BOSTON REGION METROPOLITAN PLANNING ORGANIZATION

Stephanie Pollack, MassDOT Secretary and CEO and MPO Chair
Karl H. Quackenbush, Executive Director, MPO Staff

TECHNICAL MEMORANDUM

DATE: **August 27, 2018**
TO: **James Kupfer and Donald DiMartino, Town of Bellingham**
FROM: **Seth Asante and Benjamin Erban, MPO Staff**
RE: **Redesign of Hartford Avenue and Maple Street Intersection**

This memorandum summarizes the analyses and improvement strategies for the intersection of Hartford Avenue (Route 126) and Maple Street in Bellingham.

The memorandum contains the following sections:

1. Study Background
2. Existing Facilities and Land Uses
3. Issues and Concerns
4. Existing Traffic Conditions
5. Crash Data Analysis
6. Existing Traffic Operations
7. Improvement Alternatives
8. Conclusions and Next Steps

It also includes technical appendices that contain data and methods applied in the study.

1 STUDY BACKGROUND

The purpose of the Safety and Operations Analyses at Selected Intersections study is to examine safety, operations, and mobility issues at major intersections in the Boston Region Metropolitan Planning Organization (MPO) region's arterial highways—areas where many crashes occur, that experience congestion during peak traffic periods, or are in need of improvements to accommodate heavy vehicles (buses and trucks) or nonnotarized transportation (bicyclists and pedestrians). For the past 10 years, the MPO has conducted these planning studies, which have been well received by the municipalities in the region. These studies give communities an opportunity to look at the needs of the select locations, starting at the conceptual level, before they commit funds for design and engineering. Eventually, if the project qualifies for federal funds, the study's documentation also is useful to the Massachusetts Department of Transportation (MassDOT). These studies support the MPO's visions and goals, which include increasing transportation safety, maintaining the transportation system, advancing mobility, and reducing congestion.

Following a selection process based on safety conditions, congested conditions, multimodal significance, regional significance, regional equity, and implementation potential, the following two locations from a short list of 20 intersections were approved for study by the MPO. [1,2,3,4,5,6,7]

1. Hartford Avenue (Route 126) at Maple Street in Bellingham
2. Main Street (Route 1A) at Arbor Street, Monument Avenue, and Cherry Street in Wenham

The location in Bellingham was selected because the intersection at Hartford Avenue and Maple Street carries a high proportion of truck traffic and is undersized to accommodate large commercial vehicles safely and efficiently. The intersection is just one-half mile south of the interchange of Interstate 495 and Route 126, where a number of large commercial uses exist. In addition, the area along Maple Street is zoned for industrial uses and currently home to several businesses and industrial properties (a power plant, multiple warehouses exceeding 600,000 square feet of space, and large-scale mulch and lumber hauling and production). The Town of Bellingham recognizes the need to upgrade the intersection in order to maintain the industrial uses and unlock future investment potential of the surrounding area, which is projected to grow in the future. Figure 1 shows the location of the intersection and the surrounding roadways.

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[1] Safety Conditions: Location has a higher-than-average crash rate for its functional class, contains a Highway Safety Improvement Program (HSIP)-eligible crash cluster, contains a top-200 high crash location, or has a significant number of pedestrian and bicycle crashes (two or more per mile).

[2] Congested Conditions: Travel time index is at least 1.3.

[3] Multimodal Significance: Location carries bus route(s), is adjacent to a transit stop or station; supports bicycle or pedestrian activities or has an implementation project to support one or more of these activities; has need to accommodate pedestrians and bicyclists and improve transit; or high truck traffic serving regional commerce.

[4] Regional Significance: Location is in National Highway System; carries a significant portion of regional traffic (ADT >20,000); lies within 0.5 miles of Environmental Justice transportation analysis areas or zones; or is essential for the region's economic, cultural, or recreational development.

[5] Regional Equity: That is, it was important not to select 1) more than one location in a subregion and 2) a location in same subregion as in the preceding cycle of this study.

[6] Implementation Potential: Location is proposed or endorsed by its roadway administrative agency (agencies); proposed or endorsed by its subregion and is a priority for that subregion; or has strong support from other stakeholders.

[7] Safety and Operations Analyses at Selected Intersections: Federal Fiscal Year 2018, Technical Memorandum to the Boston Region Metropolitan Planning Organization. Seth Asante and Chen-Yuan Wang, January 18, 2018.

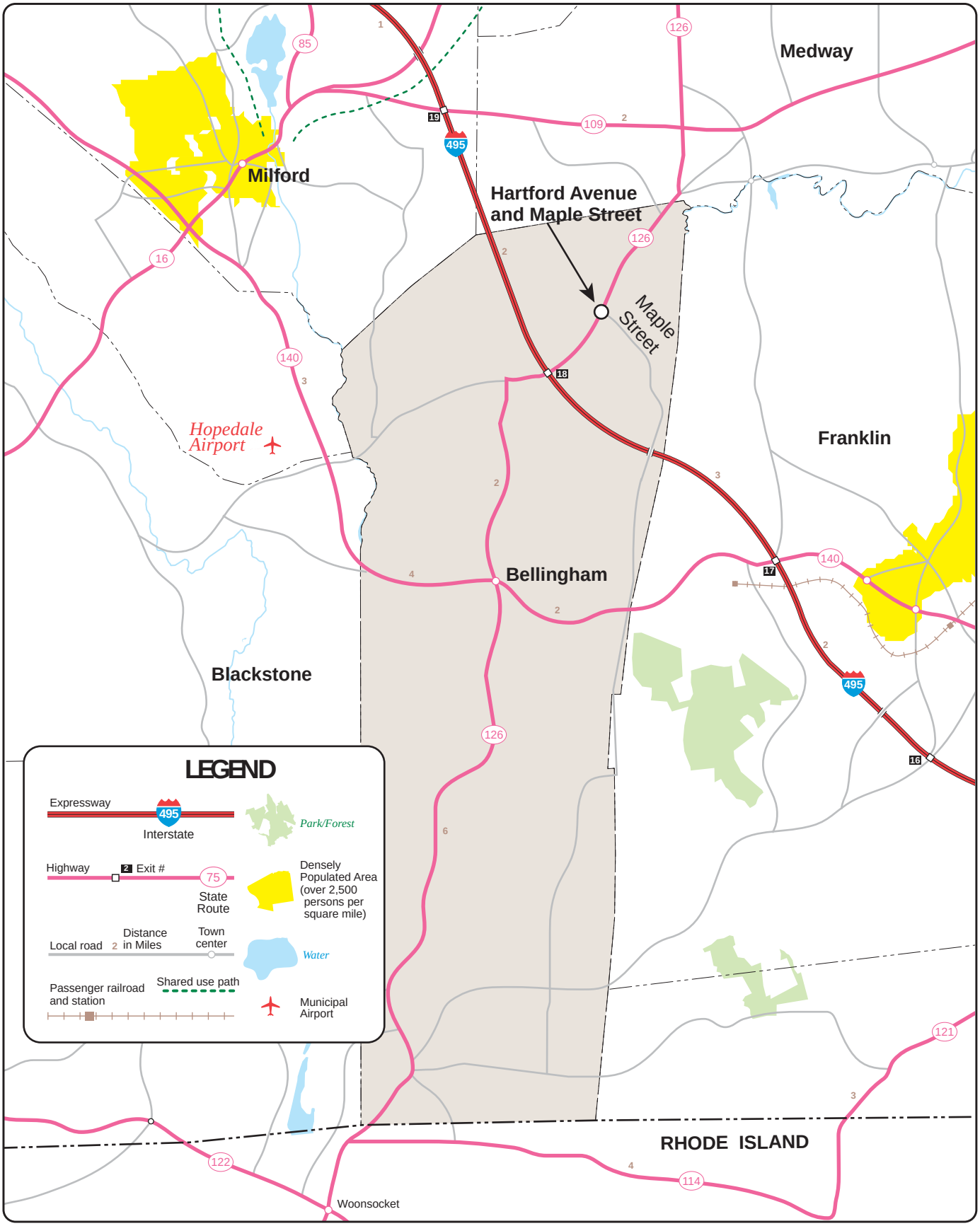

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Figure 1
Regional Map of Study Area

Safety and Operations Analysis at Selected Intersections

1.1 Public Participation

MPO staff discussed the safety and operations issues at the intersection and the scope of work for the study with the Town of Bellingham, which expressed interest and willingness to participate in the study. An advisory task force—composed of representatives from the Town of Bellingham, MassDOT District 3, and MassDOT Office of Transportation Planning (OTP)—was established to guide this study. MPO staff met with the task force twice. The first meeting focused on the work scope and existing problems. In the second meeting, MPO staff presented the existing conditions, analyses, proposed improvements, and received advice from the task force members. This report reflects the task force's feedback. Appendix A includes a list of task force members, information about the selection process, and comments about the study.

2 EXISTING FACILITIES AND LAND USES

2.1 Roadway and Geometry

The study intersection is located in the northeast corner of the Town of Bellingham, approximately one-half mile north of Exit 18 off of I-495. Hartford Avenue (Route 126) intersects with the northern terminus of Maple Street at a traffic signal. Route 126 is classified as a principal arterial (other) and is a town-accepted roadway despite being a numbered route. Both streets are two-lane, two-way roadways. The right-of-way of Hartford Avenue is 60 feet and the right-of-way of Maple Street is about 47 feet. Figure 2 shows the existing intersection geometry.

2.2 Land Uses

The property on the northeast corner of the intersection is owned by the Town of Bellingham and is currently used as an auxiliary garage for the Bellingham Fire Department. The property on the southeast corner of the intersection, 3 Maple Street, is a private residence. On the west side of Hartford Avenue are several small businesses, as well as Stall Brook Elementary School and Bellingham Early Childhood Center. The school has 19 classrooms and serves 325 students. Stall Brook School may be accessed via an unsignalized driveway that enters the study intersection, although traffic counts show that the vast majority of school traffic uses a second unsignalized driveway about 200 feet north of the intersection.

While the properties adjacent to the intersection are mostly residential and commercial, the surrounding area—particularly further down Maple Street—has a significant amount of land zoned industrial. Figure 3 gives a map of the zoning in the vicinity of the intersection and notes several existing or planned industrial businesses.

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Figure 2
Existing Intersection Geometry
Redesign of Hartford Avenue and Maple Street Intersection

Safety and Operations Analysis at Selected Intersections

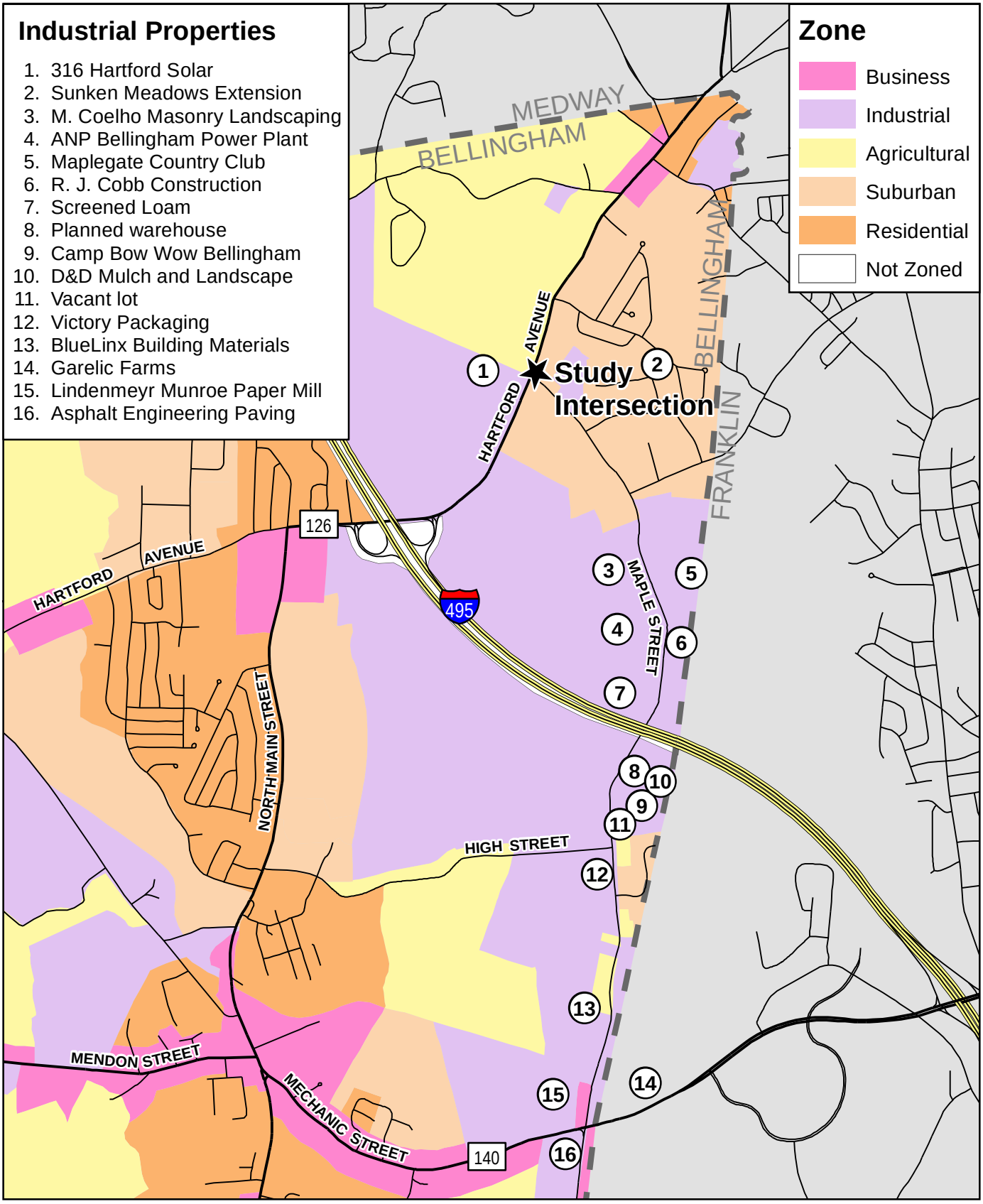

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Figure 3
Zoning and Industrial Properties
Redesign of Hartford Ave. and Maple St. Intersection

Safety and Operations Analysis at Selected Intersections

3 ISSUES AND CONCERNS

The primary issue at this intersection is truck maneuvers to and from Maple Street. Heavy vehicles have difficulty making left and right turns in the intersection. Taking a right from Hartford Avenue northbound onto Maple Street is the shortest route to access Maple Street from I-495, although the turn onto Maple Street is difficult for trucks because of a substandard curb radius. Figure 4 shows the telephone pole on the southeast corner of the intersection, which is frequently damaged by trucks making a right turn onto Maple Street from Route 126 northbound. The left turn out of Maple Street is also difficult, and heavy vehicles leaving Maple Street properties are technically required to head south to Mechanic Street (Route 140) instead of using the Hartford Avenue and Maple Street intersection, which is an inconvenience. Most of the complaints from residents about this intersection relate to the turning of large heavy vehicles.

Figure 4
Telephone Pole in front of 3 Maple Street

Maple Street already sees a high volume of truck traffic as a consequence of the existing industrial properties (shown in Figure 3), and the corridor is primed for further growth in the near future. Many of the industrial-zoned properties along Maple Street are either undeveloped (woodland or swamp) or underdeveloped properties where new businesses have expressed interest. Planned industrial projects include a new 450,000 square foot industrial warehouse currently under construction across the street from Camp Bow Wow, as well as a second warehouse further down the corridor. Additionally, the Maplegate Country Club, which spans the border with Franklin, recently changed ownership and potentially could be redeveloped, freeing up a large area for industrial development.

This area is in high demand because it is one of the few suitable sites for warehouses near I-495. In addition, its location near the Massachusetts border makes it a good stopover point for redistributing loads to meet weight regulations in Connecticut and Rhode Island. Several mulch distributors on Maple Street currently take advantage of this strategic placement.

Addressing issues at the intersection of Hartford Avenue and Maple Street is of particular interest because the intersection is the limiting factor for further development along Maple Street. The Town of Bellingham has previously made several investments in Maple Street. A redesign of the intersection at the other end of Maple Street (with Route 140) is already planned, with design work provided by the traffic consultant BETA Group and funding from both MassWorks grants and a private developer. Bellingham has spent $1.0 million on Maple Street itself to improve drainage, widen shoulders, and repair wear and tear from heavy vehicle traffic. Kleinfelder was the design contractor for this work.

In summary, addressing issues caused by heavy vehicles at the study intersection will improve safety for residents and drivers, improve access and convenience for businesses, and help the town meet its vision of a profitable industrial corridor along Maple Street.

4 EXISTING TRAFFIC CONDITIONS

4.1 Daily Traffic Volumes

MassDOT Highway Division's Traffic Data Collection section conducted automatic traffic recorder (ATR) counts over a two-day period from Monday February 12, 2018, to Wednesday February 14, 2018. The counts continuously collect traffic volumes, speeds, and classifications over the collection period, and are used to determine the average weekday traffic (AWDT) of a roadway. The counts were performed at three locations adjacent to the study intersection; however, a malfunction with the equipment placed on Route 126 north of Maple Street caused these data to be unusable.

Figure 5 presents a summary of ATR traffic data. Route 126 carried 18,200 vehicles per day and Maple Street carried 11,500 vehicles per day. The average speeds of travel in the vicinity of the intersection were 30 miles per hour (mph) on Route 126 and 34 mph on Maple Street. In comparison, the posted speed limits on Route 126 and Maple Street are 35 mph and 30 mph, respectively. The directional split on both roadways was almost equal (50 percent of the daily traffic was recorded in each direction). Full details of the counts can be found in Appendix B.

4.2 Turning Movement Volumes

MassDOT Highway Division's Traffic Data Collection Section also collected turning-movement counts (TMC) in the study area during January 2018, while schools were in session. MassDOT conducted the counts during the weekday AM peak travel period (6:00 AM–9:00 AM) and weekday PM peak travel period (2:00 PM–6:00 PM). The counts were conducted both at the study intersection of Route 126 at Maple Street and at the driveway of Stall Brook School. Heavy vehicles such as school buses, transit buses, and trucks were counted separately. Pedestrian and bicycle counts were conducted simultaneously with the TMCs.

Figure 6 shows the peak-hour turning movement, pedestrian, and bicycle volumes in the study area. The peak hours were 7:00 AM–8:00 AM for the morning peak and 4:30 PM–5:30 PM for the evening peak. There were 19 total pedestrian crossing events observed during the seven-hour observation interval, although only three of those took place during the peak hours. Eight were counted at the beginning of the school day for Stall Brook School (8:30 AM) and five at the end of the school day (2:30 PM). No cyclists were observed.

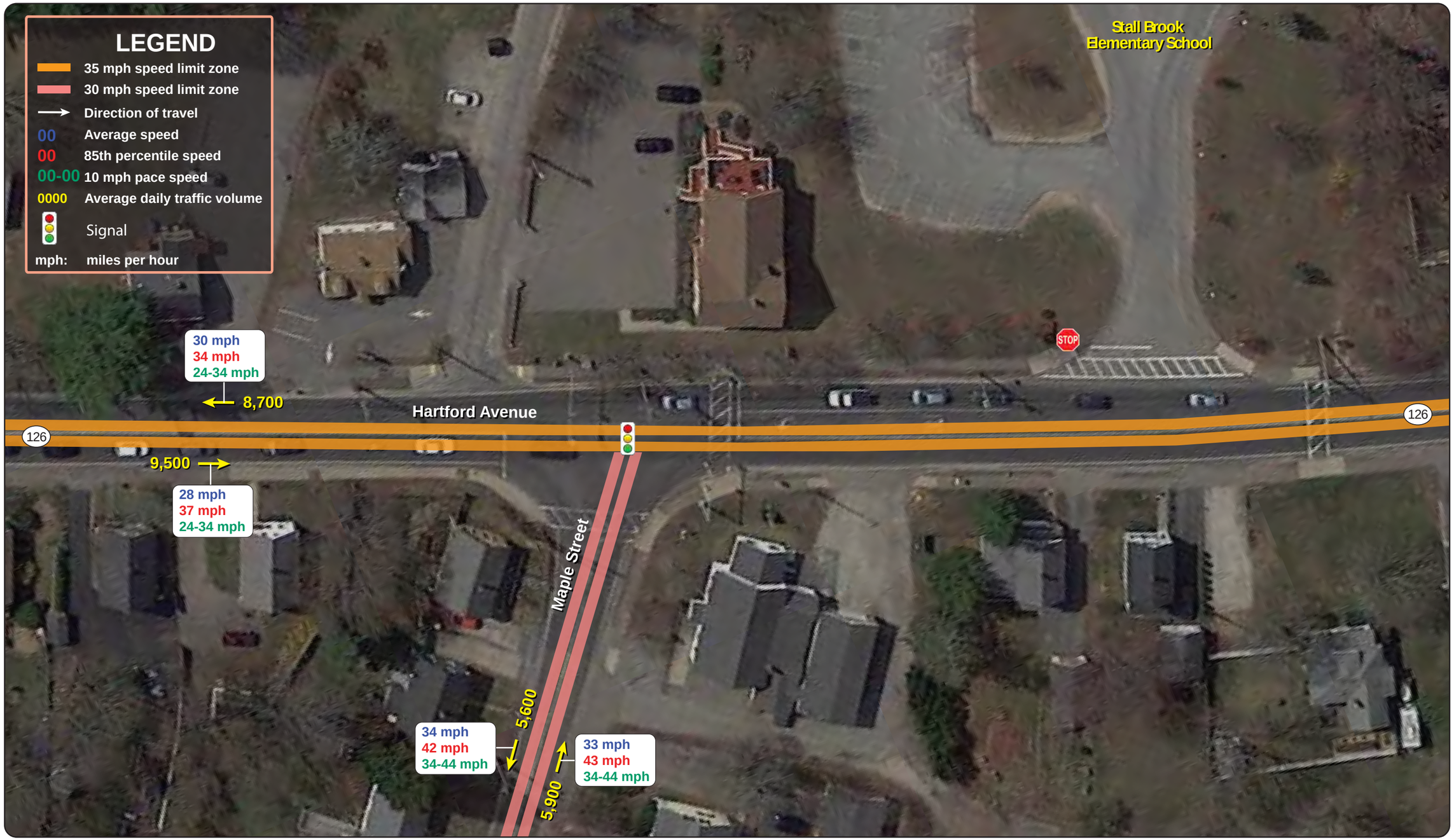

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Figure 5
Average Daily Traffic Volumes, Speed Regulations, and Estimated 85th Percentile Speeds
Redesign of Hartford Avenue and Maple Street Intersection

