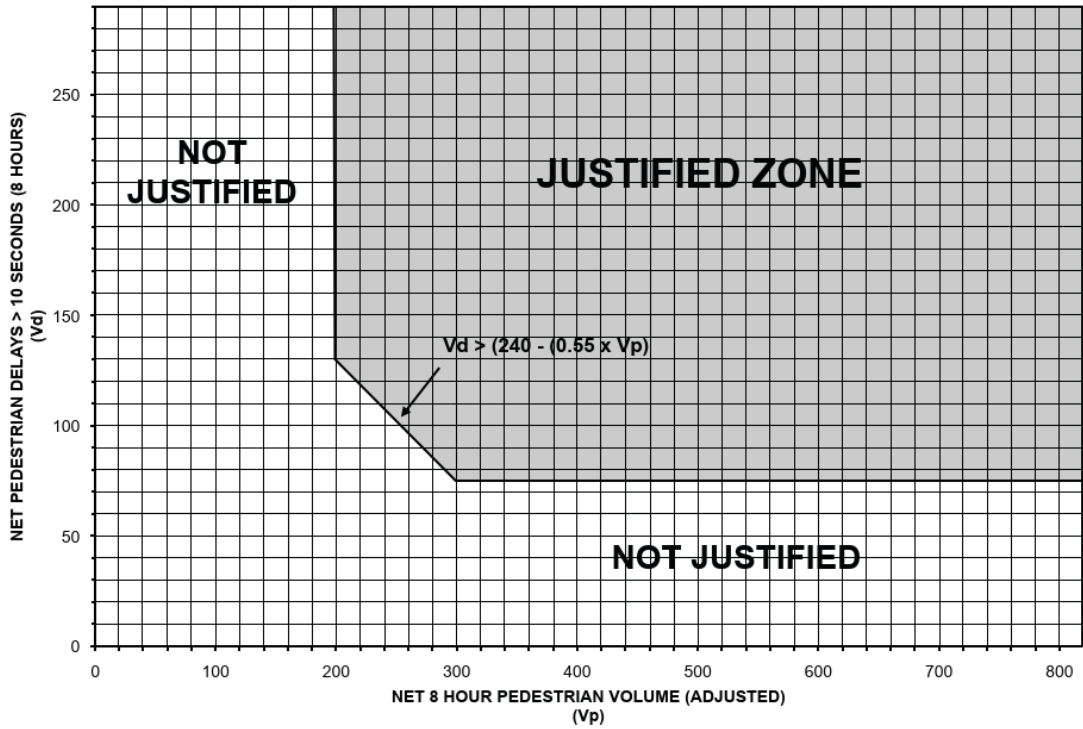


Figure 23 – Justification 6 – Pedestrian Delay

APPENDIX B – Gap Study Summary Field Sheets

GAP SURVEY FORM

Date: Wednesday, January 16, 2019
 Intersection: Pelham St @ Church Hill
 Crossing Width: 8