Safety and Operations Analysis at Selected Intersections

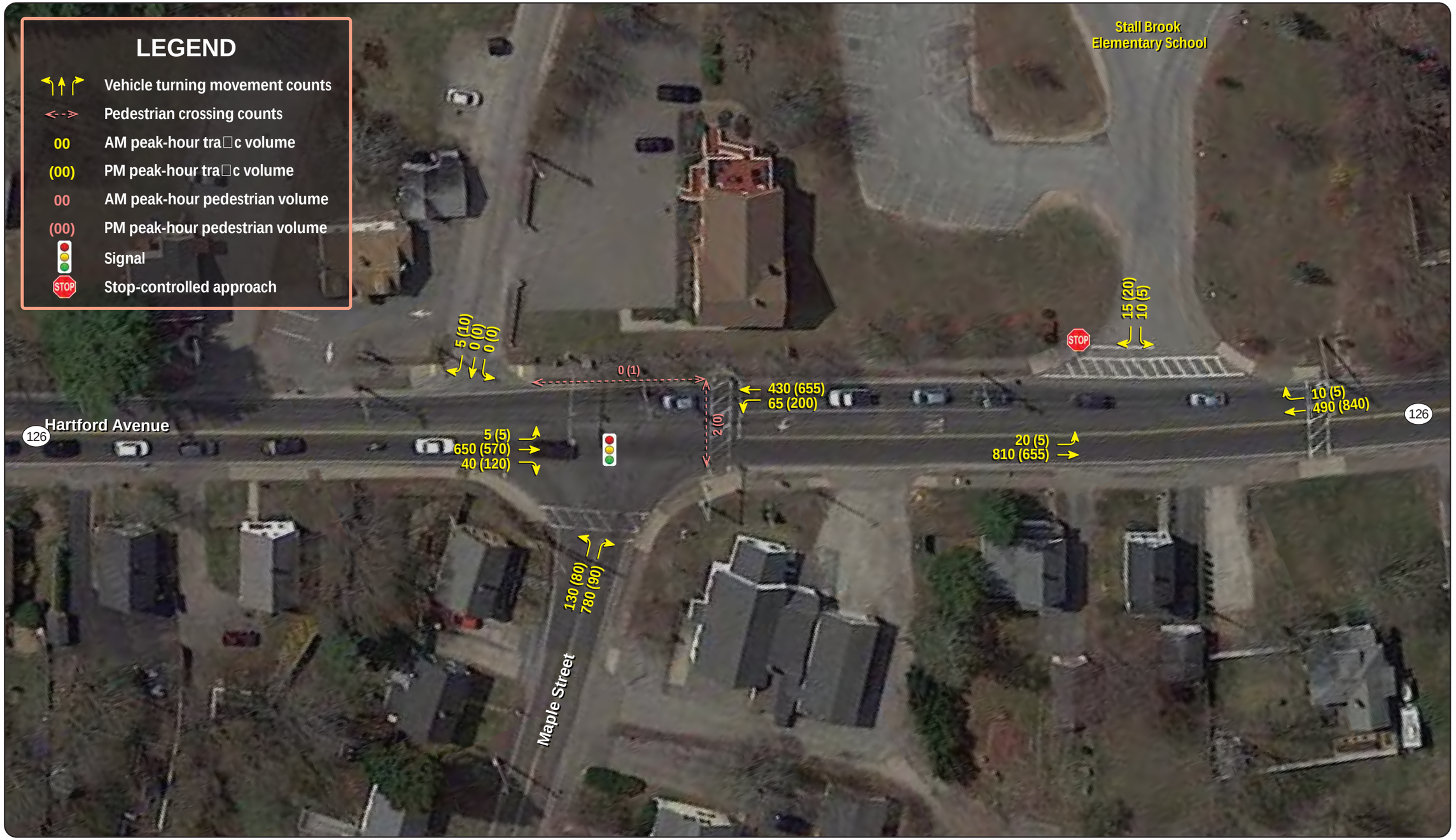

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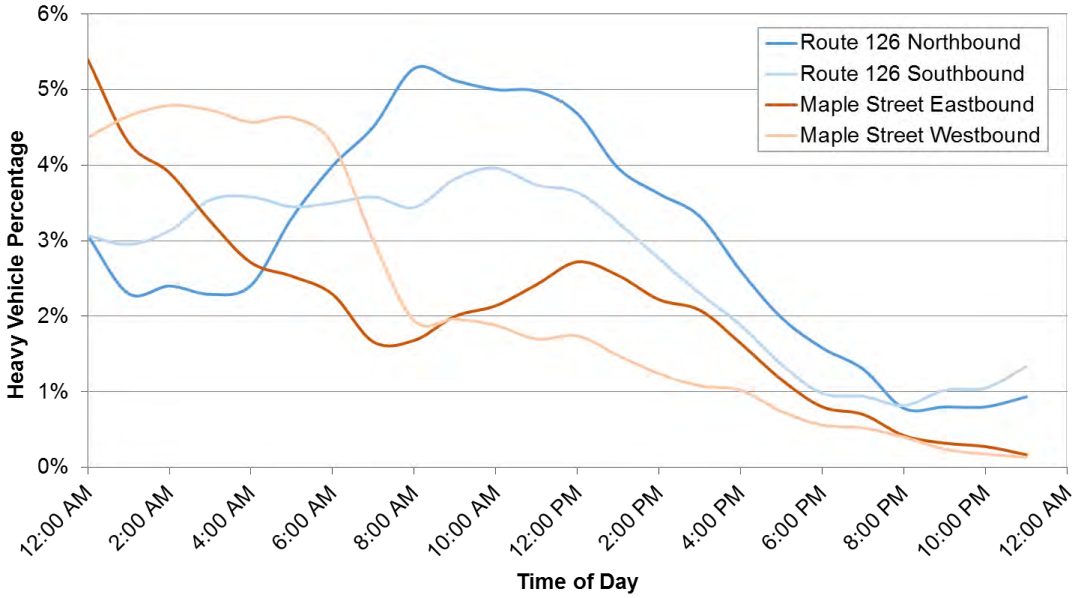
Figure 6
Weekday Peak-Hour Traffic and Pedestrian Volumes
Redesign of Hartford Avenue and Maple Street Intersection

Safety and Operations
Analysis at
Selected Intersections

4.3 Heavy Vehicle Traffic

Because heavy vehicles were important to the project objective, MPO staff also investigated the patterns of heavy vehicle traffic through the study intersection. Figure 7 shows the hourly distribution of heavy vehicle traffic, based on ATR classification data. On Route 126, heavy vehicle traffic averages 4 percent of traffic and is highest during the morning peak period. On Maple Street, heavy vehicle traffic averages 3 percent of traffic and is highest overnight.

Figure 7
Hourly Heavy Vehicle Traffic



Heavy vehicles counted in the TMCs were also compared. Over the course of the seven-hour observation interval, 373 total heavy vehicles were recorded, although 80 percent of those passed north south through the intersection along Route 126 without performing a turning movement to access Maple Street. There were 23 heavy vehicles that entered Maple Street from Route 126 southbound and 11 that entered from Route 126 northbound. The pattern of heavy vehicles leaving Maple Street was almost symmetrical, with 23 turning onto Route 126 northbound and 14 turning onto Route 126 southbound.

The observed heavy vehicle volumes indicate that high numbers of trucks are not the primary issue, but rather safety and driver comfort. However, it is likely that more drivers will choose to use the intersection if it is changed to better accommodate their needs.

5 CRASH DATA ANALYSIS

5.1 Collision Trends

Twenty crashes were recorded by the Bellingham Police Department over the five-year period between 2011 and 2015. Table 1 breaks these crashes down by type of collision, severity, and factors that may have influenced the crash. It also compares the crash rate (crashes per million entering vehicles) with the District 3 average for signalized intersections. The crash rate calculations are in Appendix C.

Table 1
2011–15 Crash Summary and Crash Rates

Crash Variable	Number of Crashes
Crash Severity	**–**
Non-fatal injury	3
Property damage only	17
Manner of Collision	**–**
Angle	2
Head-on	1
Rear-end	16
Sideswipe, opposite direction	0
Sideswipe, same direction	0
Single vehicle crash	0
Unknown	1
Road Surface Conditions	**–**
Dry	12
Snow/ice	1
Wet	7
Ambient Light Conditions	**–**
Dark–lighted roadway	5
Daylight	14
Dusk	1
Other	0
Weather Conditions	**–**
Clear	12
Cloudy	2
Rain	5
Snow	1
Bicyclists and Pedestrians Involved	**–**
Bicyclist	0
Pedestrian	0
Time Period	**–**
Peak period	14
Off-peak period	6
Total Crashes	**20**
Five-year average (rounded)	**4**
Crash rate (calculated)	0.61
Crash rate (MassDOT District 3)	0.89

Some highlights of the data include:

- 7 crashes (35 percent) occurred on wet roadways
- 16 crashes (80 percent) were rear-end collisions
- There were no fatal crashes, and only 3 crashes (15 percent) resulted in injury
- There were no crashes involving pedestrians or cyclists

5.2 Collision Diagram

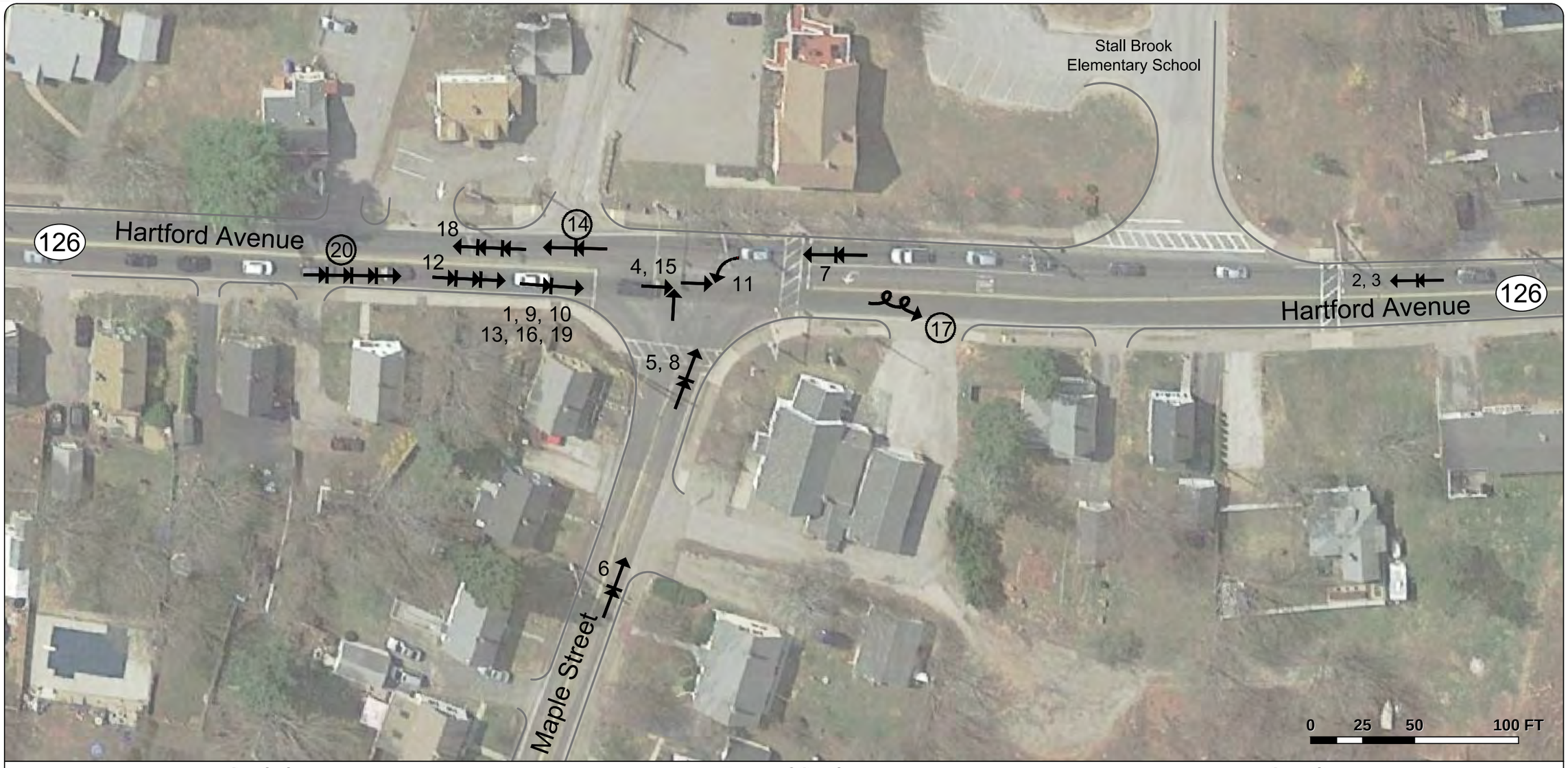
MPO staff also prepared a collision diagram for the study intersection to examine crash patterns. Police reports from the Bellingham Police Department were obtained for the years 2011–15. Figure 8 shows the collision diagram. The index numbers in the collision diagram may be used to cross-reference the crash records in Appendix C. The index numbers with circles around them refer to injury or fatal crashes, depending on the thickness of the circle line.

5.3 Safety Analysis

After analyzing the collision data, MPO staff concluded from the following information that safety was not the primary issue at the study intersection.

- The crash rate at the intersection was 0.61 crashes per million entering vehicles, which was lower than the 2016 MassDOT District 3 average for signalized intersections.
- Apart from the high proportion of crashes occurring in wet conditions, there were no notable trends revealed by the collision diagram, crash statistics, or police narratives. The majority of collisions were rear-ends caused by driver inattention.
- The injury rate was low, and there were no crashes involving pedestrians or cyclists.
- The intersection is not a cluster on the Statewide Top-200 Intersection Crash List for either 2012–14 or 2013–15, making it ineligible to receive funding through MassDOT's Highway Safety Improvement Program (HSIP).

The design alternatives presented in this study will nonetheless seek to improve driver and pedestrian safety where possible by bringing the intersection up to MassDOT design standards.



Symbols

- Moving vehicle
- Backing vehicle
- Noninvolved vehicle
- Pedestrian
- Parked vehicle
- Fixed object
- Bicycle
- Animal

Types of Crash

- Head on
- Angle
- Rear end
- Sideswipe
- Out of control

Severity

- Injury accident
- Fatal accident

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Figure 8
Collision Diagram: MassDOT Crash Data 2011–15
Redesign of Hartford Avenue and Maple Street Intersection

Safety and Operations Analysis at Selected Intersections

6 EXISTING TRAFFIC OPERATIONS

Using the data and information collected, MPO staff built a traffic analysis network (with Synchro)[8] for the AM and PM peak periods to assess the capacity and quality of traffic flow at the intersections. Staff conducted the analyses consistent with Highway Capacity Manual (HCM) methodologies.[9] The HCM methodology demonstrates the driving conditions at signalized and unsignalized intersections in terms of levels of service (LOS) ratings A through F. LOS A represents the best operating conditions (little to no delay), while LOS F represents the worst operating conditions (very long delay). LOS E represents operating conditions at capacity (limit of acceptable delay). Table 2 shows the control delays associated with each LOS for signalized and unsignalized intersections.

Table 2
Levels of Service and Control Delays at Intersections

Level of Service	Signalized Intersections Control Delay (seconds per vehicle)	Unsignalized Intersections Control Delay (seconds per vehicle)
A	≤ 10	≤ 10
B	> 10–20	> 10–15
C	> 20–35	> 15–25
D	> 35–55	> 25–35
E	> 55–80	> 35–50
F	> 80	> 50

Table 3
Levels of Service of Existing Conditions

Alternative/ Approach	Move-ment	AM LOS	AM Delay[a]	AM Queue[b]	PM LOS	PM Delay	PM Queue
Route 126 Northbound	LTR	C	25.6	430	C	31.2	#606
Route 126 Southbound	L	A	6.0	20	B	16.1	99
Route 126 Southbound	TR	A	7.1	123	A	8.2	238
Maple Street	LTR	E	59.5	#349	D	45.2	#191
Intersection Average	**All**	**C**	**26.4**	**–**	**C**	**22.1**	**–**

L = left turn. LOS = levels of service. R = right turn. T = straight through.
[a] Delay in seconds per vehicle.
[b] 95th percentile queue length in feet.
Notes:
= the 95th percentile volume exceeds capacity.
Source: Central Transportation Planning Staff.

Table 3 presents peak-hour performance in terms of LOS, delay, and queues for existing conditions. The intersection operates near the top of LOS C conditions

[8] Trafficware Inc., Synchro Studio 9, Synchro plus SimTraffic, Build 914, Sugar Land, Texas.
[9] Highway Capacity Manual, HCM 2010, Volume 3: Interrupted Flow, Transportation Research Board of the National Academies, Washington DC, December 2010.

during both peak hours, which indicates satisfactory levels of delay. More detail on the analyses can be found in Appendix D.

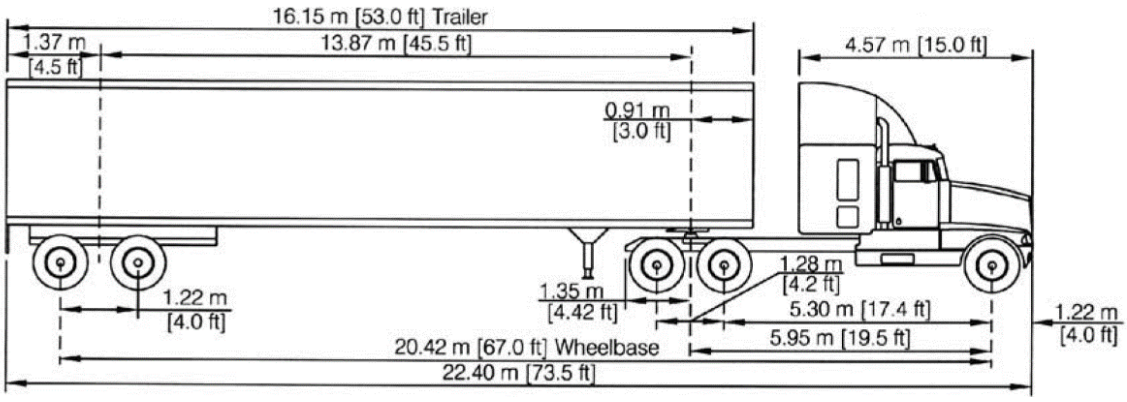
7 IMPROVEMENT ALTERNATIVES

MPO staff developed and analyzed three alternatives to address issues at the study intersection. Because the primary issue identified by the study was the inability of trucks to perform turning movements safely in the intersection, MPO staff designed each alternative with a modified intersection geometry that would accommodate all truck turning movements.

Design Method

The required intersection dimensions and curb radii were calculated based on AutoTURN truck swept path simulations conducted by MassDOT for the purposes of this study.[10] An interstate semitrailer WB-20 (also known as WB-65 or WB-67) was used as the design vehicle in those simulations (Figure 9).

Figure 9
Dimensions of WB-20 Design Vehicle



MPO staff did not have direct access to the AutoTURN software so the proposals were based on a set of potential truck paths. Using an iterative approach where the simulation is run multiple times as different geometries are tested would yield more precise (and also more conservative, that is, less land taking) designs. This process can be undertaken later in the design phase.

Space Requirements

As shown by the property lines in Figure 10, the right-of-way at the intersection extends only to the back of the sidewalk. Almost any effort to accommodate larger turning radii will therefore require either removing the sidewalk or

[10] Transoft Solutions, AutoTURN Swept Path Analysis Software, Version 10.2. Richmond, British Columbia.

expanding the right-of-way through land takings. Fortunately, the property at the north corner of Maple Street (2 Maple Street) is used as an auxiliary garage for the fire department and is already owned by the Town. The structures are more than 20 feet from the back of sidewalk, allowing a portion of this property to be used for expansion of the right-of-way. The property at the south corner of Maple Street (3 Maple Street) contains a private residence that is built very close to the existing back of sidewalk. However, the Town believes the property could be acquired and has expressed willingness to include this acquisition in design proposals.

7.1 Alternative 1: Increase Curb Radius, Shift Stop Lines Back

Alternative 1, shown in Figure 10, accommodates truck-turning movements with a combination of wider curb radii and shifted stop lines. Route 126 and Maple Street are maintained on their original alignments.

Figure 11 and Figure 12 show how Alternative 1 accommodates the turning movements of a WB-20 semitrailer. Because the rear wheels of the truck lie so far behind the pivot point at the back of the cab (45.5 feet for a WB-20), the end of the trailer will tend to cut across the inside of any turn these trucks make. During right turns the rear wheels may ride up on the sidewalk and endanger pedestrians if the curb radius is too tight. In Alternative 1 the curb radius on the northern corner of Maple Street is increased to about 77 feet to accommodate trucks turning right from Maple Street onto Route 126 northbound, and the curb radius on the southern corner of Maple Street is increased to about 46 feet to accommodate trucks turning right from 126 northbound onto Maple Street. In both cases the curb would be moved back up to eight feet, and because the existing right-of-way extends only to the back of the sidewalk, roughly 830 ft^2 of land takings would be required to maintain the six-foot sidewalk present in these locations.

On the other hand, during left turns, the rear wheels of a truck drift into the middle of the roadway. This may bring them into conflict with vehicles waiting at the opposite approach and can endanger those drivers. To address this, the stop lines on the westbound and northbound approaches in Alternative 1 are moved away from the intersection to give the rear wheels on the truck enough space to return to the lane of travel. The stop line on Route 126 northbound is moved back about 35 feet to bring it out of the path of trucks turning left from Maple Street onto Route 126 southbound, and the stop line on Maple Street westbound is moved back about 25 feet to bring it out of the path of trucks turning left from Route 126 southbound onto Maple Street. Because there are no left turns onto Route 126 northbound, the stop line on the southbound approach is not in conflict and is kept in its original position.

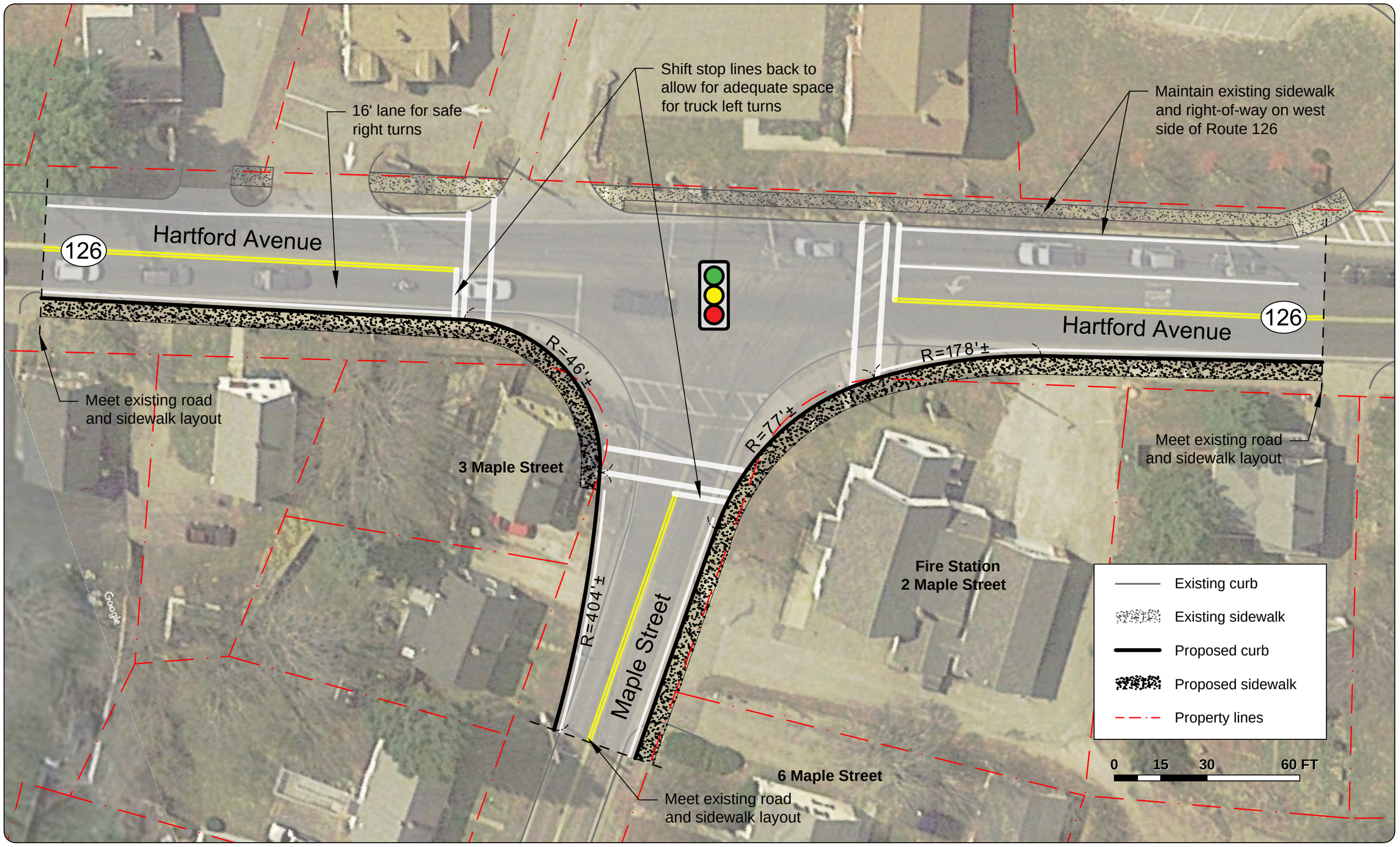


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Figure 10
Alternative 1: Proposed Geometry
Redesign of Hartford Avenue and Maple Street Intersection

Safety and Operations Analysis at Selected Intersections

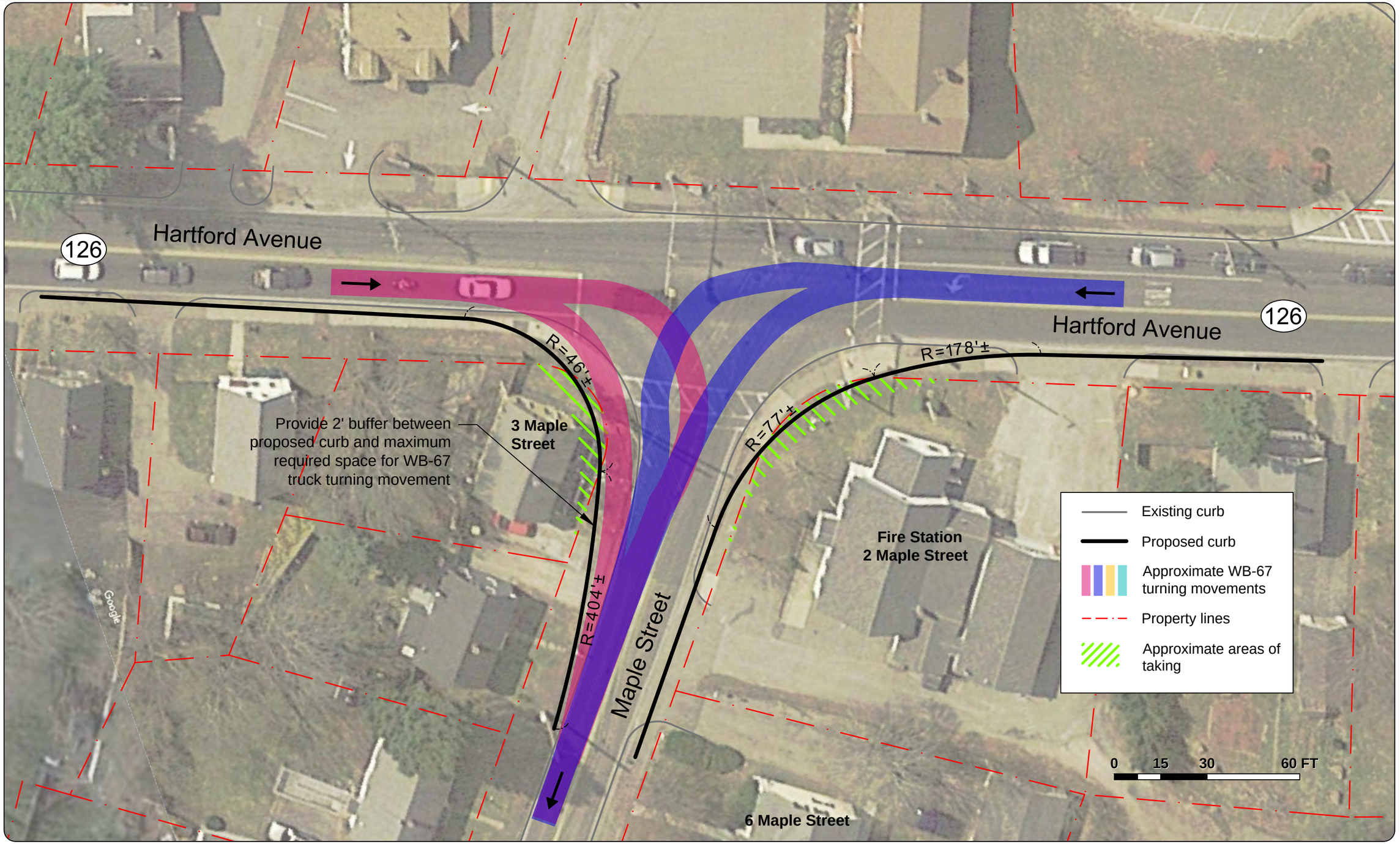

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Figure 11
Alternative 1: Truck Paths Turning Onto Maple Street
Redesign of Hartford Avenue and Maple Street Intersection

Safety and Operations Analysis at Selected Intersections

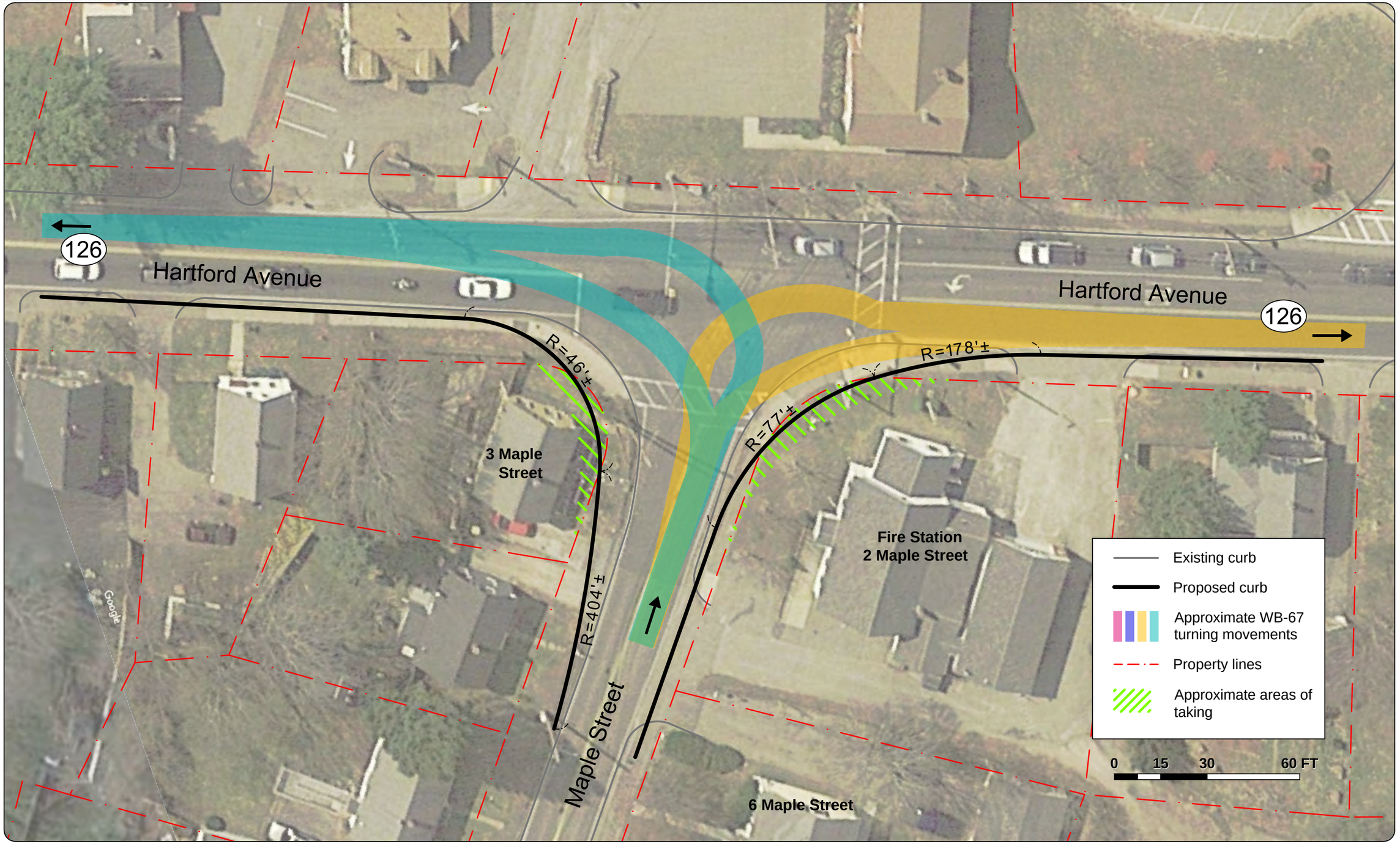

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Figure 12
Alternative 1: Truck Paths Turning From Maple Street
Redesign of Hartford Avenue and Maple Street Intersection

Safety and Operations Analysis at Selected Intersections

In addition to the geometric modifications already mentioned, Alternative 1 would include the following improvements:

- A third crosswalk added on the northbound approach crossing Route 126
- Pushbutton pedestrian signals
- Updated signal equipment and clearance times to meet MassDOT standards
- Emergency preemption system and better vehicle detection system
- Additional signal heads for improved visibility on the Maple Street approach

MPO staff estimate the cost of Alternative 1 at between $1 million and $1.5 million. This includes design and construction but excludes potential right-of-way acquisition.

7.2 Alternative 2: Shift Alignments on Route 126 and Signalize Driveway on the West Side of the Intersection

In Alternative 1, the stop lines must be shifted back a significant distance. This has the effect of making the intersection much larger and forces pedestrians to travel further out of their way to reach the crosswalk. Alternative 2, shown in Figure 13, aims to keep the stop lines closer to their original positions. To accomplish this, the Maple Street approach is widened slightly and the Route 126 alignment is shifted eight to 10 feet west. This helps create a more perpendicular approach from Maple Street to avoid forcing vehicles to make a difficult oblique angle turn as they are currently required to do. The degree to which Maple Street can be realigned is limited by the residential property to the east of the garage (6 Maple Street), which is only 100 feet from the intersection and extends to the back of the sidewalk. The stop line on the northbound approach must still be shifted back slightly for left turns from Maple Street and to accommodate the crosswalk. The trajectories of eastbound and westbound truck traffic can be seen in Figure 14 and Figure 15.

Another feature of Alternative 2 is that the driveway on the eastbound leg of the intersection is shifted 40 to 60 feet north and added to the intersection as a signalized approach. This helps to improve safety and reduce the confusion that results from having an unsignalized driveway entering almost directly into the intersection. Aligning this approach also provides some extra maneuvering room for turning heavy vehicles.

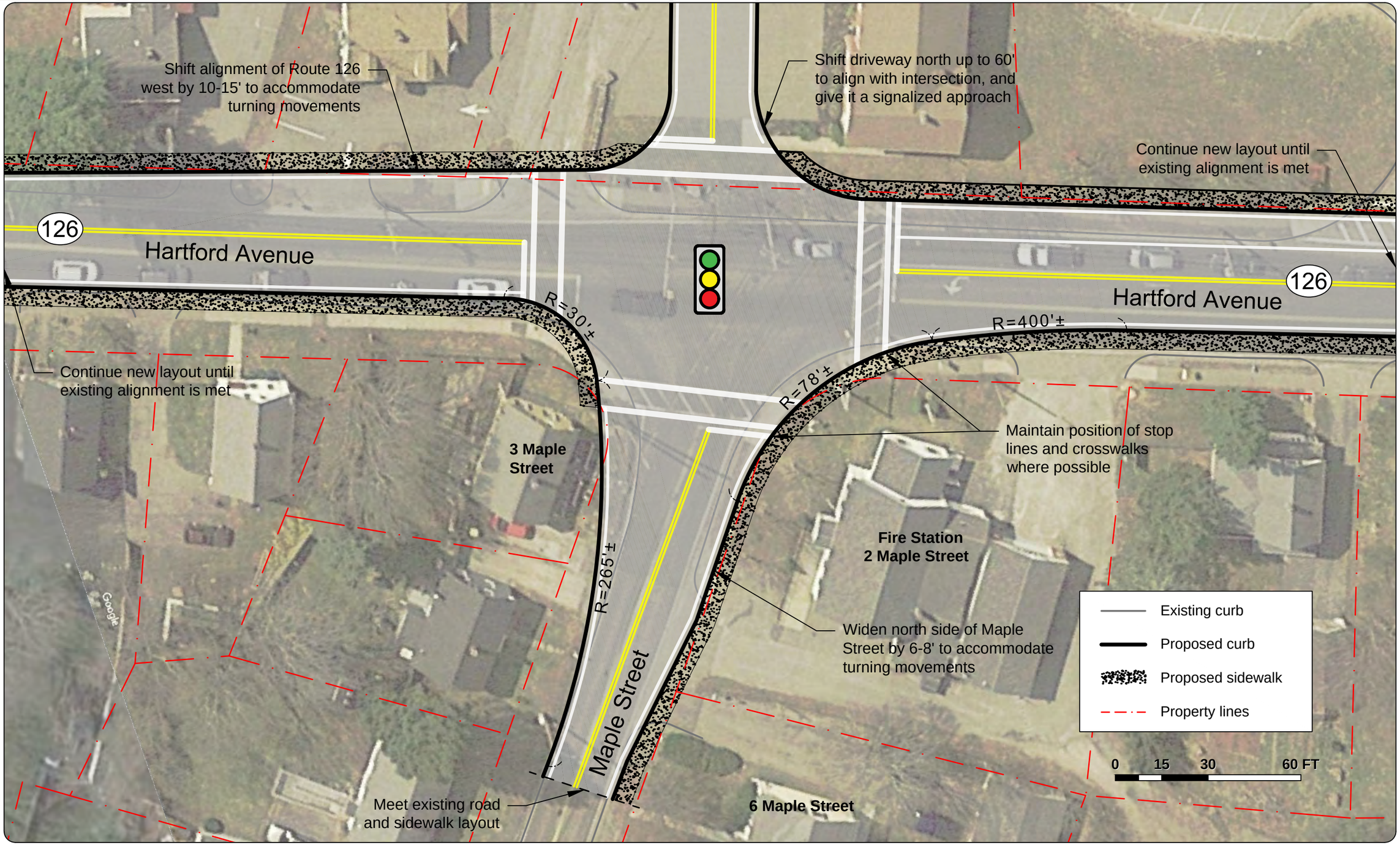

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Figure 13
Alternative 2: Proposed Geometry
Redesign of Hartford Avenue and Maple Street Intersection

Safety and Operations Analysis at Selected Intersections

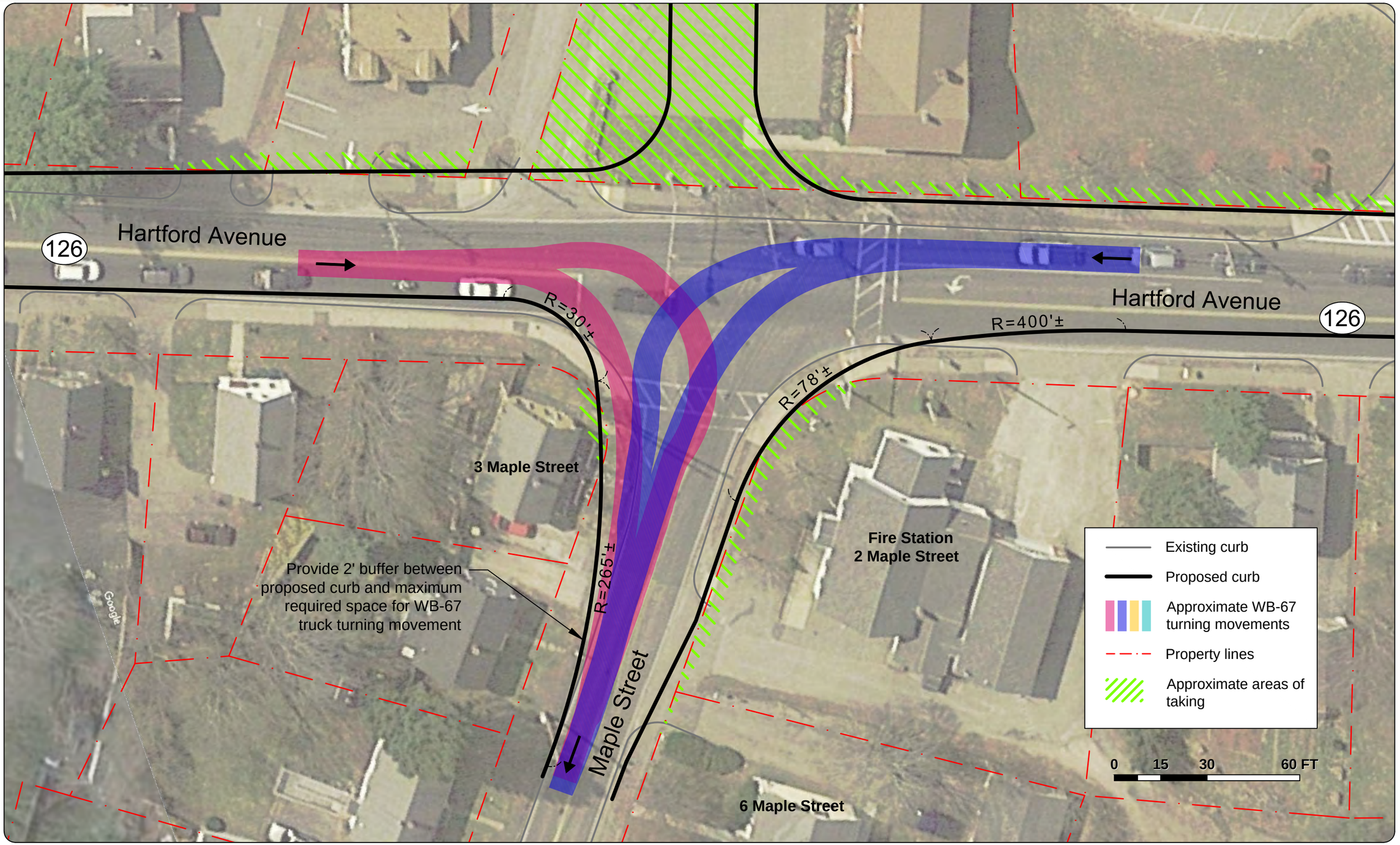

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Figure 14
Alternative 2: Truck Paths Turning Onto Maple Street
Redesign of Hartford Avenue and Maple Street Intersection

Safety and Operations Analysis at Selected Intersections

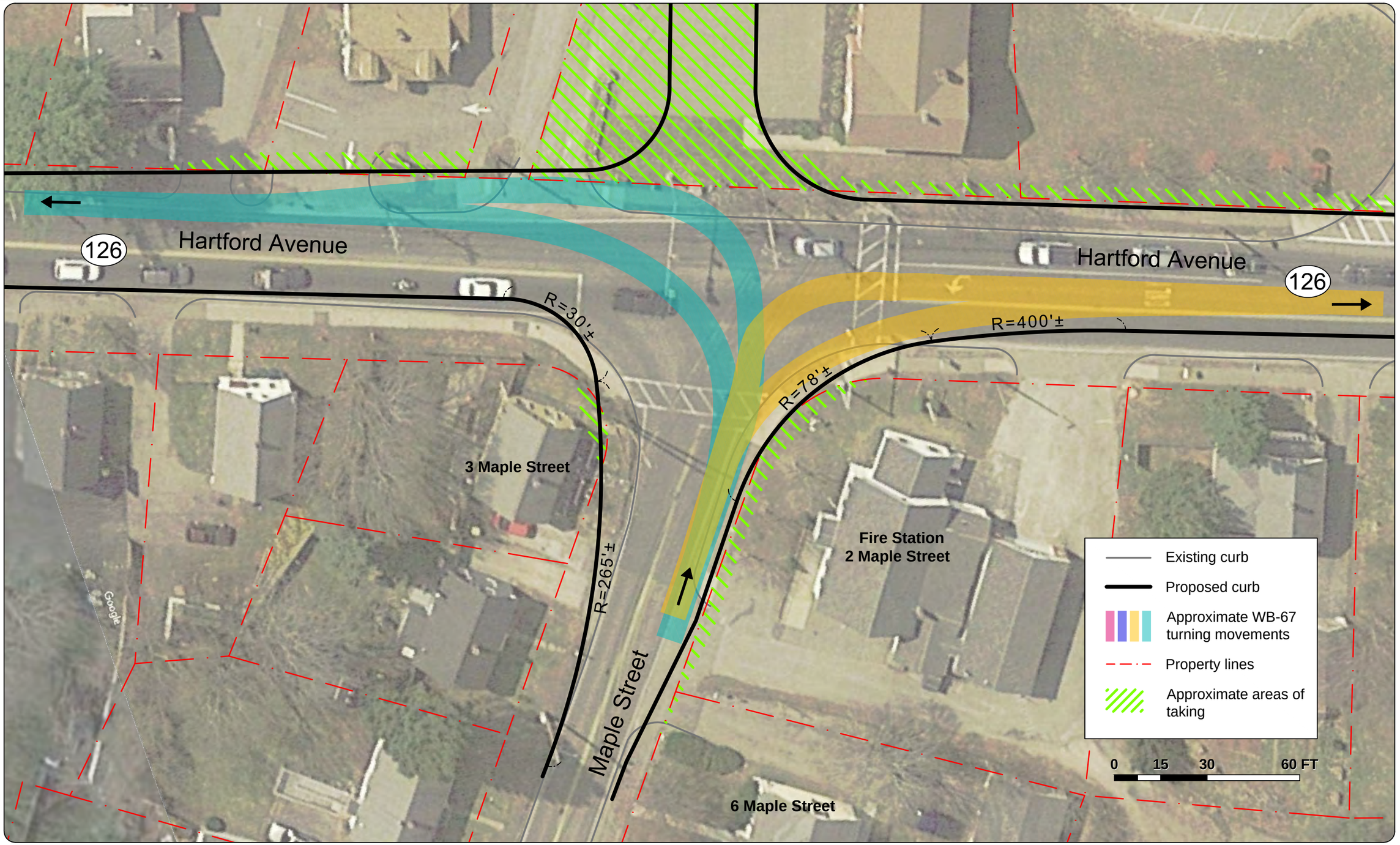

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Figure 15
Alternative 2: Truck Paths Turning From Maple Street
Redesign of Hartford Avenue and Maple Street Intersection

Safety and Operations Analysis at Selected Intersections

Alternative 2 requires more right-of-way acquisition than Alternative 1. However, because the building corner of 3 Maple Street is so close to the existing right-of-way, it would be expected that the property would have to be acquired as part of either alternative. If that is the case then it would make sense to use as much of that property as necessary.