Direction of Travel: North-South
 Safe Gap: 12
 Weather: Overcast

Time	Gaps When Signal is Green	Time When Signal is Red	Pedestrian #'s	
			Pressed Button	Did Not Press Button
8:00 – 8:05	///,///,///,32,///,///,12,23,///,///,///,14,14,///,///,///,///,22,34,///,///,///,	25,	1,	1,
8:05 – 8:10	18,21,///,///,12,///,23,13,///,///,///,19,///,16,///,///,///,///,///,///,15,///,			
8:10 – 8:15	///,///,20,13,17,///,///,///,///,25,///,12,///,///,///,18,///,///,14,///,///,///,17,17,///,///,			
8:15 – 8:20	///,///,17,///,16,///,17,///,14,17,///,///,///,14,///,///,///,///,15,///,///,13,			
8:20 – 8:25	///,///,///,///,///,///,14,16,///,///,///,///,14,///,///,///,///,///,///,///,///,///,///,			
8:25 – 8:30	///,///,///,///,31,///,///,19,///,///,///,///,///,///,29,14,///,///,///,///,24,	25,	2,	
8:30 – 8:35	///,///,///,///,///,///,///,///,///,///,///,///,///,///,///,///,14,///,///,///,///,///,///,			1,
8:35 – 8:40	///,14,13,///,///,///,12,17,18,///,13,///,18,///,///,///,///,14,///,18,20,///,			1,
8:40 – 8:45	///,///,12,///,///,///,///,24,14,///,///,///,36,///,16,///,///,///,13,///,22,	25,	1,	
8:45 – 8:50	///,///,13,///,///,///,20,///,///,///,///,///,///,///,///,///,///,///,///,25,			1,
8:50 – 8:55	///,17,///,///,16,///,///,///,///,///,///,///,13,///,///,///,///,12,///,///,			
8:55 – 9:00	///,///,///,///,///,13,///,///,12,///,///,14,///,///,///,///,20,///,///,///,15,///,///,			
		Total:	4	4
11:45 - 11:50	///,///,///,///,///,14,23,15,///,///,///,///,///,19,///,///,25,///,///,///,	25,	1,	1,
11:50 - 11:55	///,///,///,///,///,///,17,///,///,///,///,///,16,///,27,			1,
11:55 - 12:00	///,///,21,///,///,///,12,34,///,///,///,///,13,///,///,36,	25,	1,	
12:00 - 12:05	///,16,///,///,17,///,///,///,14,///,///,///,///,16,	25,	1,	
12:05 - 12:10	///,///,///,///,///,17,///,16,///,26,///,19,29,///,///,15,			1,
12:10 - 12:15	///,///,///,///,///,19,///,24,///,///,14,17,23,///,13,12,///,///,///,///,			
12:15 - 12:20	///,///,///,///,14,///,19,12,///,15,15,///,///,15,13,///,///,15,15,///,15,			1,
12:20 - 12:25	14,///,///,///,13,///,///,14,///,///,16,///,///,12,///,18,15,			
12:25 - 12:30	///,///,///,12,///,///,20,///,///,25,28,///,///,///,			1,1,
12:30 - 12:35	///,///,///,///,///,13,///,///,17,///,///,13,///,			1,
12:35 - 12:40	16,///,///,///,22,///,15,14,///,///,23,///,///,///,			
12:40 - 12:45	///,///,///,12,///,39,///,///,35,///,12,15,17,///,///,	25,25,	1,1,	
		Total:	5	7
16:15 - 16:20	///,///,///,///,13,///,14,///,///,///,16,///,///,			1,
16:20 - 16:25	///,///,///,14,///,15,12,///,19,23,///,///,///,			
16:25 - 16:30	///,///,///,21,///,///,///,///,12,			
16:30 - 16:35	///,///,18,///,13,///,///,21,///,27,///,15,			
16:35 - 16:40	///,///,///,15,///,///,13,///,19,14,///,15,///,16,///,///,			1,
16:40 - 16:45	///,///,///,///,///,///,17,///,///,///,17,///,///,///,			1,
16:45 - 16:50	///,///,///,17,///,15,///,13,17,///,///,///,			
16:50 - 16:55	///,13,///,21,///,19,///,14,23,///,13,///,15,			1,
16:55 - 17:00	///,///,16,///,17,///,16,///,17,///,18,///,///,			1,
17:00 - 17:05	///,///,15,13,///,23,///,17,///,14,16,///,26,///,///,			1,
17:05 - 17:10	///,///,12,///,20,///,12,///,///,23,			
17:10 - 17:15	///,12,///,///,32,///,///,///,17,///,///,	25,	1,	
		Total:	1	6

GAP SURVEY FORM

Date: Wednesday, January 16, 2019
 Intersection: Pelham St @ Bacon Ln
 Crossing Width: 10