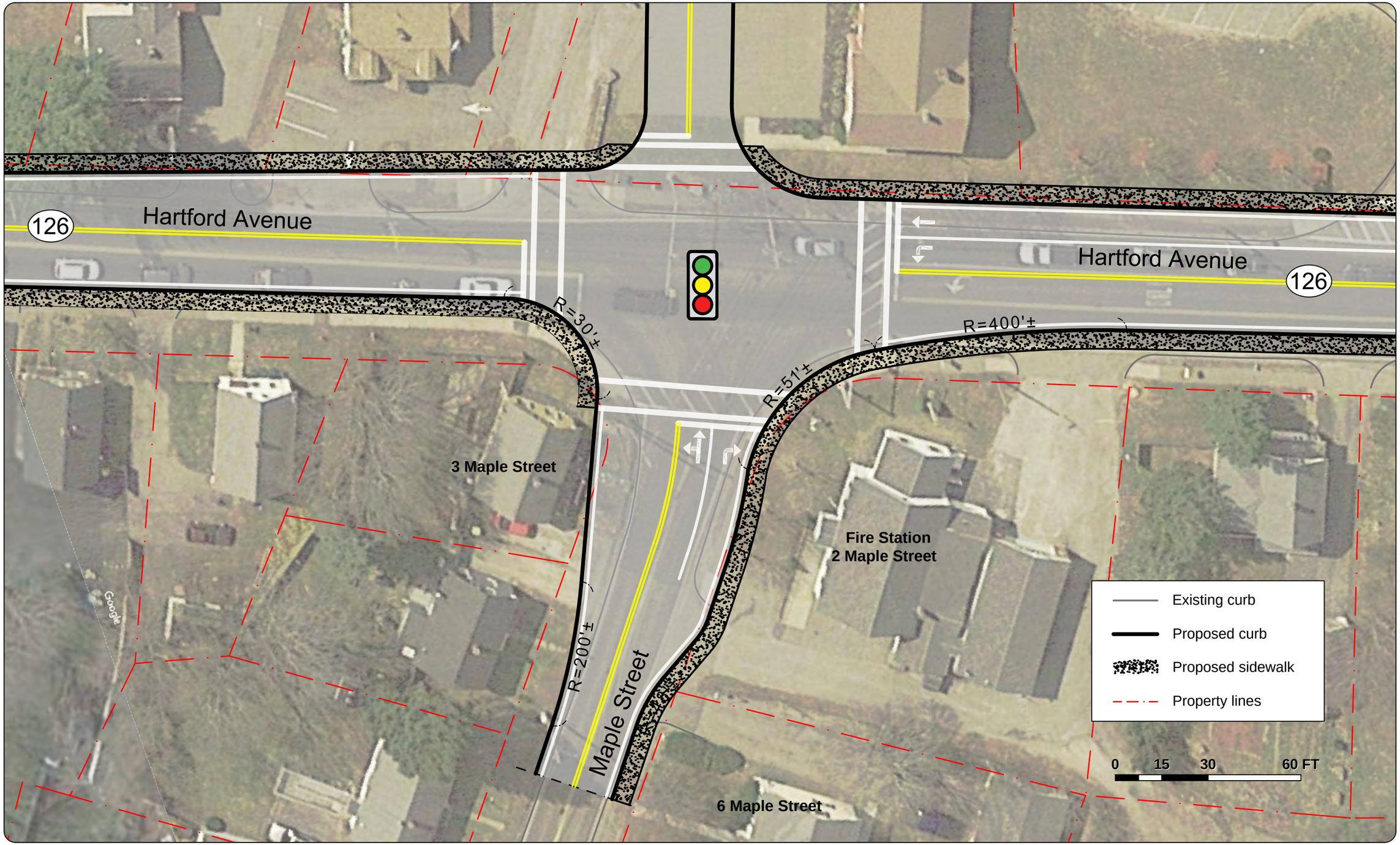
As drawn, Alternative 2 also calls for some takings on the west side of Route 126, both to shift the alignment of Hartford Avenue west and to shift the eastbound driveway north. The Town believed that takings from this property (324 Hartford Avenue) might also be acquired at a reasonable price and wanted to consider it among the design options at the intersection. The amount of takings, if any, on that side of the intersection could be decided later during the design process.

Alternative 2 also includes the same pedestrian improvements and signal standardizations discussed in Alternative 1. MPO staff estimate the design and construction cost of Alternative 2 to be between $1.5 million and $2 million.

7.3 Alternative 3: Add Turn Bay on Maple Street Approach

Alternative 3, shown in Figure 16, incorporates some of the suggestions from the Town of Bellingham into the original Alternative 2 design. Although the 2025 level of service is acceptable, the anticipated commercial and industrial growth on Maple Street has the potential to sustain traffic growth well beyond that threshold. Alternative 3 adds a right-turn bay from the Maple Street approach to increase the overall capacity of the intersection with the goal of extending the functional life of the design proposal. Like Alternative 2, this design also assumes that properties adjacent to Maple Street will have to be purchased and seeks to fully use this extra real estate. The estimated cost for Alternative 3 would be similar to the $1.5 million to $2 million range of Alternative 2.

Because it was added at a later stage in the project, MPO staff did not have the opportunity to test Alternative 3 with AutoTURN simulations. The geometry in Figure 16 gives a conceptual design only.



BOSTON
REGION
MPO

Figure 16
Alternative 3: Proposed Geometry
Redesign of Hartford Avenue and Maple Street Intersection

Safety and Operations
Analysis at
Selected Intersections

7.4 Level of Service of Proposed Alternatives

Table 4 summarizes the level of service analysis for the proposed alternatives. The 2025 future conditions project a uniform 5 percent traffic increase in the study area. More detail on the analyses can be found in Appendix D.

Table 4
Levels of Service of Proposed Alternatives

Alternative/ Approach	Move-ment	AM LOS	AM Delay[a]	AM Queue[b]	PM LOS	PM Delay	PM Queue
2025 No-Build	**–**	**–**	**–**	**–**	**–**	**–**	**–**
Route 126 Northbound	LTR	D	38.4	#642	C	34.5	#653
Route 126 Southbound	L	A	9.5	29	C	21.3	123
Route 126 Southbound	TR	A	9.4	176	A	8.4	259
Maple Street	LT	E	55.4	#347	D	49.5	#205
Maple Street	R	E	55.4	#347	D	49.5	#205
Intersection Average	**All**	**C**	**32.4**	**–**	**C**	**24.5**	**–**
Alternative 1	**–**	**–**	**–**	**–**	**–**	**–**	**–**
Route 126 Northbound	LTR	D	40.7	#648	D	35.5	#659
Route 126 Southbound	L	A	9.5	29	C	20.1	118
Route 126 Southbound	TR	A	9.4	176	A	8.4	259
Maple Street	LT	E	55.4	#347	D	49.9	#205
Maple Street	R	E	55.4	#347	D	49.9	#205
Intersection Average	**All**	**C**	**33.4**	**–**	**C**	**24.8**	**–**
Alternative 2	**–**	**–**	**–**	**–**	**–**	**–**	**–**
Route 126 Northbound	LTR	D	53.9	#719	C	33.2	#626
Route 126 Southbound	L	A	9.1	34	A	8.1	59
Route 126 Southbound	TR	B	11.4	210	A	8.8	261
Maple Street	LT	E	56.7	#358	E	56.4	#217
Maple Street	R	E	56.7	#358	E	56.4	#217
Driveway	LTR	C	23.0	10	C	30.2	21
Intersection Average	**All**	**D**	**40.4**	**–**	**C**	**23.3**	**–**
Alternative 3	**–**	**–**	**–**	**–**	**–**	**–**	**–**
Route 126 Northbound	LTR	C	26.3	511	B	20.0	433
Route 126 Southbound	L	A	5.2	23	A	6.3	49
Route 126 Southbound	TR	A	6.8	144	A	6.2	219
Maple Street	LT	D	42.7	#159	D	40.3	99
Maple Street	R	D	47.2	#222	D	39.6	108
Driveway	LTR	C	30.4	12	C	32.1	22
Intersection Average	**All**	**C**	**23.8**	**–**	**B**	**15.2**	**–**

L = left turn. LOS = levels of service. R = right turn. T = straight through.
[a] Delay in seconds per vehicle.
[b] 95th percentile queue length in feet.
Notes:
= the 95th percentile volume exceeds capacity.
Source: Central Transportation Planning Staff.

The proposed modifications are mostly geometric; only adding a turn lane in Alternative 3 and signalizing the driveway in Alternatives 2 and 3 significantly influenced level of service. Shifting stop lines back in Alternative 1 required an extra one-half second of all-red time on the northbound approach to clear the intersection, but this change had negligible effects on capacity.

The unsignalized intersection at the Stall Brook School driveway was also included in the analysis, although it did not have operational issues under any scenario. Those results can also be found in Appendix D.

8 CONCLUSIONS AND NEXT STEPS

8.1 Conclusions

The above analyses and evaluation supports the need for renovations that would improve access for heavy vehicles and enhance safety for pedestrians and motorists.

All of the proposed alternatives address the issue of truck maneuvers. The scale of the changes varies, however, with Alternative 1 providing the lowest cost option and Alternative 3 providing the most comprehensive solution.

- Alternative 1 minimizes construction and takings by only proposing modifications to the east side of Route 126
- Alternative 2 improves safety and pedestrian comfort by keeping the intersection geometry tighter
- Alternative 3 adds a turn bay to preemptively address operational issues that might be caused by future traffic growth

Deciding between the three alternatives hinges upon:

- Available budget and funding sources
- Ability to acquire the property at 3 Maple Street and/or 334 Hartford Avenue
- Refined projections for growth and land use in the region
- On-ground survey to determine the feasibility of each option
- Feedback from stakeholders

If found to be suitable after considering the factors listed above, MPO staff recommends Alternative 3 because it represents the most complete solution to the issues encountered at the study intersection.

8.2 Next Steps

The Town of Bellingham has jurisdiction of the intersection and is responsible for renovations to improve safety, mobility, connectivity, and operations. This study gives the city an opportunity to review the needs of the intersection and plan for design and engineering. The next step would be to select the preferred alternative that is sensitive to the goals and needs of stakeholders, and then advance the project through the planning process. These steps will depend upon cooperation between MassDOT, the Town of Bellingham, and the MPO to begin the project notification and review process, and complete the project initiation form. After completing the initial steps, the Town of Bellingham and MassDOT can start preliminary design and engineering to place the project in the Transportation Improvement Program. Transportation decision making is complex, and influenced by factors such as financial limitations and agency programmatic commitments. Project development is the process that takes transportation improvements from concept to construction (see Appendix E for an overview of this process).

This study supports the MPO's visions and goals, which include increasing transportation safety, maintaining the transportation system, advancing mobility and access, reducing congestion, and expanding the opportunities for walking and bicycling, while also making them safer. If implemented, the improvements proposed in this report would increase traffic safety and modernize the roadway to accommodate all users.

cc: Erin Kinahan, MassDOT District 3,
Joseph Frawley, MassDOT District 3

Appendix A:
Comments and Selection Process

Hartford Avenue (Route 126) and Maple Street Intersection Redesign Study

Lower Level Meeting Room

Bellingham Municipal Center, 10 Mechanic Street

May 4, 2018

Attendance

Name	Affiliation	Email
James Kupfer	Town of Bellingham	jkupfer@bellinghamma.org
Joe Collamati	Town of Bellingham	jcollamati@comcast.net
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Roland Lavallee	HNTB	rlavallee@hntb.com
Mark Abbott	CTPS	mabbott@ctps.org
Seth Asante	CTPS	sasante@ctps.org
Benjamin Erban	CTPS	berban@ctps.org

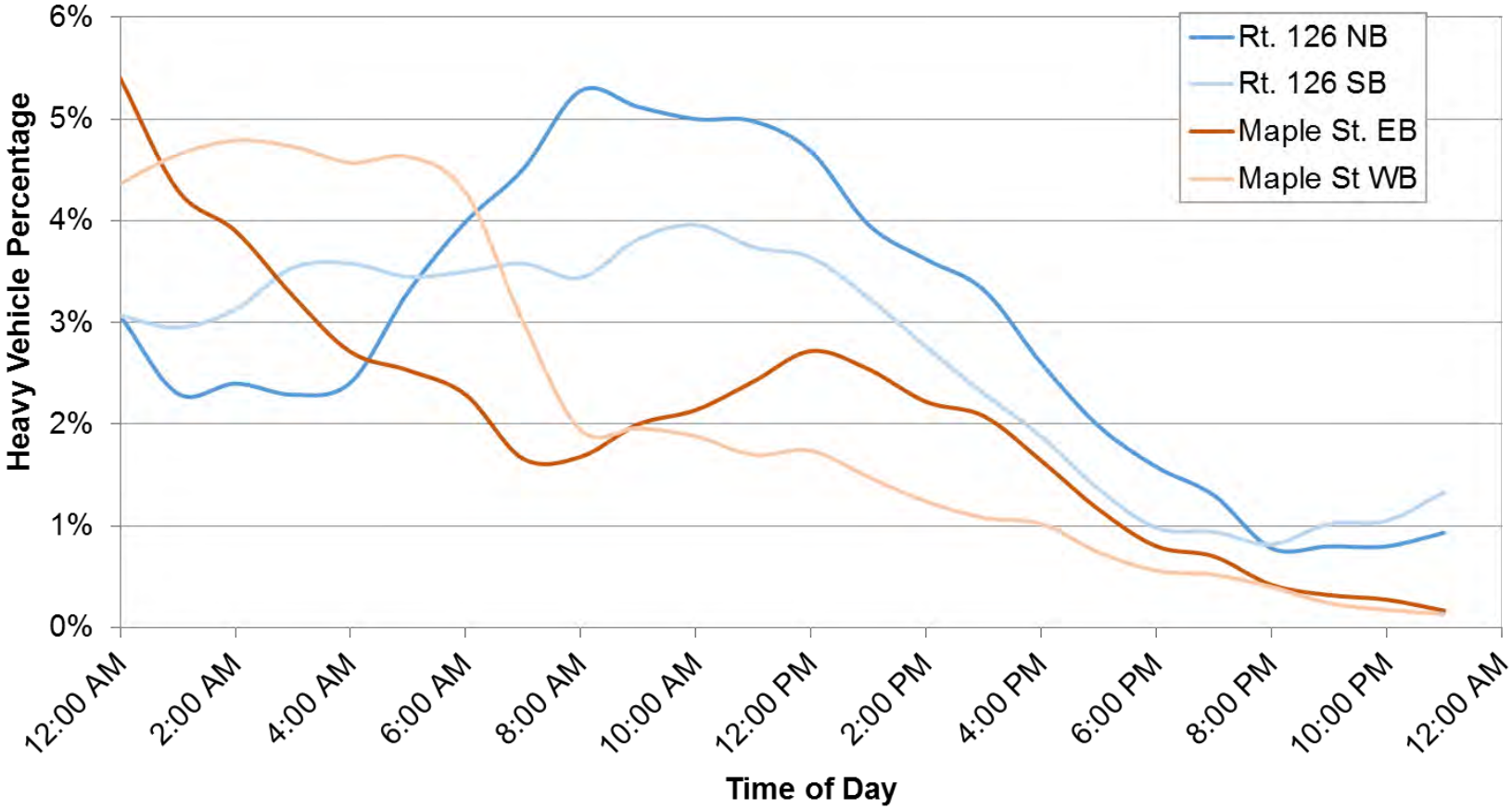
Summary and Updates from Meeting with Town of Bellingham

- CTPS presented their two proposed alternatives to address truck and pedestrian accommodations at the intersection of Route 126 and Maple Street. A PDF copy of the presentation has been attached to this email.
    - The proposed alternatives were well received, with preference expressed towards Alternative 2 (geometric changes on both Hartford Avenue and Maple Street, align driveway with intersection) to better meet expected future growth.
    - Additionally, some interest was shown in adding a turn bay for trucks leaving Maple Street, either as a component of one of the alternatives or as a third option. CTPS will investigate this possibility and include its findings in the final memo.
- Interest was expressed in permitting Right Turn on Red for traffic leaving Maple Street. However, according to CTPS analyses the sight distance at this intersection is small enough that right turn on red should probably be prohibited under existing conditions. Making right-turn-on-red a priority may require removal of the fence or city garage building on the north side of the intersection.
- The telephone pole nearest the curb on the southern corner of Maple and Hartford has been removed over the past week or two. The associated cables are now carried by the second pole closer to the house at #3 Maple Street.
- Some of the attendees were curious to know when specifically the highest truck flows occurred through the study intersection. A figure showing heavy vehicle percentage vs. time can be found on the next page of these minutes.
- Attendees also discussed how this project would be funded such as through the MPO TIP and MassWorks.

Follow-up Tasks

- Town of Bellingham: Review the included presentation and provide feedback to CTPS by Tuesday, May 15.
- CTPS: Incorporate feedback from the Town of Bellingham, and prepare final memo to be published in July/August.

Figure 1
Heavy Vehicle Percentage vs. Time of Day



Hartford Avenue and Maple Street Intersection Redesign Study

Lower Level Meeting Room

Bellingham Municipal Center, 10 Mechanic Street

May 4, 2018

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Hartford Avenue (Route 126) and Maple Street Intersection Redesign Study

Lower Level Meeting Room

Bellingham Municipal Center, 10 Mechanic Street

February 22, 2018

Attendance

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Mark Abbott	CTPS	mabbott@ctps.org
Seth Asante	CTPS	sasante@ctps.org
Benjamin Erban	CTPS	berban@ctps.org

Summary of concerns and ideas discussed at meeting

- The major issue is truck maneuvers to/from Maple Street. Heavy vehicles have a difficult time turning onto and off of Maple Street from Hartford Avenue (Route 126).
    - Taking a right from Hartford Avenue northbound onto Maple Street is the shortest route to access Maple Street from I-495, although the turn onto Maple Street is difficult for trucks because of a substandard curb radius. This fact is demonstrated by the telephone pole in front of the property on the southeast corner of the intersection, which is continually being hit by turning trucks.
    - The left turn out of Maple Street is also difficult – heavy vehicles leaving Maple Street properties are technically required to head west to Route 140 instead of using the Hartford Avenue and Maple Street intersection, which is an inconvenience.
    - Most of the complaints from residents about this intersection relate to turning heavy vehicles.
- Future development: Maple Street already sees a high volume of truck traffic, and is primed for growth in the near future.
    - All the land surrounding Maple Street between Pine Street and Route 140 is zoned industrial. Much of this is either undeveloped (woodland or swamp), or underdeveloped properties where new businesses have expressed interest.
    - Existing industrial businesses include several mulch distributors, a power station, and a construction company.
    - Future industrial properties include a new 450,000 SF industrial warehouse going in across the street from Camp Bow Wow, as well as a second warehouse.
    - Additionally, the Maplegate Country Club which is mostly located in Franklin recently changed ownership and may be up for sale, freeing up a huge amount of real estate for industrial development.
    - This area is in high demand because it is one of the few suitable sites for warehouses right off I-495. Additionally, its location makes it a good stopover location for re-distributing loads (e.g. mulch from Canada) to match weight regulations in Connecticut and Rhode Island.
- The Hartford Avenue and Maple Street intersection is the limiting factor for further development along Maple Street. The Town of Bellingham has previously made several investments in Maple Street.
    - A redesign of the intersection at the other end of Maple Street (with Route 140) is already planned. The consultant for this project is BETA Group and the work will be paid for by a MassWorks grant along with funds from a private developer.

- Bellingham has spent 1.0 million on Maple Street itself to improve drainage, widen slightly, and repair wear and tear from the heavy vehicle traffic. Kleinfelder was the design contractor for this work.

- Potential solutions and other ideas discussed at the meeting
  - The Town of Bellingham is potentially open to options involving land takings necessary for a satisfactory solution.
  - Moving the Maple Street stop line back would present a low-cost solution, but the Town of Bellingham expressed interest in pursuing more long-term solutions.
  - The driveway across Hartford Avenue from Maple Street is private property but is sometimes used for school traffic. Shifting this driveway north and making the intersection 4-way could be an option. The property to the north of the driveway is privately owned but may be up for sale.
  - The property on the northeast corner of the intersection is a garage used by the fire department (storage only) and is publicly owned, so could be used for right-of-way if necessary.
  - The house on the southeast corner was up for sale a few times. The right-of-way is only 10 or 15 feet from the building there. It has been up for sale a few times, for around $175,000.
- Follow-up tasks
  - Town of Bellingham: send recent and future developments and signal timing plans to CTPS

TECHNICAL MEMORANDUM

DATE: **January 18, 2018**
TO: **Boston Region MPO**
FROM: **Seth Asante, Chen-Yuan Wang, and Ben Erban**
RE: **Safety and Operations Analyses at Selected Intersections: Federal Fiscal Year 2018**

1 BACKGROUND

This memorandum presents the results of Task 1 (Select Study Locations) of the work program for Safety and Operations Analyses at Selected Intersections: Federal Fiscal Year (FFY) 2018.[1]

This study builds on recommendations generated by the Boston Region Metropolitan Planning Organization's (MPO) Congestion Management Process (CMP) to address safety and congestion problems at intersections in the MPO area. Several similar studies were completed in previous funding years and received favorable responses from municipalities, which included appreciation of the MPO's assistance with the conceptual design of low-cost improvements and the planning and implementation processes.