Direction of Travel: North-South
 Safe Gap: 14
 Weather: Overcast

Time	Gaps When Signal is Green	Time When Signal is Red	Pedestrian #'s	
			Pressed Button	Did Not Press Button
8:00 – 8:05	///,///,30,///,25,22,///,///,///,///,17,///,///,///,18,///,///,			
8:05 – 8:10	25,///,///,20,///,8,///,22,///,///,///,///,16,///,///,///,///,///,///,///,///,			
8:10 – 8:15	///,24,///,20,14,///,///,17,///,15,///,///,///,///,14,///,///,///,///,///,///,			
8:15 – 8:20	///,9,///,///,///,///,///,34,///,19,///,18,///,///,///,///,25,///,///,///,20,16,			
8:20 – 8:25	///,15,///,///,21,///,///,///,///,///,///,25,///,///,///,///,18,///,///,///,///,17,///,///,			
8:25 – 8:30	///,///,///,///,///,///,///,16,///,///,///,52,///,///,///,17,///,///,///,///,16,///,			
8:30 – 8:35	///,15,///,27,///,///,///,///,///,17,///,///,15,///,///,///,///,///,///,///,///,///,			
8:35 – 8:40	///,///,///,///,///,///,///,///,///,///,///,///,14,///,///,///,///,///,///,32,			
8:40 – 8:45	///,///,///,///,///,///,///,///,27,///,///,///,///,///,///,///,16,///,			
8:45 – 8:50	///,///,14,///,///,///,16,14,17,///,///,///,///,7,///,15,///,///,///,///,///,31,			
8:50 – 8:55	///,///,///,///,21,19,///,///,///,///,///,///,///,///,///,///,14,///,///,///,///,///,			
8:55 – 9:00	///,///,29,///,///,///,///,///,20,14,///,///,///,///,16,///,///,///,///,///,///,///,			
		Total:	0	0

13:00 - 13:05	///,///,///,22,///,15,///,16,///,///,20,14,///,///,///,18,15,///,///,///,///,17,///,			1,
13:05 - 13:10	///,///,17,///,///,28,///,29,///,///,///,///,14,///,///,17,///,23,17,///,25,			
13:10 - 13:15	///,///,///,18,///,18,///,23,29,///,14,///,17,///,///,28,///,22,			
13:15 - 13:20	20,///,///,17,///,///,15,///,///,18,///,///,///,///,///,40,///,16,			
13:20 - 13:25	///,14,///,///,///,21,///,///,///,20,///,40,///,///,24,///,///,25,///,			1,1,
13:25 - 13:30	///,41,///,28,///,///,22,///,27,///,///,///,14,///,///,///,			
13:30 - 13:35	///,///,///,///,23,///,17,///,18,21,26,///,22,///,///,17,16,///,///,///,			
13:35 - 13:40	///,16,///,///,///,14,///,///,21,///,///,///,32,///,36,///,///,16,			
13:40 - 13:45	///,///,///,///,///,14,///,///,30,18,///,///,17,///,31,///,18,22,///,///,			
13:45 - 13:50	///,///,///,///,///,///,20,///,///,///,///,///,26,15,///,///,29,///,///,///,			
13:50 - 13:55	///,///,16,17,///,14,19,18,19,///,///,///,///,14,14,///,///,///,///,///,///,			
13:55 - 14:00	///,///,///,///,17,///,///,22,///,17,///,///,///,///,16,19,///,///,15,///,			
		Total:	0	3

16:30 - 16:35	///,///,///,///,///,14,///,///,///,///,///,///,///,///,///,///,14,///,///,///,///,///,			
16:35 - 16:40	///,///,///,///,17,///,///,///,///,17,///,///,///,///,19,///,///,///,///,///,///,			
16:40 - 16:45	///,///,///,///,///,///,///,///,///,///,///,17,15,15,///,///,///,19,///,///,///,			
16:45 - 16:50	///,///,///,///,///,///,32,///,///,///,///,14,///,///,///,///,///,///,///,		1,	
16:50 - 16:55	///,///,///,24,///,///,///,///,16,///,///,///,17,21,///,///,14,16,14,///,29,			
16:55 - 17:00	///,///,///,///,///,///,///,///,26,8,///,///,///,///,///,///,///,///,///,///,			
17:00 - 17:05	///,///,///,///,///,3,///,///,18,///,///,16,///,///,///,///,///,///,///,///,			
17:05 - 17:10	///,///,///,///,///,14,///,///,///,18,///,///,///,20,///,///,17,///,///,			
17:10 - 17:15	///,///,///,17,///,///,19,///,///,///,15,///,///,///,16,///,///,///,20,///,///,			
17:15 - 17:20	///,///,///,///,///,///,25,///,///,///,15,///,///,///,34,///,///,///,			
17:20 - 17:25	///,24,///,///,///,14,///,16,///,///,///,///,///,///,///,27,///,///,///,///,			
17:25 - 17:30	///,///,///,18,///,///,///,14,///,///,///,28,///,///,///,15,///,			
		Total:	1	0