Previous studies examined large, complex intersections, simpler intersections, and locations that include two or more adjacent intersections. The focus for FFY 2018 is on simpler intersections. Locations that would potentially require major geometry redesigns, such as grade separation or adding travel lanes on an arterial roadway, were considered to be less suitable for this study.

As in the past, the basic requirement for a location to qualify as a study candidate is that it must be located on an arterial roadway in the Boston Region MPO where 1) it has safety and operational concerns and 2) the agencies and/or municipalities with jurisdiction over the roadway are committed to implementing recommended improvements.

[1] Karl H. Quackenbush, CTPS Executive Director, memorandum of a work program to the Boston Region MPO, "Work Program for Safety and Operations Analyses at Selected Intersections," November 16, 2017.

2 SELECTION PROCEDURE

The study selection process consisted of the following four steps completed by the MPO:

1) Generate a list of potential intersection study locations then narrow it to 10 locations
2) Gather detailed data for each of the 10 locations
3) Apply specific criteria to examine potential study locations more closely
4) Score and rate the 10 locations, and assign low, medium, or high priority to each intersection location

2.1 Generating List of Potential Locations

MPO staff used the following sources to develop an initial list of nearly 50 potential study locations in the MPO area:

- FFY 2016 safety and operations list of potential candidates
- Suggested locations from Unified Planning Work Program outreach

The following exclusion criteria were developed to narrow the list of locations:

- Located in a municipality that has been selected for this study within the past three years
- Located in a subregion that has been well- or over-represented in past subregional priority corridor projects in terms of the proportion of population or Massachusetts Department of Transportation (MassDOT) top-200 high-crash locations in the region
- Studied by MPO staff or another agency; included in a Transportation Improvement Program (TIP) project with a status of “advertised” or “programmed,” or included in an active MassDOT or other agency project that is in design (at 25 percent or higher design status), in construction, or recently completed
- Considered part of a larger potential study area, such as a highway interchange or a long traffic corridor with an extensive area of congestion
- Considered not at-grade

2.2 Gathering Detailed Data

Staff gathered data to support the exclusion criteria and eliminated locations that were not suitable. The assembled data for 10 intersection locations in 10 municipalities in the MPO region are listed below.

- MassDOT’s 2015 Road Inventory File. To collect the following information for each major arterial segment in each intersection location: roadway jurisdiction, National Highway System (NHS) status, and annual average daily traffic (AADT)

- MassDOT's Transportation Data Management System. Recently updated AADT counts were retrieved from MassDOT's online database
- MassDOT's 2010–14 Crash Database. Identify high-crash locations and numbers of crashes
- MPO CMP Data on Arterial Congestion. Determine travel-time index (that is, travel time in the peak period divided by travel time in free-flow conditions) for each major arterial segment intersection location
- MPO Data on Bike Network Gaps and MassDOT Bike Facilities. Identify bicycle needs—including connectivity—and accommodation
- Data on Massachusetts Bay Transportation Authority (MBTA) Bus Service Performance and Passenger Load. Determine the percentage of bus trips that do not adhere to the schedule (late service) or to passenger load standards (crowding)
- Data on MBTA Subway and Commuter Rail Lines. Identify locations serving MBTA stations
- Data from the following sources were also included*:*
    - Data selected from MassDOT's project-information and roadway safety audit databases
    - The MPO's 2016–20 TIP projects
    - MPO planning (and other) studies
    - Municipal websites (to obtain data on projects, studies, and TIP projects planned or programmed for each arterial segment)

Table 1 (at the end of this memorandum) presents the data assembled for each intersection location, community, Metropolitan Area Planning Council (MAPC) subregion, MassDOT district office, jurisdiction, equivalent property damage only crashes, total crashes, fatal crashes, injury crashes, property damage only and non-reported crashes, bicycle and pedestrian crashes, top-200 crash clusters, crash clusters that are eligible for Highway Safety Improvement Program (HSIP) funding, transit routes, a list of relevant studies or projects, and staff comments. The table also shows the results of applying the selection criteria and the priority rating, which was performed in the fourth step of this process (described below).

2.3 Applying Criteria

MPO staff further examined the intersection locations by applying the five criteria cited below (each item is worth one point):

- *Safety Conditions, 0–2 Points*
    - Location has an estimated crash rate that is higher than the district average
    - Location has a significant number of pedestrian and bicycle crashes per year (more than three), or has truck traffic safety concerns

- *Multimodal Significance, 0–2 Points*
  - Location needs improved transit, bicycle, or pedestrian facilities
  - Location has a high volume of truck traffic serving regional commerce

- *Regional Significance, 0–2 Points*
  - Location carries a significant portion of regional traffic (AADT is greater than 15,000 on at least one intersecting road)
  - Location is essential for the region's economic, cultural, or recreational development

- *Regional equity, 0–2 Points*
  - Location is in an MPO subregion that is at least slightly under-represented in previous safety and operations analyses in terms of the proportion of population or number of MassDOT top-200 high-crash locations in the region
  - Location is in an MPO subregion that is very under-represented in previous safety and operations analyses in terms of the proportion of population or number of MassDOT top-200 high-crash locations in the region

- *Implementation Potential, 0–2 Points*
  - Location has strong potential for implementation based on the urgent need for safety improvements
  - Location is proposed or endorsed by its roadway administrative agency or agencies and has strong support from other stakeholders (for example, municipalities, MassDOT, and subregions)

In addition, no two locations in the same town would be selected.

2.4 Scoring and Rating

Intersection locations with a score of four or fewer points were rated low priority; those with a score of five to seven points were rated medium priority; and those with a score of eight or more points were rated high priority. Five locations were given a high-priority rating and four a medium-priority rating by MPO staff based on safety, operations, multimodal and regional significance, and support from agencies and municipalities.

Staff examined the high-priority segments more closely. Locations within the following parameters were not suitable candidates for this cycle of safety and operations analyses:

- Locations that were recently or are currently under study
- Locations that exhibited a density of closely spaced intersections that suggest that a corridor study is needed
- Locations that were selected for the FFY 2018 Subregional Priority Corridors study

3 SELECTED INTERSECTIONS FOR STUDY

Based on the evaluation above, staff selected two intersections for study: 1) Route 1A (Main Street) at Cherry Street, Monument Street, and Arbor Street in Wenham; and 2) Route 126 (Hartford Avenue) at Maple Street in Bellingham.

1) *Route 1A (Main Street) at Cherry Street, Monument Street, and Arbor Street in Wenham:* The Town of Wenham and MassDOT District 4 requested MPO staff to study three major intersections on Route 1A from Cherry Street to Arbor Street. The primary issues raised were safety and operational concerns for users of all modes, including pedestrians and bicyclists.

   The three intersections are located close to each other within a short distance of 750 feet and serve a high volume of traffic on the regional arterial of Route 1A corridor. Additionally, several properties are located adjacent to these intersections, including the town hall, police department, fire department, the Maples Retirement Home, and First Church. The combination of these factors has caused safety concerns for all the users, especially for residents frequently visiting the area.

   All three intersections are currently unsignalized, and preliminary traffic signal needs analyses performed by MassDOT show that they satisfy the first three warrants of Manual on Uniform Traffic Control Devices. However, the three intersections should be further examined together in a comprehensive study under the existing town center context.

2) *Route 126 (Hartford Avenue) at Maple Street in Bellingham:* The Town of Bellingham requested MPO's assistance in addressing the safety and operational concerns at this intersection, especially on the truck operational and safety issues.

   The Town expressed that the intersection at Hartford Avenue and Maple Street carries a high proportion of truck traffic and is undersized to accommodate large commercial vehicles safely and efficiently. The intersection is just one-half mile south of the interchange of Interstate 495 and Route 126, where a number of large commercial uses exist.

Meanwhile, a significant portion of Maple Street, currently zoned industrial, houses a power plant, multiple warehouses, mulch- and lumber-producing facilities, and vacant land for future developments.

In addition, an elementary school that serves all of North Bellingham is located on Route 126, less than 100 feet north of the intersection. The traffic and pedestrian access to the school should also be considered in further study. The intersection is suitable for this study because of the issues and concerns from these different travel modes.

Staff also evaluated the pedestrian accommodation and safety improvement needs for the two locations by applying the Pedestrian Report Card Assessment that the MPO recently developed.[2] The two selected locations are highly qualified for pedestrian accommodation or safety improvement requirements. Appendix A contains detailed results of the assessments.

4 SUMMARY

The recommended intersection locations meet the selection criteria of this study because of their potential for safety and operations improvements. The work scope for this study assumed that “as many as three” locations would be selected. Staff selected two locations that contain a total of four intersections. Appendix B contains the support letters from MassDOT and stakeholders in Wenham and Bellingham.

Staff will submit these recommendations to the MPO for discussion. If the MPO endorses the study selections, staff will meet with officials from Wenham, Bellingham, and MassDOT to discuss study specifics, conduct field visits, collect data, and perform analyses.

SA/CW/BE/sa

[2] Pedestrian Level-of-Service Memorandum, Ryan Hicks and Casey-Marie Claude, Boston Region Metropolitan Organization, January 19, 2017.

TABLE 1. FFY 2018 Safety and Operations for Selected Intersections
Selected locations are highlighted in green

Location	Community	MAPC Subregion	MassDOT District	Jurisdiction	Street 1	Route 1	Street 2	Study, Project, or TIP Project	EPDO Crashes 2012-14	Total Crashes 2012-14	Injury Crashes 2012-14	Bike/Ped Crashes 2012-14	Top 200 Crash Clusters 2012-14	HSIP-eligible Crash Clusters 2012-14	Transit Routes	Safety Conditions	Multimodal Significance	Regional Significance	Regional Equity	Implementation Potential	Total Score	Rating	Comments
1	Wenham	NSTF	4	MassDOT	Main Street	Route 1A	Cherry Street Monument Street Arbor St / Friend Ct	None	76	36	10	1	0	0	None	2	2	2	2	2	10	High	Wenham and MassDOT District 4 requested MPO staff to study these three major intersections on Route 1A. The primary issues raised were safety and operational concerns for users of all modes, including pedestrians and bicyclists. To fully address these issues, the three intersections should be examined together under the existing town center context.
2	Bellingham	SWAP	3	Town	Hartford Avenue	Route 126	Maple Street	#604862: Bellingham- Ramp Construction and Relocation. I-495 At Route 126 (Hartford Avenue) (half a mile south of location) (TIP project, preliminary design phase, last update 2007) #605239: Bellingham- Franklin- Bridge Preservation - Hartford Ave over I-495 (half a mile south) (Complete 2012)	12	8	1	0	0	0	None	1	2	2	2	2	9	High	The Town of Bellingham requested MPO's assistance in addressing the safety and operational concerns at this intersection, especially on the truck operational and safety issues. A future study should also consider traffic and pedestrian safety from an elementary school adjacent to the intersection.
3	Danvers	NSTF	4	MassDOT	Andover Street	Route 114	Garden Street	Project 605383 Danvers- Peabody- Resurfacing and Related Work on Route 114 (completed in 2011)	97	37	15	1	1	1	None	2	2	2	1	1	8	High	This intersection was studied as part of the FFY 2011 Priority Corridors: Route 114 Study in Danvers. That study proposed improvements for addressing safety and operations at the intersection.
4	Cambridge	ICC	6	DCR and City	Mount Auburn Street and Fresh Pond Parkway	Route 3	Coolidge Hill Road	None	101	41	15	1	1	1	MBTA 71 and 73	2	2	2	2	0	8	High	Comments from MPO outreach indicate pedestrian safety issues and traffic congestion and operations concerns at Mount Auburn Street/Coolidge Hill Road. DCR interest is critical for this study due to the proximity of Route 3/Fresh Pond Parkway at Mount Auburn Street.
5	Marlborough	MetroWest	3	MassDOT	Boston Post Road West	Route 20	Northboro Road East (Shopping Plaza)	#601133: Marlborough- Roadway Reconstruction Including Signals, Route 20 (Boston Post Road) From The Northboro Cl To Felton St. (2004) #608467: Marlborough- Resurfacing And Related Work On Route 20 (Unknown Location) (Planned for 2019 TIP)	92	68	6	4	0	1	MWRTA Route 7	2	2	2	1	1	8	High	A Route 20 study in Marlborough is recommended for the MPO FFY 2016 Subregional Priority Corridors Study. This location was not selected because of the geographic equity consideration applied in the selection study locations.
6	Boston	ICC	6	DCR	Jamaicaway		Bynner Street	None	122	50	18	2	1	1	None	1	2	2	1	1	7	Medium	Potential candidate for a safety and operations study. The location is in the current list of Top 200 High-Crash Intersections. The City of Boston expressed interest, but the DCR did not indicate interest.
7	Salem	NSTF	4	Town	North Street	Route 114	Mason Street	#605332: Salem- Bridge Replacement, S-01-001, (St 114) North Street Over North River - Is just south of the intersection. (TIP project, begins 2021) #608521: Salem- Bridge Maintenance, S-01-018 (32t), (St 114) North Street Over (St 107) Bridge Street and MBTA - a little further down (TIP project, begins 2018)	102	45	12	6	1	1	MBTA 465	1	2	2	1	1	7	Medium	This location was not selected because the crash cluster at this location includes two signalized intersections and four unsignalized intersections in a half-mile distance. An arterial segment study is more suitable for this location. In addition, a Route 1A study involving Swampscott, Salem, and Marblehead has been recommended for the MPO FFY 2016 Subregional Priority Corridors Study, and so, because of geographic equity considerations, this location is not recommended for that reason as well.
8	Boston	ICC	6	MassDOT	Columbia Road		Buttonwood Street	#603412: Boston- Traffic Signal And Safety Improvements, Route I-93 Ramps At Columbia Road - is adjacent to intersection. (Complete 2005)	79	27	13	0	0	1	MBTA 8, 18, and 41	2	1	1	2	1	7	Medium	Potential candidate for a safety and operations study. This unsignalized intersection is located between two busy and closely spaced signalized intersections.
9	Newton	ICC	6	City	Commonwealth Avenue	Route 30	Washington Street	None	22	14	2	1	0	0	MBTA 505	0	2	1	2	1	6	Medium	Potential candidate for a safety and operations analysis.
10	Sherborn	SWAP	3	Town	Washington Street	Route 16	S Main Street (Route 27)	None	46	18	7	0	0	1	None	1	1	1	1	0	4	Low	Location was studied by CTPS and VHB in 2002 and 2004. Improvements were not implemented. A UPWP comment suggested that this could be a good location for demand response signal.

Acronyms and Abbreviations
BAT = Brockton Area Transit Authority. CATA = Cape Ann Transit Authority. CTPS = Central Transportation Planning Staff. DCR = Department of Conservation and Recreation. EPDO = Equivalent property damage only. FFY = Federal fiscal year. HSIP = Highway Safety Improvement Program. ICC = Inner Core Committee. MAPC = Metropolitan Area Planning Council. MassDOT = Massachusetts Department of Transportation. MBTA = Massachusetts Bay Transportation Authority. MetroWest = MetroWest Regional Collaborative. MPO = Boston Region Metropolitan Planning Organization. MWRTA = MetroWest Regional Transit Authority. NSPC = North Suburban Planning Council. NSTF = North Shore Task Force. SWAP = South West Advisory Planning Committee. TIP = Transportation Improvement Program. TRIC = Three Rivers Interlocal Council. UPWP = Unified Planning Work Program.

Selection Criteria
Safety Conditions: Intersection has a HSIP-eligible crash cluster, a top-200 high-crash location, and/or a significant number of or HSIP-eligible clusters of pedestrian or bicycle crashes.
Congested Conditions: Intersection experiences delays during peak periods.
Multimodal Significance: Intersection currently supports transit, bicycle or pedestrian activities, needs improved facilities for these activities, and/or has high truck traffic serving regional commerce.
Regional Significance: Intersection is on the National Highway System, carries a significant proportion of regional traffic, lies within 0.5 miles of Environmental Justice transportation analysis zones, and/or is essential for the region's economic, cultural, or recreational development.
Regional Equity: Intersection is underrepresented in previous safety and operations studies in terms of the proportion of population or number of top-200 high-crash locations.
Implementation Potential: Intersection has strong potential for implementation based on the urgent need for safety improvements, is proposed or endorsed by its roadway administrative agency or agencies, and/or has strong support from other stakeholders.

Notes
1. Locations are in order of their ratings based on scoring from selection criteria.
2. EPDO Crash Rating = 10 * Fatal Crashes + 5 * Injury Crashes + 1 * Other Crashes (Property Damage Only or Unknown Severity), based on MassDOT top-200 high-crash locations: 2012-14 crash data.
3. HSIP-eligible crash clusters are defined by MassDOT as crash clusters that rank within the top five percent of crash clusters for each Regional Planning Agency, based on the EDPO index. In the Boston region the 921 intersections in the top five percent have crash clusters with a minimum EDPO value of 42.

Source: Central Transportation Planning Staff.

APPENDIX A

Pedestrian Report Card Assessment

1. Route 1A from Cherry Street to Arbor Street/Friend Court, Wenham
2. Route 126 and Maple Street, Bellingham

BOSTON REGION METROPOLITAN PLANNING ORGANIZATION

Central Transportation Planning Staff (CTPS) to the Boston Region MPO:
www.ctps.org | 857.702.3700 | ctps@ctps.org

Ryan Hicks, Congestion Management Process Manager:
www.ctps.org/cmp | 857.702.3661 | rhicks@ctps.org

Casey Claude, Bicycle and Pedestrian Program Manager:
www.ctps.org/livability | 857.702.3707 | cclaude@ctps.org

Pedestrian Report Card Assessment (PRCA):

Roadway Segment

Roadway Segment Location
Route 1A from Cherry St. to Arbor St./Friend Ct.

Grading Categories	Score	Rating
Safety	2.4	Good
System Preservation	N/A	Poor
Capacity Management and Mobility	2.16	Fair
Economic Vitality	1.5	Poor

Transportation Equity	
High Priority Area	
Moderate Priority Area	
Not a Priority Area	✓

Category Ratings
Good: Score of 2.3 or more (maximum 3.0)
Fair: Score is between 1.7 and 2.3
Poor: Score is 1.7 or less (minimum 0)

Grading Categories: Scoring Breakdown **Roadway Segment**

Capacity Management and Mobility

Performance Measure	Weight	Rating	Weighted Score
Sidewalk Presence	3	Fair	6
Crossing Opportunities	2	Good	6
Walkway Width	1	Poor	1
Total	**6**		**13**

Economic Vitality

Performance Measure	Weight	Rating	Weighted Score
Pedestrian Volumes	1	Fair	2
Adjacent Bicycle Accommodations	1	Poor	1
Total	**2**		**3**

Category rating = total rating/total weight
Rating Score:
Good = 3
Fair = 2
Poor = 1

Safety

Performance Measure	Weight	Rating	Weighted Score
Pedestrian Crashes	3	Good	9
Pedestrian-Vehicle Buffer	1	Poor	1
Vehicle Travel Speed	1	Fair	2
Total	**5**		**12**

System Preservation

Performance Measure	Rating
Sidewalk Condition	**Poor**

Transportation Equity Priority

Area Condition	Yes/No
Environmental Justice zone?	No
School or college within one-quarter mile?	Yes
More than 8.9% of population older than 75 years?	No
More than 27.5% of households do not own a vehicle?	No

Category Ratings
Good: Score of 2.3 or more (maximum 3.0)
Fair: Score is between 1.7 and 2.3
Poor: Score is 1.7 or less (minimum 0)

Detailed Performance Measure Information: Roadway Segment

Goal	Performance Measure	Features of Analyzed Locations
Mobility	Sidewalk Presence	Sidewalk is present on one side of the street
	Crossing Opportunities	2 crossing opportunities/0.2 miles =10 crosswalks per mile
	Walkway Width	4-foot wide sidewalks
Economic Vitality	Pedestrian Volumes	15 pedestrians per hour
Safety	Adjacent Bicycle Accommodations	none
	Pedestrian Crashes	Not in HSIP cluster
	Pedestrian-Vehicle Buffer	3 feet buffers
	Vehicle Travel Speed	32 mph
System Preservation	Sidewalk Condition	Sidewalks are in poor condition

BOSTON REGION METROPOLITAN PLANNING ORGANIZATION

Central Transportation Planning Staff (CTPS) to the Boston Region MPO:
www.ctps.org | 857.702.3700 | ctps@ctps.org

Ryan Hicks, Congestion Management Process Manager:
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Casey Claude, Bicycle and Pedestrian Program Manager:
www.ctps.org/livability | 857.702.3707 | cclaude@ctps.org

Pedestrian Report Card Assessment (PRCA):

Intersection

Intersection Location
Route 126 and Maple St.

Grading Categories	Score	Rating
Safety	1.87	Fair
System Preservation	N/A	Poor
Capacity Management and Mobility	1.57	Poor
Economic Vitality	N/A	Fair

Transportation Equity	
High Priority Area	
Moderate Priority Area	
Not a Priority Area	✓

Category Ratings
Good: Score of 2.3 or more (maximum 3.0)
Fair: Score is between 1.7 and 2.3
Poor: Score is 1.7 or less (minimum 0)

Grading Categories: Scoring Breakdown
Intersection

Capacity Management and Mobility

Performance Measure	Weight	Rating	Weighted Score
Pedestrian Delay	3	Poor	3
Sidewalk Presence	2	Fair	4
Curb Ramps	1	Fair	2
Crossing Opportunities	1	Fair	2
Total	**7**		**11**

Economic Vitality

Performance Measure	Rating
Pedestrian Volumes	**Fair**

Category rating = total rating/total weight
Rating Score:
Good = 3
Fair = 2
Poor = 1

Safety

Performance Measure	Weight	Rating	Weighted Score
Sufficient Crossing Time (Index)	3	Poor	3
Pedestrian Crashes	3	Good	9
Pedestrian Signal Presence	1	Poor	1
Vehicle Travel Speed	1	Fair	2
Total	**8**		**15**

System Preservation

Performance Measure	Rating
Sidewalk Condition	**Poor**

Transportation Equity Priority

Area Condition	Yes/No
Environmental Justice zone?	No
School or college within a one-quarter mile?	Yes
More than 8.9% of population older than 75 years?	No
More than 27.5% of households do not own a vehicle?	No

Category Ratings
Good: Score of 2.3 or more (maximum 3.0)
Fair: Score is between 1.7 and 2.3
Poor: Score is 1.7 or less (minimum 0)

Detailed Performance Measure Information: Intersection

Goal	Performance Measure	Features of Analyzed Locations
Mobility	Pedestrian Delay	Estimated cycle length = 150 seconds Estimated pedestrian walk/flashing don't walk time = 12 seconds Estimated pedestrian delay = 63.48 seconds
	Sidewalk Presence	Sidewalks present on all approaches
	Curb Ramps	Curb ramps are present on 2 of 3 approaches
	Crossing Opportunities	Crosswalks at 2 of 3 approaches
Economic Vitality	Pedestrian Volumes	Estimated 5 to 6 pedestrians per hour
Safety	Sufficient Crossing Time (Index)	50 feet crossing; 12 seconds allowed; 15 seconds needed
	Pedestrian Crashes	Not in HSIP cluster
	Pedestrian Signal Presence	Pedestrian signals are present on one approach. Concurrent pedestrian signal, right turn on red permitted
	Vehicle Travel Speed	31 mph
System Preservation	Sidewalk Condition	Sidewalks are in poor condition

APPENDIX B

Support Letters from MassDOT, Wenham, and Bellingham

Charles D. Baker, Governor
Karyn E. Polito, Lieutenant Governor
Stephanie Pollack, Secretary & CEO
Jonathan L. Gulliver, Acting Highway Administrator

MassDOT
Massachusetts Department of Transportation
Highway Division

August 10, 2017

Mark Abbott, Manager
Traffic Analysis and Design Group
Central Transportation Planning Staff
Boston Region Metropolitan Planning Organization
10 Park Plaza, Suite 2150
Boston, MA 02116-3968

Dear Mr. Abbott:

I am writing on behalf of MassDOT District 4 to express our support for further traffic analysis of three intersections on Main Street (Route 1A) in Wenham. These intersections are located at Cherry Street, Monument Street and Arbor Street/Friend Court.

The District's Traffic Operations Section had recently worked with the Town on a traffic signal warrant analysis of the three intersections. It was determined that MUTCD Warrants 1, 2 and 3 (volume-related warrants) were met. Since Warrants 1A and 1B, Eight-Hour Vehicular Volume, were satisfied for each of the locations, any of them would be solid candidates for a traffic signal.

To determine the true feasibility of such a project, further study in the form of a Functional Design Report (FDR) is needed. I understand that an FDR may be eligible for funding through a FY18 UPWP study entitled "Safety and Operations at Selected Locations" being conducted by your group. The Town is committed to improving safety in this area of Route 1A and is willing to complete 25% design for a project, if selected for the study. MassDOT District 4, therefore, believes that further study of the locations should be funded and completed.

Thank you for your consideration. If you have any further questions on this matter, please contact me at (781)641-8322.

Sincerely,

Paul D. Stedman
District Highway Director

JEG/gb
cc: Peter Lombardi, Wenham Town Administrator
Traffic File

519 Appleton Street, Arlington, MA 02476
Tel: 781-641-8300, Fax: 781-646-5115
www.mass.gov/massdot

The Commonwealth of Massachusetts
MASSACHUSETTS SENATE
OFFICE OF THE MINORITY LEADER

SENATOR BRUCE E. TARR
MINORITY LEADER
First Essex and Middlesex

STATE HOUSE, ROOM 308
BOSTON, MA 02133-1053
TEL. (617) 722-1600
FAX: (617) 722-1310
BRUCE.TARR@MASENATE.GOV
WWW.MASENATE.GOV

August 1, 2017

Mark Abbott, Manager
Traffic Analysis and Design Group
Central Transportation Planning Staff
Boston Region Metropolitan Planning Organization
Ten Park Plaza, Suite 2150
Boston, MA 02116-3968

Dear Mr. Abbott,

I would like to take this opportunity to express my strong support for the Town of Wenham. In particular, the Board of Selectmen's recent funding request for further traffic analysis regarding three intersections on Main Street in downtown Wenham, located at Cherry Street, Monument Street, and Arbor Street / Friend Court.

Given that the Main Street corridor (Route 1A) is a state road, the town worked with MassDOT District 4 Traffic Operations to complete a traffic signal warrant analysis earlier this year, which resulted in positive findings. With that, I note that all three intersections on Main Street meet the MUTCD Signal Warrants 1, 2, and 3. Noting such, I believe the relative data sufficiently satisfies Warrant 1A and 1B for Eight-Hour Vehicular traffic, with any of these locations satisfying the requirements for signal installation.

Considering such, the town is in need of assistance in determining project feasibility, specifically a Functional Design Report (FDR), which may be funded through a FY18 UPWP Study (Safety and Operations at Selected Locations). When considering the town's demonstrated commitment to addressing public safety concerns related to traffic volume, together with the number of motor vehicle crash incidents in these locations on Route 1A, I firmly believe a comprehensive operational and safety analysis of these three intersections can/should be funded and completed.

I further note, if your office is able to support/fund conducting an FDR, the town agrees to be responsible for completing a 25% design to continue to move forward with this project. This, together with the town's ongoing efforts is just another example of their demonstrated and genuine commitment to public safety.

Accordingly, I seek your careful consideration of the Town of Wenham's request for FDR funding. Thank you for such, and please don't hesitate to contact me directly should you have any questions.

Sincerely,

Bruce E. Tarr
State Senator
Minority Leader

Town of Wenham

Town Hall
138 Main Street
Wenham, MA 01984

Selectmen / Town Administrator
TEL 978-468-5520 FAX 978-468-8014

August 1, 2017

Mark Abbott
Manager, Traffic Analysis and Design Group
Central Transportation Planning Staff
Boston Region Metropolitan Planning Organization
Ten Park Plaza, Suite 2150
Boston, MA 02116-3968

Dear Mr. Abbott,

I am writing on behalf of the Board of Selectmen to express our strong support for further traffic analysis regarding three intersections on Main Street in downtown Wenham, located at Cherry Street, Monument Street, and Arbor Street / Friend Court. Since the Main Street corridor is also a state roadway, Route 1A, we worked with MassDOT District 4 Traffic Operations to complete a traffic signal warrant analysis earlier this year.

The attached findings from that report show that these three intersections on Main Street all meet the MUTCD Signal Warrants 1, 2, and 3. Since the data satisfies Warrant 1A and 1B for Eight-Hour Vehicular Volume, our understanding is that any of these locations would be strong candidates to have a signal installed. However, the Town now needs assistance in completing the next step to determine the feasibility of this project, a Functional Design Report (FDR).

According to our Town Administrator, this project may be eligible for funding through a FY18 UPWP study entitled "Safety and Operations at Selected Locations". Given the community's ongoing public safety concerns about traffic volume and accidents along this corridor on Route 1A, we hope that your office is able to support conducting an FDR so that a comprehensive operational and safety analysis of these three intersections can be completed. We understand that, if funded, conceptual alternatives would be included in the scope of work, but that the Town would then be responsible for completing 25% design to continue to move forward with this project.

Thank you for your consideration. Please contact our Town Administrator, Peter Lombardi, at 978-468-5520 x. 2 or plombardi@wenhamma.gov if you have any further questions.

Best regards,

Jack Wilhelm
Chair, Wenham Board of Selectmen

BELLINGHAM PLANNING DEPARTMENT

10 MECHANIC STREET BELLINGHAM, MASSACHUSETTS 02019
(508) 657-2892 Plan-zone@bellinghamma.org

October 17, 2017

Mark Abbot
Metropolitan Planning Organization
Central Transportation Planning Staff
State Transportation Building
10 Park Plaza, Suite 2150
Boston, MA 02116

Re: Technical Assistance Request – Roadway Intersection Redesign – Hartford Avenue and Maple Street

The Town of Bellingham respectfully requests technical assistance from the Central Transportation Planning Staff for the intersection redesign of Hartford Avenue and Maple Street.

Hartford Avenue at Exit 18 hosts a large inventory of commercial uses and, moving eastward, a dense residential area. In addition, a public elementary school, which services all of North Bellingham, and a small community center are located at the intersection of Hartford Avenue and Maple Street.

The intersection of Hartford Avenue and Maple Street operates well for standard motorized vehicles. However, it is over burdened by commercial vehicles. This cannot be avoided due to the proximity to I-495 and the Town's desire to retain significant acreage of industrial zoned parcels along Maple Street (See attached Zoning Map). Current industrial uses along Maple Street consist of a power plant, multiple warehouses exceeding 600,000 square feet of space, and large scale mulch and lumber hauling and production. These bring with them numerous trips by large tractor trailers.

Unfortunately this intersection is severally undersized to function properly for its desired use. The Town has recognized the need to upgrade Maple Street in order to sufficiently maintain industrial uses along this corridor. Through a public/private partnership, the town of Bellingham has begun the redesign process for the southern intersection of Maple Street and Route 140 and will be investing over $2 Million dollars during the improvement and construction process. In a separate improvement project, the Town has invested over $1 Million dollars to repave and correct drainage in a large section of Maple Street to better service the zoned uses. Improvement of the Hartford Avenue and Maple Street intersection is an important step in the improvement process to properly upgrade Maple Street to adequately service the industrial uses along this road and to allow large vehicles to access Route I-495 as quickly and safely as possible.

Town Officials will be available to assist and offer comments during the design process and to coordinate any public meetings that are required. Please do not hesitate to contact us if more information is necessary.

James S. Kupfer, MPA, AICP
Town Planner/ Zoning Compliance Officer
10 Mechanic Street
Bellingham, MA 02019
Phone: 508-657-2893
jkupfer@bellinghamma.org

Donald F. DiMartino
DPW Director
26 Blackstone Street
Bellingham, MA 02019
Phone - 508-966-5813
DDiMartino@bellinghamma.org

Town of Bellingham
BOARD OF SELECTMEN
10 Mechanic Street
Bellingham, Massachusetts 02019
Tel: 508-966-5800 * Fax: 508-966-4425

November 6, 2017

Mark Abbot
Metropolitan Planning Organization
Central Transportation Planning Staff
State Transportation Building
10 Park Plaza, Suite 2150
Boston, MA 02116

Re: Technical Assistance Request – Roadway Intersection Redesign – Hartford Avenue and Maple Street

Dear Mr. Abbot:

The Town of Bellingham Board of Selectmen is writing to express our enthusiastic support for the Town's proposal "Roadway Intersection Redesign – Hartford Avenue and Maple Street".

This intersection is severely undersized to function properly for its desired use. The Town has recognized the need to upgrade Maple Street in order to sufficiently maintain industrial uses along this corridor as well as unlock future investment. Through a public/private partnership, the town of Bellingham has begun the redesign process for the southern intersection of Maple Street and Route 140 and will be investing over $2 Million dollars during the improvement and construction process. In a separate improvement project, the Town has invested over $1 Million dollars to repave and correct drainage in a large section of Maple Street to better service the zoned uses. Improvement of the Hartford Avenue and Maple Street intersection is an important step in the improvement process to properly upgrade Maple Street to adequately service the industrial uses along this road and to allow large vehicles to access Route I-495 as quickly and safely as possible.

The support of the Metropolitan Planning Organization and the Central Transportation Planning Staff will be critical to following through on this important project. Thank you in advance for considering our proposal.

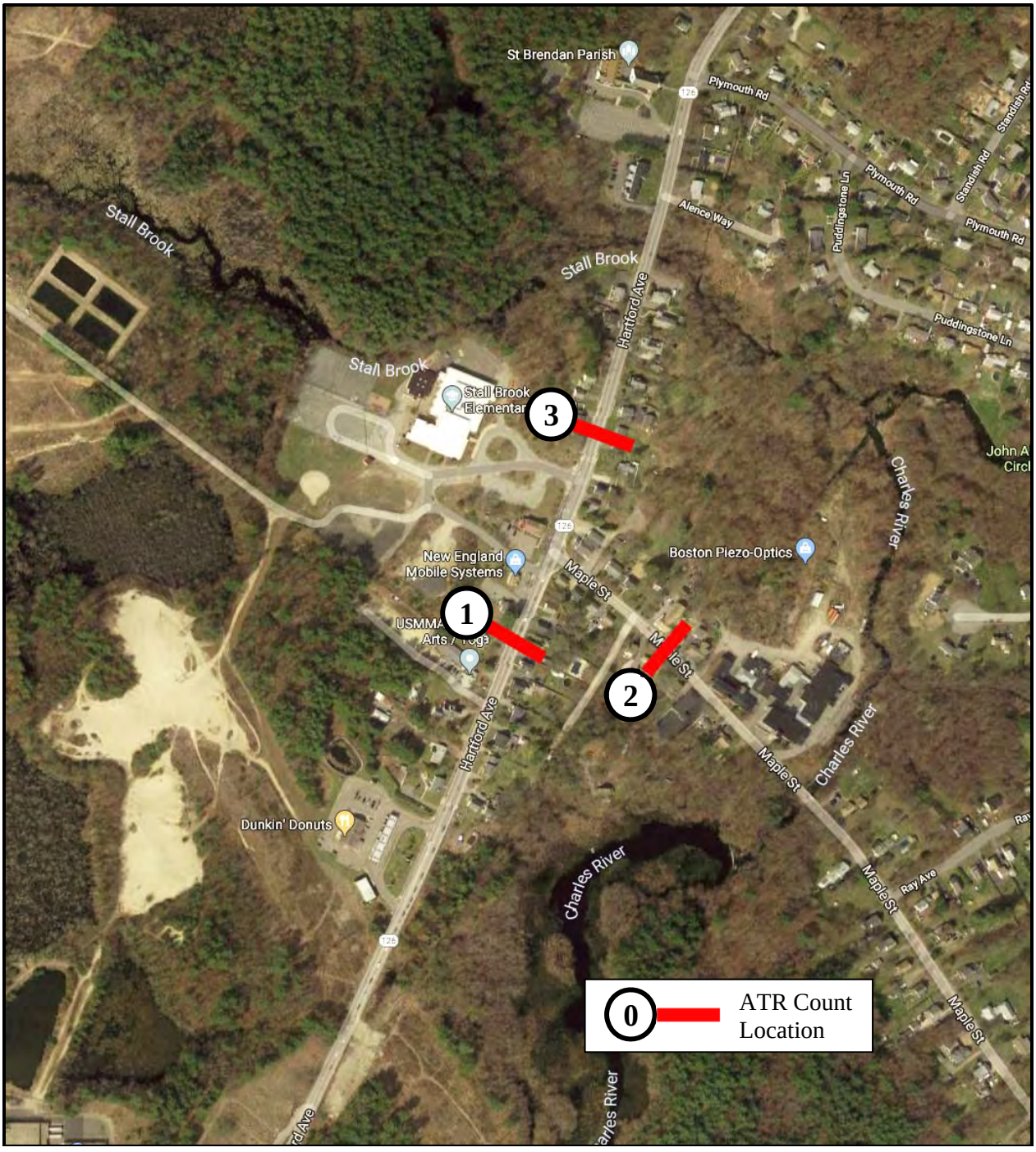
Sincerely,

Michael J. Soter, Chairman
Board of Selectmen

Appendix B:
Traffic Data Collection

Hartford Avenue (Route 126) in Bellingham
Turning Movement Count (TMC) Locations

Hartford Avenue (Route 126) in Bellingham
Automatic Traffic Recorder (ATR) Locations



Study Name	Bellingham - Route 126 and Maple Street TM1 TMC
Start Date	Wednesday, January 31, 2018 6:00 AM
End Date	Wednesday, January 31, 2018 6:00 PM
Site Code	

Report Summary

		Southbound						Westbound						Northbound						Eastbound								Crosswalk		
Time Period	**Class.**	**R**	**T**	**L**	**U**	**I**	**O**	**R**	**T**	**L**	**U**	**I**	**O**	**R**	**T**	**L**	**U**	**I**	**O**	**R**	**T**	**L**	**U**	**I**	**O**	**Total**		**Bicycles on Crosswalk**	**Pedestrians**	**Total**
Peak 1	Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	N	0	0	0
Specified Period	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		0%	0%	
6:00 AM - 9:00 AM	Cars	0	354	47	0	401	637	147	0	115	0	262	73	26	490	7	1	524	477	7	0	0	0	7	7	1194	E	0	0	0
One Hour Peak	%	0%	78%	71%	0%	78%	79%	85%	0%	82%	0%	83%	70%	67%	78%	78%	100%	77%	79%	78%	0%	0%	0%	70%	78%	79%		0%	0%	
7:15 AM - 8:15 AM	Light Goods Vehicles	0	71	14	0	85	122	23	0	23	0	46	25	11	99	1	0	111	96	2	0	0	0	2	1	244	S	0	0	0
	%	0%	16%	21%	0%	16%	15%	13%	0%	16%	0%	15%	24%	28%	16%	11%	0%	16%	16%	22%	0%	0%	0%	20%	11%	16%		0%	0%	
	Buses	0	3	1	0	4	2	0	0	0	0	0	2	1	2	0	0	3	3	0	0	0	0	0	0	7	W	0	0	0
	%	0%	1%	2%	0%	1%	0%	0%	0%	0%	0%	0%	2%	3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		0%	0%	
	Single-Unit Trucks	0	16	4	0	20	31	3	0	1	0	4	4	0	28	0	0	28	17	0	0	0	0	0	0	52		**0**	**0**	**0**
	%	0%	4%	6%	0%	4%	4%	2%	0%	1%	0%	1%	4%	0%	4%	0%	0%	4%	3%	0%	0%	0%	0%	0%	0%	3%				
	Articulated Trucks	0	7	0	0	7	10	0	0	2	0	2	1	1	9	1	0	11	9	0	0	1	0	1	1	21				
	%	0%	2%	0%	0%	1%	1%	0%	0%	1%	0%	1%	1%	3%	1%	11%	0%	2%	1%	0%	0%	100%	0%	10%	11%	1%				
	Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%				
	Total	**0**	**451**	**66**	**0**	**517**	**802**	**173**	**0**	**141**	**0**	**314**	**105**	**39**	**628**	**9**	**1**	**677**	**602**	**9**	**0**	**1**	**0**	**10**	**9**	**1518**				
	PHF	0	0.93	0.75	0	0.9	0.93	0.86	0	0.9	0	0.93	0.8	0.75	0.92	0.45	0.25	0.91	0.94	0.56	0	0.25	0	0.5	0.45	0.96				
	Approach %					34%	53%					21%	7%					45%	40%					1%	1%					
Peak 2	Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	N	0	2	2
Specified Period	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		0%	100%	
2:00 PM - 6:00 PM	Cars	0	528	163	0	691	562	74	0	66	0	140	266	103	488	4	0	595	603	9	0	0	0	9	4	1435	E	0	0	0
One Hour Peak	%	0%	80%	82%	0%	81%	86%	84%	0%	83%	0%	83%	83%	85%	86%	100%	0%	86%	81%	100%	0%	0%	0%	100%	100%	83%		0%	0%	
4:30 PM - 5:30 PM	Light Goods Vehicles	0	114	36	0	150	85	14	0	13	0	27	52	16	71	0	0	87	127	0	0	0	0	0	0	264	S	0	0	0
	%	0%	17%	18%	0%	18%	13%	16%	0%	16%	0%	16%	16%	13%	12%	0%	0%	13%	17%	0%	0%	0%	0%	0%	0%	15%		0%	0%	
	Buses	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	W	0	1	1
	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		0%	100%	
	Single-Unit Trucks	0	12	0	0	12	8	0	0	1	0	1	2	2	8	0	0	10	13	0	0	0	0	0	0	23		**0**	**3**	**3**
	%	0%	2%	0%	0%	1%	1%	0%	0%	1%	0%	1%	1%	2%	1%	0%	0%	1%	2%	0%	0%	0%	0%	0%	0%	1%				
	Articulated Trucks	0	1	1	0	2	2	0	0	0	0	0	1	0	2	0	0	2	1	0	0	0	0	0	0	4				
	%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%				
	Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%				
	Total	**0**	**656**	**200**	**0**	**856**	**657**	**88**	**0**	**80**	**0**	**168**	**321**	**121**	**569**	**4**	**0**	**694**	**745**	**9**	**0**	**0**	**0**	**9**	**4**	**1727**				
	PHF	0	0.87	0.88	0	0.89	0.88	0.71	0	0.83	0	0.76	0.96	0.92	0.85	0.5	0	0.88	0.91	0.45	0	0	0	0.45	0.5	0.91				
	Approach %					50%	38%					10%	19%					40%	43%					1%	0%					

Study Name	Bellingham - Route 126 and Stall Brook School Driveway TM2 TMC
Start Date	Wednesday, January 31, 2018 6:00 AM
End Date	Wednesday, January 31, 2018 6:00 PM
Site Code	

Report Summary

		Southbound					Northbound					Eastbound							Crosswalk		
Time Period	**Class.**	**R**	**T**	**U**	**I**	**O**	**T**	**L**	**U**	**I**	**O**	**R**	**L**	**U**	**I**	**O**	**Total**		**Bicycles on Crosswalk**	**Pedestrians**	**Total**
Peak 1	Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	N	0	0	0
Specified Period	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		0%	0%	
6:00 AM - 9:00 AM	Cars	9	390	0	399	642	642	20	0	662	392	2	0	0	2	29	1063	S	0	0	0
One Hour Peak	%	90%	79%	0%	79%	78%	78%	95%	0%	79%	79%	100%	0%	0%	100%	94%	79%		0%	0%	
7:00 AM - 8:00 AM	Light Goods Vehicles	1	77	0	78	132	132	1	0	133	77	0	0	0	0	2	211	W	0	0	0
	%	10%	16%	0%	16%	16%	16%	5%	0%	16%	16%	0%	0%	0%	0%	6%	16%		0%	0%	
	Buses	0	3	0	3	1	1	0	0	1	3	0	0	0	0	0	4		**0**	**0**	**0**
	%	0%	1%	0%	1%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%				
	Single-Unit Trucks	0	17	0	17	33	33	0	0	33	17	0	0	0	0	0	50				
	%	0%	3%	0%	3%	4%	4%	0%	0%	4%	3%	0%	0%	0%	0%	0%	4%				
	Articulated Trucks	0	5	0	5	10	10	0	0	10	5	0	0	0	0	0	15				
	%	0%	1%	0%	1%	1%	1%	0%	0%	1%	1%	0%	0%	0%	0%	0%	1%				
	Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%				
	Total	**10**	**492**	**0**	**502**	**818**	**818**	**21**	**0**	**839**	**494**	**2**	**0**	**0**	**2**	**31**	**1343**				
	PHF	0.62	0.87	0	0.87	0.97	0.97	0.66	0	0.96	0.87	0.5	0	0	0.5	0.65	0.95				
	Approach %				37%	61%				62%	37%				0%	2%					
Peak 2	Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	N	0	0	0
Specified Period	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		0%	0%	
2:00 PM - 6:00 PM	Cars	4	681	1	686	563	557	5	0	562	697	16	5	0	21	9	1269	S	0	0	0
One Hour Peak	%	100%	81%	100%	81%	86%	86%	100%	0%	86%	81%	89%	100%	0%	91%	100%	83%		0%	0%	
4:30 PM - 5:30 PM	Light Goods Vehicles	0	145	0	145	79	79	0	0	79	147	2	0	0	2	0	226	W	0	0	0
	%	0%	17%	0%	17%	12%	12%	0%	0%	12%	17%	11%	0%	0%	9%	0%	15%		0%	0%	
	Buses	0	1	0	1	0	0	0	0	0	1	0	0	0	0	0	1		**0**	**0**	**0**
	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%				
	Single-Unit Trucks	0	13	0	13	9	9	0	0	9	13	0	0	0	0	0	22				
	%	0%	2%	0%	2%	1%	1%	0%	0%	1%	2%	0%	0%	0%	0%	0%	1%				
	Articulated Trucks	0	2	0	2	2	2	0	0	2	2	0	0	0	0	0	4				
	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%				
	Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%				
	Total	**4**	**842**	**1**	**847**	**653**	**647**	**5**	**0**	**652**	**860**	**18**	**5**	**0**	**23**	**9**	**1522**				
	PHF	0.33	0.9	0.25	0.9	0.9	0.89	0.42	0	0.89	0.9	0.75	0.42	0	0.64	0.56	0.9				
	Approach %				56%	43%				43%	57%				2%	1%					

STA. 1
TOTAL

Site Reference: 180040000798
Site ID: 000000000101
Location: ROUTE 126 SOUTH OF MAPLE ST.
Direction: ROAD TOTAL

File: SPDC1.prn
City: BELLINGHAM
County: SPEED NB&SB

TIME	MON 12	TUE 13	WED 14	THU 15	FRI	WKDAY AVG	SAT	SUN	WEEK AVG	TOTAL
01:00		66	60	62		62			62	188
02:00		27	36	35		32			32	98
03:00		28	22	24		24			24	74
04:00		41	53	44		46			46	138
05:00		141	126	115		127			127	382
06:00		422	427	405		418			418	1254
07:00		976	962	938		958			958	2876
08:00		1192	1211	1153		1185			1185	3556
09:00		1243	1263	1220		1242			1242	3726
10:00		980	1039			1009			1009	2019
11:00		969	988			978			978	1957
12:00	1027	1034	1120			1060			1060	3181
13:00	1091	1140	1128			1119			1119	3359
14:00	1117	1119	1152			1129			1129	3388
15:00	1232	1253	1229			1238			1238	3714
16:00	1395	1448	1402			1415			1415	4245
17:00	1374	1471	1393			1412			1412	4238
18:00	1423	1426	1439			1429			1429	4288
19:00	1154	1245	1176			1191			1191	3575
20:00	743	860	829			810			810	2432
21:00	549	657	567			591			591	1773
22:00	309	364	431			368			368	1104
23:00	197	179	238			204			204	614
24:00	114	141	143			132			132	398
TOTALS	11725	18422	18434	3996	0	18179	0	0	18179	52577
% AVG WKDY	64.4	101.3	101.4	21.9						
% AVG WEEK	64.4	101.3	101.4	21.9						
AM Times	12:00	09:00	09:00	09:00		09:00			09:00	
AM Peaks	1027	1243	1263	1220		1242			1242	
PM Times	18:00	17:00	18:00			18:00			18:00	
PM Peaks	1423	1471	1439			1429			1429	

U3

COMB AWD 18179

FAC 1.00

COMB ADT 18,200

MassDOT Highway Division
WEEKLY SUMMARY FOR LANE 1 Page: 1
Starting: 2/12/2018

STA. 1 NB

Site Reference: 180040000798
Site ID: 000000000101
Location: ROUTE 126 SOUTH OF MAPLE ST.
Direction: NORTH

File: SPDC1.prn
City: BELLINGHAM
County: SPEED NB&SB

TIME	MON 12	TUE 13	WED 14	THU 15	FRI	WKDAY AVG	SAT	SUN	WEEK AVG	TOTAL
01:00		31	27	28		28			28	86
02:00		10	15	17		14			14	42
03:00		15	9	14		12			12	38
04:00		24	31	25		26			26	80
05:00		98	92	77		89			89	267
06:00		291	294	285		290			290	870
07:00		688	671	659		672			672	2018
08:00		630	623	603		618			618	1856
09:00		637	656	647		646			646	1940
10:00		489	524			506			506	1013
11:00		479	516			497			497	995
12:00	536	515	577			542			542	1628
13:00	541	548	577			555			555	1666
14:00	609	584	607			600			600	1800
15:00	599	599	601			599			599	1799
16:00	633	687	671			663			663	1991
17:00	656	701	668			675			675	2025
18:00	744	728	710			727			727	2182
19:00	557	600	590			582			582	1747
20:00	395	440	398			411			411	1233
21:00	323	386	286			331			331	995
22:00	187	214	256			219			219	657
23:00	105	95	116			105			105	316
24:00	45	48	64			52			52	157
TOTALS	5930	9537	9579	2355	0	9459	0	0	9459	27401
% AVG WKDY	62.6	100.8	101.2	24.8						
% AVG WEEK	62.6	100.8	101.2	24.8						
AM Times	12:00	07:00	07:00	07:00		07:00			07:00	
AM Peaks	536	688	671	659		672			672	
PM Times	18:00	18:00	18:00			18:00			18:00	
PM Peaks	744	728	710			727			727	

STA. 1 SB

Site Reference: 180040000798
Site ID: 000000000101
Location: ROUTE 126 SOUTH OF MAPLE ST.
Direction: SOUTH

File: SPDC1.prn
City: BELLINGHAM
County: SPEED NB&SB

TIME	MON 12	TUE 13	WED 14	THU 15	FRI	WKDAY AVG	SAT	SUN	WEEK AVG	TOTAL
01:00		35	33	34		34			34	102
02:00		17	21	18		18			18	56
03:00		13	13	10		12			12	36
04:00		17	22	19		19			19	58
05:00		43	34	38		38			38	115
06:00		131	133	120		128			128	384
07:00		288	291	279		286			286	858
08:00		562	588	550		566			566	1700
09:00		606	607	573		595			595	1786
10:00		491	515			503			503	1006
11:00		490	472			481			481	962
12:00	491	519	543			517			517	1553
13:00	550	592	551			564			564	1693
14:00	508	535	545			529			529	1588
15:00	633	654	628			638			638	1915
16:00	762	761	731			751			751	2254
17:00	718	770	725			737			737	2213
18:00	679	698	729			702			702	2106
19:00	597	645	586			609			609	1828
20:00	348	420	431			399			399	1199
21:00	226	271	281			259			259	778
22:00	122	150	175			149			149	447
23:00	92	84	122			99			99	298
24:00	69	93	79			80			80	241
TOTALS	5795	8885	8855	1641	0	8713	0	0	8713	25176
% AVG WKDY	66.5	101.9	101.6	18.8						
% AVG WEEK	66.5	101.9	101.6	18.8						
AM Times	12:00	09:00	09:00	09:00		09:00			09:00	
AM Peaks	491	606	607	573		595			595	
PM Times	16:00	17:00	16:00			16:00			16:00	
PM Peaks	762	770	731			751			751	

STA. 2
TOTAL

Site Reference: 180040000668
Site ID: 000000000203
Location: MAPLE STREET EAST OF RTE. 126
Direction: ROAD TOTAL

File: SPDC2.prn
City: BELLINGHAM
County: SPEED EB&WB

TIME	MON 12	TUE 13	WED 14	THU 15	FRI	WKDAY AVG	SAT	SUN	WEEK AVG	TOTAL
01:00		44	47	50		47			47	141
02:00		15	8	21		14			14	44
03:00		37	9	9		18			18	55
04:00		32	33	36		33			33	101
05:00		76	93	71		80			80	240
06:00		243	267	242		250			250	752
07:00		669	671	620		653			653	1960
08:00		910	863	896		889			889	2669
09:00		821	803	776		800			800	2400
10:00		530	632			581			581	1162
11:00		476	608			542			542	1084
12:00	614	570	594			592			592	1778
13:00	641	663	691			665			665	1995
14:00	605	578	678			620			620	1861
15:00	763	756	771			763			763	2290
16:00	953	912	929			931			931	2794
17:00	919	1007	1004			976			976	2930
18:00	1074	961	957			997			997	2992
19:00	839	810	781			810			810	2430
20:00	384	456	432			424			424	1272
21:00	306	439	317			354			354	1062
22:00	175	293	281			249			249	749
23:00	136	129	159			141			141	424
24:00	80	75	82			79			79	237
TOTALS	7489	11502	11710	2721	0	11508	0	0	11508	33422
% AVG WKDY	65	99.9	101.7	23.6						
% AVG WEEK	65	99.9	101.7	23.6						
AM Times	12:00	08:00	08:00	08:00		08:00			08:00	
AM Peaks	614	910	863	896		889			889	
PM Times	18:00	17:00	17:00			18:00			18:00	
PM Peaks	1074	1007	1004			997			997	

45

COMB AWD 11508

FAC 1.03

COMB ADT 11,800

MassDOT Highway Division
WEEKLY SUMMARY FOR LANE 1
Starting: 2/12/2018

STA. 2 EB

Site Reference: 180040000668
Site ID: 000000000203
Location: MAPLE STREET EAST OF RTE. 126
Direction: EAST

File: SPDC2.prn
City: BELLINGHAM
County: SPEED EB&WB

TIME	MON 12	TUE 13	WED 14	THU 15	FRI	WKDAY AVG	SAT	SUN	WEEK AVG	TOTAL
01:00		19	25	25		23			23	69
02:00		6	3	8		5			5	17
03:00		18	3	5		8			8	26
04:00		19	16	21		18			18	56
05:00		47	56	39		47			47	142
06:00		127	153	125		135			135	405
07:00		356	345	320		340			340	1021
08:00		469	455	465		463			463	1389
09:00		431	407	402		413			413	1240
10:00		275	312			293			293	587
11:00		224	297			260			260	521
12:00	295	283	305			294			294	883
13:00	321	331	315			322			322	967
14:00	284	273	326			294			294	883
15:00	368	362	359			363			363	1089
16:00	417	431	427			425			425	1275
17:00	426	476	476			459			459	1378
18:00	503	445	457			468			468	1405
19:00	397	360	345			367			367	1102
20:00	189	214	211			204			204	614
21:00	145	210	143			166			166	498
22:00	82	135	124			113			113	341
23:00	61	60	68			63			63	189
24:00	36	35	35			35			35	106
TOTALS	3524	5606	5663	1410	0	5578	0	0	5578	16203
% AVG WKDY	63.1	100.5	101.5	25.2						
% AVG WEEK	63.1	100.5	101.5	25.2						
AM Times	12:00	08:00	08:00	08:00		08:00			08:00	
AM Peaks	295	469	455	465		463			463	
PM Times	18:00	17:00	17:00			18:00			18:00	
PM Peaks	503	476	476			468			468	

STA.2 WB

Site Reference: 180040000668
Site ID: 000000000203
Location: MAPLE STREET EAST OF RTE. 126
Direction: WEST

File: SPDC2.prn
City: BELLINGHAM
County: SPEED EB&WB

TIME	MON 12	TUE 13	WED 14	THU 15	FRI	WKDAY AVG	SAT	SUN	WEEK AVG	TOTAL
01:00		25	22	25		24			24	72
02:00		9	5	13		9			9	27
03:00		19	6	4		9			9	29
04:00		13	17	15		15			15	45
05:00		29	37	32		32			32	98
06:00		116	114	117		115			115	347
07:00		313	326	300		313			313	939
08:00		441	408	431		426			426	1280
09:00		390	396	374		386			386	1160
10:00		255	320			287			287	575
11:00		252	311			281			281	563
12:00	319	287	289			298			298	895
13:00	320	332	376			342			342	1028
14:00	321	305	352			326			326	978
15:00	395	394	412			400			400	1201
16:00	536	481	502			506			506	1519
17:00	493	531	528			517			517	1552
18:00	571	516	500			529			529	1587
19:00	442	450	436			442			442	1328
20:00	195	242	221			219			219	658
21:00	161	229	174			188			188	564
22:00	93	158	157			136			136	408
23:00	75	69	91			78			78	235
24:00	44	40	47			43			43	131
TOTALS	3965	5896	6047	1311	0	5921	0	0	5921	17219
% AVG WKDY	66.9	99.5	102.1	22.1						
% AVG WEEK	66.9	99.5	102.1	22.1						
AM Times	12:00	08:00	08:00	08:00		08:00			08:00	
AM Peaks	319	441	408	431		426			426	
PM Times	18:00	17:00	17:00			18:00			18:00	
PM Peaks	571	531	528			529			529	

MassDOT Highway Division
WEEKLY SUMMARY FOR LANE 1
Starting: 2/12/2018

STA. 3 SB

Site Reference: 180040000400
Site ID: 000000000302
Location: ROUTE 126 NORTH OF MAPLE ST.
Direction: SOUTH

File: CL302.prn
City: BELLINGHAM
County: CLASS SB

TIME	MON 12	TUE 13	WED 14	THU 15	FRI	WKDAY AVG	SAT	SUN	WEEK AVG	TOTAL
01:00		94	67	85		82			82	246
02:00		37	36	48		40			40	121
03:00		46	22	30		32			32	98
04:00		72	58	69		66			66	199
05:00		205	144	168		172			172	517
06:00		465	429	430		441			441	1324
07:00		622	880	624		708			708	2126
08:00		636	949	651		745			745	2236
09:00		688	927	645		753			753	2260
10:00		650	815			732			732	1465
11:00		763	787			775			775	1550
12:00	574	788	788			716			716	2150
13:00	694	847	762			767			767	2303
14:00	677	872	769			772			772	2318
15:00	704	966	685			785			785	2355
16:00	731	1016	683			810			810	2430
17:00	740	990	746			825			825	2476
18:00	703	1035	745			827			827	2483
19:00	665	905	780			783			783	2350
20:00	537	735	655			642			642	1927
21:00	469	580	512			520			520	1561
22:00	340	353	421			371			371	1114
23:00	243	181	269			231			231	693
24:00	146	139	176			153			153	461
TOTALS	7223	13685	13105	2750	0	12748	0	0	12748	36763
% AVG WKDY	56.6	107.3	102.8	21.5						
% AVG WEEK	56.6	107.3	102.8	21.5						
AM Times	12:00	12:00	08:00	08:00		11:00			11:00	
AM Peaks	574	788	949	651		775			775	
PM Times	17:00	18:00	19:00			18:00			18:00	
PM Peaks	740	1035	780			827			827	

Site Reference: 180040000798
Site ID: 000000000101
Location: ROUTE 126 SOUTH OF MAPLE ST.
Direction: ROAD TOTAL

STA.1
TOTAL

File: SPDC1.prn
City: BELLINGHAM
County: SPEED NB&SB

TIME	MON 12		TUE 13		WED 14		THU 15		FRI		SAT		SUN		WK TOT		WK AVG	
Lane 3	am	pm	am	pm	am	pm	am	pm	am	pm	am	pm	am	pm	am	pm	am	pm
00:15		271	18	309	17	317	14								49	897	16	299
00:30		275	16	287	8	275	17								41	837	13	279
00:45		267	22	289	19	286	19								60	842	20	280
01:00		278	10	255	16	250	12								38	783	12	261
01:15		270	10	273	12	281	17								39	824	13	274
01:30		294	3	278	7	281	7								17	853	5	284
01:45		283	4	278	13	286	7								24	847	8	282
02:00		270	10	290	4	304	4								18	864	6	288
02:15		276	5	286	4	295	9								18	857	6	285
02:30		299	8	283	7	297	5								20	879	6	293
02:45		315	8	355	5	307	6								19	977	6	325
03:00		342	7	329	6	330	4								17	1001	5	333
03:15		349	5	395	11	353	5								21	1097	7	365
03:30		361	6	357	8	336	6								20	1054	6	351
03:45		343	16	340	24	360	18								58	1043	19	347
04:00		342	14	356	10	353	15								39	1051	13	350
04:15		366	27	400	20	358	13								60	1124	20	374
04:30		359	19	365	28	356	26								73	1080	24	360
04:45		315	38	363	39	353	28								105	1031	35	343
05:00		334	57	343	39	326	48								144	1003	48	334
05:15		370	51	384	65	336	71								187	1090	62	363
05:30		356	87	378	85	378	70								242	1112	80	370
05:45		359	128	317	121	367	126								375	1043	125	347
06:00		338	156	347	156	358	138								450	1043	150	347
06:15		316	182	342	199	309	178								559	967	186	322
06:30		318	237	319	225	318	234								696	955	232	318
06:45		257	296	313	272	267	232								800	837	266	279
07:00		263	261	271	266	282	294								821	816	273	272
07:15		225	293	247	280	221	255								828	693	276	231
07:30		191	313	206	303	216	282								898	613	299	204
07:45		175	307	217	325	181	316								948	573	316	191
08:00		152	279	190	303	211	300								882	553	294	184
08:15		175	299	195	299	158	283								881	528	293	176
08:30		158	315	182	314	154	312								941	494	313	164
08:45		121	347	162	361	148	336								1044	431	348	143
09:00		95	282	118	289	107	289								860	320	286	106
09:15		105	258	103	282	122									540	330	270	110
09:30		74	254	95	268	114									522	283	261	94
09:45		62	235	90	239	99									474	251	237	83
10:00		68	233	76	250	96									483	240	241	80
10:15		68	223	66	245	69									468	203	234	67
10:30		61	251	42	250	58									501	161	250	53
10:45		41	246	40	253	61									499	142	249	47
11:00		27	249	31	240	50									489	108	244	36
11:15	247	33	231	46	263	47									741	126	247	42
11:30	257	35	261	41	229	38									747	114	249	38
11:45	256	25	255	30	322	23									833	78	277	26
12:00	267	21	287	24	306	35									860	80	286	26
TOTALS	11725		18422		18434		3996		0		0		0		52577		18158	
AM Times	11:15		8:15		8:00		8:00								8:00		8:00	
AM Peaks	1027		1243		1277		1231								3748		1248	
PM Times	17:15		16:00		17:15										15:45		15:45	
PM Peaks	1423		1484		1439										4298		1431	

MassDOT Highway Division
WEEKLY SUMMARY
Starting:2/12/2018

STA. 1 NB

Site Reference: 180040000798
Site ID: 000000000101
Location: ROUTE 126 SOUTH OF MAPLE ST.
Direction: NORTH

File: SPDC1.prn
City: BELLINGHAM
County: SPEED NB&SB

TIME	MON 12		TUE 13		WED 14		THU 15		FRI		SAT		SUN		WK TOT		WK AVG	
Lane 1	am	pm	am	pm	am	pm	am	pm	am	pm	am	pm	am	pm	am	pm	am	pm
00:15		129	9	156	11	150	6								26	435	8	145
00:30		133	6	136	4	147	8								18	416	6	138
00:45		140	12	140	9	166	11								32	446	10	148
01:00		139	4	116	3	114	3								10	369	3	123
01:15		145	1	137	3	147	5								9	429	3	143
01:30		163	2	142	4	141	7								13	446	4	148
01:45		150	0	154	6	152	3								9	456	3	152
02:00		151	7	151	2	167	2								11	469	3	156
02:15		154	2	141	2	156	5								9	451	3	150
02:30		141	3	137	3	150	1								7	428	2	142
02:45		152	4	170	1	155	5								10	477	3	159
03:00		152	6	151	3	140	3								12	443	4	147
03:15		164	4	178	7	168	4								15	510	5	170
03:30		158	5	154	5	163	5								15	475	5	158
03:45		152	7	181	12	173	5								24	506	8	168
04:00		159	8	174	7	167	11								26	500	8	166
04:15		186	19	187	11	175	11								41	548	13	182
04:30		169	14	163	20	166	15								49	498	16	166
04:45		143	27	180	33	183	23								83	506	27	168
05:00		158	38	171	28	144	28								94	473	31	157
05:15		199	37	196	37	170	48								122	565	40	188
05:30		195	62	190	60	175	50								172	560	57	186
05:45		173	94	167	91	165	94								279	505	93	168
06:00		177	98	175	106	200	93								297	552	99	184
06:15		154	130	170	152	153	129								411	477	137	159
06:30		166	169	156	164	155	166								499	477	166	159
06:45		111	215	145	197	135	166								578	391	192	130
07:00		126	174	129	158	147	198								530	402	176	134
07:15		113	167	121	160	112	141								468	346	156	115
07:30		107	158	109	160	99	151								469	315	156	105
07:45		83	150	100	162	79	159								471	262	157	87
08:00		92	155	110	141	108	152								448	310	149	103
08:15		103	153	126	165	75	159								477	304	159	101
08:30		90	185	108	180	87	173								538	285	179	95
08:45		68	153	87	174	65	158								485	220	161	73
09:00		62	146	65	137	59	157								440	186	146	62
09:15		74	123	62	140	70									263	206	131	68
09:30		40	117	60	112	74									229	174	114	58
09:45		32	126	50	131	61									257	143	128	47
10:00		41	123	42	141	51									264	134	132	44
10:15		39	110	33	123	35									233	107	116	35
10:30		31	126	24	128	22									254	77	127	25
10:45		22	123	23	137	32									260	77	130	25
11:00		13	120	15	128	27									248	55	124	18
11:15	123	11	118	13	138	20									379	44	126	14
11:30	138	12	133	12	113	13									384	37	128	12
11:45	128	12	128	9	175	12									431	33	143	11
12:00	147	10	136	14	151	19									434	43	144	14
TOTALS	5930		9537		9579		2355		0		0		0		27401		9437	
AM Times	11:15		6:30		6:30		6:30								6:30		6:30	
AM Peaks	536		725		679		671								2075		690	
PM Times	17:15		16:45		17:15										17:15		17:15	
PM Peaks	744		737		710										2182		726	

STA. 1 SB

Site Reference: 180040000798
Site ID: 000000000101
Location: ROUTE 126 SOUTH OF MAPLE ST.
Direction: SOUTH

File: SPDC1.prn
City: BELLINGHAM
County: SPEED NB&SB

TIME	MON 12		TUE 13		WED 14		THU 15		FRI		SAT		SUN		WK TOT		WK AVG	
Lane 2	am	pm	am	pm	am	pm	am	pm	am	pm	am	pm	am	pm	am	pm	am	pm
00:15		142	9	153	6	167	8								23	462	7	154
00:30		142	10	151	4	128	9								23	421	7	140
00:45		127	10	149	10	120	8								28	396	9	132
01:00		139	6	139	13	136	9								28	414	9	138
01:15		125	9	136	9	134	12								30	395	10	131
01:30		131	1	136	3	140	0								4	407	1	135
01:45		133	4	124	7	134	4								15	391	5	130
02:00		119	3	139	2	137	2								7	395	2	131
02:15		122	3	145	2	139	4								9	406	3	135
02:30		158	5	146	4	147	4								13	451	4	150
02:45		163	4	185	4	152	1								9	500	3	166
03:00		190	1	178	3	190	1								5	558	1	186
03:15		185	1	217	4	185	1								6	587	2	195
03:30		203	1	203	3	173	1								5	579	1	193
03:45		191	9	159	12	187	13								34	537	11	179
04:00		183	6	182	3	186	4								13	551	4	183
04:15		180	8	213	9	183	2								19	576	6	192
04:30		190	5	202	8	190	11								24	582	8	194
04:45		172	11	183	6	170	5								22	525	7	175
05:00		176	19	172	11	182	20								50	530	16	176
05:15		171	14	188	28	166	23								65	525	21	175
05:30		161	25	188	25	203	20								70	552	23	184
05:45		186	34	150	30	202	32								96	538	32	179
06:00		161	58	172	50	158	45								153	491	51	163
06:15		162	52	172	47	156	49								148	490	49	163
06:30		152	68	163	61	163	68								197	478	65	159
06:45		146	81	168	75	132	66								222	446	74	148
07:00		137	87	142	108	135	96								291	414	97	138
07:15		112	126	126	120	109	114								360	347	120	115
07:30		84	155	97	143	117	131								429	298	143	99
07:45		92	157	117	163	102	157								477	311	159	103
08:00		60	124	80	162	103	148								434	243	144	81
08:15		72	146	69	134	83	124								404	224	134	74
08:30		68	130	74	134	67	139								403	209	134	69
08:45		53	194	75	187	83	178								559	211	186	70
09:00		33	136	53	152	48	132								420	134	140	44
09:15		31	135	41	142	52									277	124	138	41
09:30		34	137	35	156	40									293	109	146	36
09:45		30	109	40	108	38									217	108	108	36
10:00		27	110	34	109	45									219	106	109	35
10:15		29	113	33	122	34									235	96	117	32
10:30		30	125	18	122	36									247	84	123	28
10:45		19	123	17	116	29									239	65	119	21
11:00		14	129	16	112	23									241	53	120	17
11:15	124	22	113	33	125	27									362	82	120	27
11:30	119	23	128	29	116	25									363	77	121	25
11:45	128	13	127	21	147	11									402	45	134	15
12:00	120	11	151	10	155	16									426	37	142	12
TOTALS	5795		8885		8855		1641		0		0		0		25176		8689	
AM Times	11:15		8:15		8:45		8:00								8:00		8:45	
AM Peaks	491		606		637		589								1800		610	
PM Times	15:00		14:45		17:00										15:00		15:00	
PM Peaks	769		783		753										2261		753	

STA. 2
TOTAL

Site Reference: 180040000668
Site ID: 000000000203
Location: MAPLE STREET EAST OF RTE. 126
Direction: ROAD TOTAL

File: SPDC2.prn
City: BELLINGHAM
County: SPEED EB&WB

TIME	MON 12		TUE 13		WED 14		THU 15		FRI		SAT		SUN		WK TOT		WK AVG	
Lane 3	am	pm	am	pm	am	pm	am	pm	am	pm	am	pm	am	pm	am	pm	am	pm
00:15		154	14	193	20	184	12								46	531	15	177
00:30		169	14	173	11	160	6								31	502	10	167
00:45		162	5	145	5	179	14								24	486	8	162
01:00		156	11	152	11	168	18								40	476	13	158
01:15		130	0	134	0	161	3								3	425	1	141
01:30		166	6	180	3	169	12								21	515	7	171
01:45		154	6	145	5	175	6								17	474	5	158
02:00		155	3	119	0	173	0								3	447	1	149
02:15		170	3	148	0	195	0								3	513	1	171
02:30		188	10	166	6	187	0								16	541	5	180
02:45		191	23	219	0	188	6								29	598	9	199
03:00		214	1	223	3	201	3								7	638	2	212
03:15		222	2	218	9	227	6								17	667	5	222
03:30		246	0	232	2	215	9								11	693	3	231
03:45		258	6	223	12	234	3								21	715	7	238
04:00		227	24	239	10	253	18								52	719	17	239
04:15		243	10	249	22	264	6								38	756	12	252
04:30		199	24	247	19	245	15								58	691	19	230
04:45		240	21	249	28	238	19								68	727	22	242
05:00		237	21	262	24	257	31								76	756	25	252
05:15		299	30	259	36	216	37								103	774	34	258
05:30		259	62	236	75	235	48								185	730	61	243
05:45		239	70	261	60	256	77								207	756	69	252
06:00		277	81	205	96	250	80								257	732	85	244
06:15		260	114	249	91	243	105								310	752	103	250
06:30		202	180	202	168	204	161								509	608	169	202
06:45		181	189	201	190	164	158								537	546	179	182
07:00		196	186	158	222	170	196								604	524	201	174
07:15		136	204	136	163	124	193								560	396	186	132
07:30		84	240	113	234	125	223								697	322	232	107
07:45		72	237	115	225	76	251								713	263	237	87
08:00		92	229	92	241	107	229								699	291	233	97
08:15		90	202	125	196	90	174								572	305	190	101
08:30		79	211	126	238	85	208								657	290	219	96
08:45		85	224	100	207	83	208								639	268	213	89
09:00		52	184	88	162	59	186								532	199	177	66
09:15		60	147	100	190	75									337	235	168	78
09:30		32	126	64	145	64									271	160	135	53
09:45		45	127	65	137	85									264	195	132	65
10:00		38	130	64	160	57									290	159	145	53
10:15		62	105	50	163	65									268	177	134	59
10:30		32	130	28	141	35									271	95	135	31
10:45		21	120	33	167	33									287	87	143	29
11:00		21	121	18	137	26									258	65	129	21
11:15	157	10	136	21	144	23									437	54	145	18
11:30	153	29	131	18	150	17									434	64	144	21
11:45	135	25	146	17	132	24									413	66	137	22
12:00	169	16	157	19	168	18									494	53	164	17
TOTALS	7489		11502		11710		2721		0		0		0		33422		11484	
AM Times	11:15		7:15		7:45		7:15								7:30		7:30	
AM Peaks	614		910		900		896								2681		892	
PM Times	17:15		17:00		16:15										17:00		17:00	
PM Peaks	1074		1018		1004										3016		1005	

MassDOT Highway Division
WEEKLY SUMMARY
Starting:2/12/2018

STA. 2 EB

Site Reference: 180040000668
Site ID: 000000000203
Location: MAPLE STREET EAST OF RTE. 126
Direction: EAST

File: SPDC2.prn
City: BELLINGHAM
County: SPEED EB&WB

TIME	MON 12		TUE 13		WED 14		THU 15		FRI		SAT		SUN		WK TOT		WK AVG	
Lane 1	am	pm	am	pm	am	pm	am	pm	am	pm	am	pm	am	pm	am	pm	am	pm
00:15		78	6	97	10	81	6								22	256	7	85
00:30		92	6	81	7	76	4								17	249	5	83
00:45		76	2	78	1	85	6								9	239	3	79
01:00		75	5	75	7	73	9								21	223	7	74
01:15		61	0	62	0	74	1								1	197	0	65
01:30		77	2	85	1	83	5								8	245	2	81
01:45		69	3	68	2	84	2								7	221	2	73
02:00		77	1	58	0	85	0								1	220	0	73
02:15		78	1	71	0	88	0								1	237	0	79
02:30		95	5	78	2	89	0								7	262	2	87
02:45		93	12	106	0	91	3								15	290	5	96
03:00		102	0	107	1	91	2								3	300	1	100
03:15		95	2	101	5	110	4								11	306	3	102
03:30		110	0	104	1	94	5								6	308	2	102
03:45		109	3	103	4	109	1								8	321	2	107
04:00		103	14	123	6	114	11								31	340	10	113
04:15		113	6	118	13	119	3								22	350	7	116
04:30		98	14	112	12	112	8								34	322	11	107
04:45		109	14	113	17	110	11								42	332	14	110
05:00		106	13	133	14	135	17								44	374	14	124
05:15		146	14	118	19	89	20								53	353	17	117
05:30		126	31	109	42	109	24								97	344	32	114
05:45		114	38	126	36	131	39								113	371	37	123
06:00		117	44	92	56	128	42								142	337	47	112
06:15		123	68	108	49	104	63								180	335	60	111
06:30		94	97	93	88	90	84								269	277	89	92
06:45		86	99	91	105	74	74								278	251	92	83
07:00		94	92	68	103	77	99								294	239	98	79
07:15		71	113	66	85	64	103								301	201	100	67
07:30		45	124	50	125	60	120								369	155	123	51
07:45		34	119	57	124	39	132								375	130	125	43
08:00		39	113	41	121	48	110								344	128	114	42
08:15		42	107	58	106	45	88								301	145	100	48
08:30		38	107	61	112	39	106								325	138	108	46
08:45		38	117	48	104	37	109								330	123	110	41
09:00		27	100	43	85	22	99								284	92	94	30
09:15		31	80	51	102	31									182	113	91	37
09:30		12	66	26	72	29									138	67	69	22
09:45		21	60	31	69	39									129	91	64	30
10:00		18	69	27	69	25									138	70	69	23
10:15		28	50	23	82	28									132	79	66	26
10:30		13	59	14	66	14									125	41	62	13
10:45		10	53	15	84	14									137	39	68	13
11:00		10	62	8	65	12									127	30	63	10
11:15	77	4	65	11	75	9									217	24	72	8
11:30	75	13	61	8	81	8									217	29	72	9
11:45	61	11	79	6	62	11									202	28	67	9
12:00	82	8	78	10	87	7									247	25	82	8
TOTALS	3524		5606		5663		1410		0		0		0		16203		5551	
AM Times	11:15		7:15		7:30		7:15								7:15		7:15	
AM Peaks	295		469		476		465								1389		462	
PM Times	17:15		17:00		16:15										17:00		17:00	
PM Peaks	503		486		476										1442		478	

STA.2 WB

Site Reference: 180040000668
Site ID: 000000000203
Location: MAPLE STREET EAST OF RTE. 126
Direction: WEST

File: SPDC2.prn
City: BELLINGHAM
County: SPEED EB&WB

TIME	MON 12		TUE 13		WED 14		THU 15		FRI		SAT		SUN		WK TOT		WK AVG	
Lane 2	am	pm	am	pm	am	pm	am	pm	am	pm	am	pm	am	pm	am	pm	am	pm
00:15		76	8	96	10	103	6								24	275	8	91
00:30		77	8	92	4	84	2								14	253	4	84
00:45		86	3	67	4	94	8								15	247	5	82
01:00		81	6	77	4	95	9								19	253	6	84
01:15		69	0	72	0	87	2								2	228	0	76
01:30		89	4	95	2	86	7								13	270	4	90
01:45		85	3	77	3	91	4								10	253	3	84
02:00		78	2	61	0	88	0								2	227	0	75
02:15		92	2	77	0	107	0								2	276	0	92
02:30		93	5	88	4	98	0								9	279	3	93
02:45		98	11	113	0	97	3								14	308	4	102
03:00		112	1	116	2	110	1								4	338	1	112
03:15		127	0	117	4	117	2								6	361	2	120
03:30		136	0	128	1	121	4								5	385	1	128
03:45		149	3	120	8	125	2								13	394	4	131
04:00		124	10	116	4	139	7								21	379	7	126
04:15		130	4	131	9	145	3								16	406	5	135
04:30		101	10	135	7	133	7								24	369	8	123
04:45		131	7	136	11	128	8								26	395	8	131
05:00		131	8	129	10	122	14								32	382	10	127
05:15		153	16	141	17	127	17								50	421	16	140
05:30		133	31	127	33	126	24								88	386	29	128
05:45		125	32	135	24	125	38								94	385	31	128
06:00		160	37	113	40	122	38								115	395	38	131
06:15		137	46	141	42	139	42								130	417	43	139
06:30		108	83	109	80	114	77								240	331	80	110
06:45		95	90	110	85	90	84								259	295	86	98
07:00		102	94	90	119	93	97								310	285	103	95
07:15		65	91	70	78	60	90								259	195	86	65
07:30		39	116	63	109	65	103								328	167	109	55
07:45		38	118	58	101	37	119								338	133	112	44
08:00		53	116	51	120	59	119								355	163	118	54
08:15		48	95	67	90	45	86								271	160	90	53
08:30		41	104	65	126	46	102								332	152	110	50
08:45		47	107	52	103	46	99								309	145	103	48
09:00		25	84	45	77	37	87								248	107	82	35
09:15		29	67	49	88	44									155	122	77	40
09:30		20	60	38	73	35									133	93	66	31
09:45		24	67	34	68	46									135	104	67	34
10:00		20	61	37	91	32									152	89	76	29
10:15		34	55	27	81	37									136	98	68	32
10:30		19	71	14	75	21									146	54	73	18
10:45		11	67	18	83	19									150	48	75	16
11:00		11	59	10	72	14									131	35	65	11
11:15	80	6	71	10	69	14									220	30	73	10
11:30	78	16	70	10	69	9									217	35	72	11
11:45	74	14	67	11	70	13									211	38	70	12
12:00	87	8	79	9	81	11									247	28	82	9
TOTALS	3965		5896		6047		1311		0		0		0		17219		5895	
AM Times	11:15		7:30		8:00		7:15								7:45		7:45	
AM Peaks	319		445		439		431								1296		430	
PM Times	17:15		16:30		16:00										17:15		17:15	
PM Peaks	571		541		545										1587		527	

MassDOT Highway Division
WEEKLY SUMMARY
Starting:2/12/2018

STA. 3 SB

Site Reference: 180040000400
Site ID: 000000000302
Location: ROUTE 126 NORTH OF MAPLE ST.
Direction: SOUTH

File: SPD302.prn
City: BELLINGHAM
County: SPEED SB

TIME	MON 12		TUE 13		WED 14		THU 15		FRI		SAT		SUN		WK TOT		WK AVG	
Lane 1	am	pm	am	pm	am	pm	am	pm	am	pm	am	pm	am	pm	am	pm	am	pm
00:15		176	28	219	17	197	20								65	592	21	197
00:30		188	22	230	12	191	18								52	609	17	203
00:45		172	30	192	24	195	30								84	559	28	186
01:00		158	14	202	14	179	17								45	539	15	179
01:15		183	11	204	13	176	21								45	563	15	187
01:30		165	5	218	6	215	11								22	598	7	199
01:45		184	8	208	13	188	11								32	580	10	193
02:00		145	13	232	4	181	5								22	558	7	186
02:15		175	7	239	4	168	13								24	582	8	194
02:30		169	13	224	7	153	5								25	546	8	182
02:45		174	13	247	7	175	6								26	596	8	198
03:00		186	13	252	4	189	6								23	627	7	209
03:15		177	7	252	9	160	6								22	589	7	196
03:30		177	13	245	10	187	16								39	609	13	203
03:45		198	25	252	27	169	24								76	619	25	206
04:00		179	27	262	12	167	23								62	608	20	202
04:15		193	41	274	23	186	24								88	653	29	217
04:30		176	42	221	28	189	31								101	586	33	195
04:45		185	51	251	51	181	52								154	617	51	205
05:00		186	71	234	42	190	61								174	610	58	203
05:15		169	74	263	62	176	77								213	608	71	202
05:30		174	116	259	85	175	93								294	608	98	202
05:45		199	136	273	136	217	126								398	689	132	229
06:00		161	139	239	145	176	134								418	576	139	192
06:15		178	134	231	187	209	158								479	618	159	206
06:30		160	174	229	225	190	142								541	579	180	193
06:45		156	164	236	229	171	175								568	563	189	187
07:00		171	150	199	228	204	149								527	574	175	191
07:15		146	159	204	239	156	141								539	506	179	168
07:30		147	158	186	252	168	173								583	501	194	167
07:45		123	147	172	231	152	158								536	447	178	149
08:00		121	172	168	220	177	179								571	466	190	155
08:15		136	164	158	243	134	149								556	428	185	142
08:30		120	175	164	241	141	178								594	425	198	141
08:45		108	175	146	227	136	173								575	390	191	130
09:00		105	174	112	209	100	145								528	317	176	105
09:15		114	140	110	202	116									342	340	171	113
09:30		80	169	92	220	97									389	269	194	89
09:45		69	184	77	192	112									376	258	188	86
10:00		77	157	73	196	96									353	246	176	82
10:15		80	179	59	194	69									373	208	186	69
10:30		72	176	47	208	65									384	184	192	61
10:45		57	205	42	196	76									401	175	200	58
11:00		34	200	33	188	59									388	126	194	42
11:15	140	43	182	42	201	56									523	141	174	47
11:30	156	42	208	41	173	46									537	129	179	43
11:45	150	34	182	32	222	27									554	93	184	31
12:00	128	27	209	24	190	47									527	98	175	32
TOTALS	7223		13625		13052		2750		0		0		0		36650		12686	
AM Times	11:15		10:45		7:00		8:00								8:00		10:15	
AM Peaks	574		795		950		679								2296		772	
PM Times	15:30		17:15		17:45										17:00		17:00	
PM Peaks	747		1034		792										2515		836	

MassDOT Highway Division
SPEED SUMMARY
Mon 2/12/2018

STA. 1 NB

Site Reference: 180040000798
Site ID: 000000000101
Location: ROUTE 126 SOUTH OF MAPLE ST.
Direction: NORTH
Lane: 1

File: SPDC1.prn
City: BELLINGHAM
County: SPEED NB&SB

TIME	19	24	29	34	39	44	49	54	59	64	69	74	79	85	86+	Tota
12:00	14	37	134	217	114	18	2	0	0	0	0	0	0	0	0	536
13:00	69	60	129	180	91	9	3	0	0	0	0	0	0	0	0	541
14:00	34	53	139	232	128	20	3	0	0	0	0	0	0	0	0	609
15:00	86	92	146	172	87	16	0	0	0	0	0	0	0	0	0	599
16:00	81	72	128	224	108	19	1	0	0	0	0	0	0	0	0	633
17:00	56	134	206	184	71	4	1	0	0	0	0	0	0	0	0	656
18:00	363	175	117	66	20	3	0	0	0	0	0	0	0	0	0	744
19:00	33	73	167	176	91	17	0	0	0	0	0	0	0	0	0	557
20:00	4	35	67	160	103	25	1	0	0	0	0	0	0	0	0	395
21:00	12	9	51	130	105	14	2	0	0	0	0	0	0	0	0	323
22:00	0	0	11	67	86	21	2	0	0	0	0	0	0	0	0	187
23:00	0	3	9	33	44	14	2	0	0	0	0	0	0	0	0	105
24:00	0	0	4	8	20	11	1	1	0	0	0	0	0	0	0	45
DAY TOTAL	752	743	1308	1849	1068	191	18	1	0	0	0	0	0	0	0	5930
PERCENTS	12.7%	12.6%	22.1%	31.1%	18.0%	3.2%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100%

Statistical Information...

15th Percentile Speed
19.9 mph

85th Percentile Speed
35.8 mph

Median Speed
29.4 mph

Average Speed
27.6 mph

10 MPH Pace Speed
24 mph to 34 mph
3157 vehicles in pace
Representing 53.2% of the total vehicles

Vehicles > 65 MPH
0
0.0%

Site Reference: 180040000798
Site ID: 000000000101
Location: ROUTE 126 SOUTH OF MAPLE ST.
Direction: NORTH
Lane: 1

File: SPDC1.prn
City: BELLINGHAM
County: SPEED NB&SB

TIME	19	24	29	34	39	44	49	54	59	64	69	74	79	85	86+	Tota
01:00	0	1	5	6	14	3	2	0	0	0	0	0	0	0	0	31
02:00	0	0	0	3	3	4	0	0	0	0	0	0	0	0	0	10
03:00	0	0	0	7	4	2	2	0	0	0	0	0	0	0	0	15
04:00	0	0	3	7	4	8	0	1	1	0	0	0	0	0	0	24
05:00	0	0	1	14	44	32	7	0	0	0	0	0	0	0	0	98
06:00	2	5	35	72	117	53	5	2	0	0	0	0	0	0	0	291
07:00	84	101	154	185	137	24	2	1	0	0	0	0	0	0	0	688
08:00	142	114	112	156	90	14	2	0	0	0	0	0	0	0	0	630
09:00	154	117	183	114	60	9	0	0	0	0	0	0	0	0	0	637
10:00	16	47	107	158	139	21	0	1	0	0	0	0	0	0	0	489
11:00	14	33	110	174	123	24	1	0	0	0	0	0	0	0	0	479
12:00	13	14	100	228	139	19	2	0	0	0	0	0	0	0	0	515
13:00	34	40	135	191	130	18	0	0	0	0	0	0	0	0	0	548
14:00	17	20	104	258	156	28	1	0	0	0	0	0	0	0	0	584
15:00	76	94	146	166	100	14	3	0	0	0	0	0	0	0	0	599
16:00	97	105	209	179	80	16	1	0	0	0	0	0	0	0	0	687
17:00	140	106	178	182	83	11	1	0	0	0	0	0	0	0	0	701
18:00	156	135	188	165	75	8	1	0	0	0	0	0	0	0	0	728
19:00	111	113	134	149	80	13	0	0	0	0	0	0	0	0	0	600
20:00	6	27	107	167	114	17	2	0	0	0	0	0	0	0	0	440
21:00	19	27	68	128	114	28	1	1	0	0	0	0	0	0	0	386
22:00	0	1	25	74	83	27	3	0	1	0	0	0	0	0	0	214
23:00	0	0	7	26	35	22	3	2	0	0	0	0	0	0	0	95
24:00	0	0	3	13	23	8	1	0	0	0	0	0	0	0	0	48
DAY TOTAL	1081	1100	2114	2822	1947	423	40	8	2	0	0	0	0	0	0	9537
PERCENTS	11.4%	11.6%	22.2%	29.6%	20.4%	4.4%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100%

Statistical Information...

15th Percentile Speed
20.6 mph

85th Percentile Speed
36.6 mph

Median Speed
29.8 mph

Average Speed
28.3 mph

10 MPH Pace Speed
24 mph to 34 mph
4936 vehicles in pace
Representing 51.7% of the total vehicles

Vehicles > 65 MPH
0
0.0%

Site Reference: 180040000798
Site ID: 000000000101
Location: ROUTE 126 SOUTH OF MAPLE ST.
Direction: NORTH
Lane: 1

File: SPDC1.prn
City: BELLINGHAM
County: SPEED NB&SB

TIME	19	24	29	34	39	44	49	54	59	64	69	74	79	85	86+	Tota
01:00	0	0	2	4	15	5	1	0	0	0	0	0	0	0	0	27
02:00	0	0	1	4	5	2	2	0	1	0	0	0	0	0	0	15
03:00	0	0	1	3	5	0	0	0	0	0	0	0	0	0	0	9
04:00	0	0	1	7	11	10	1	1	0	0	0	0	0	0	0	31
05:00	0	0	6	12	42	25	5	2	0	0	0	0	0	0	0	92
06:00	1	1	27	78	129	50	6	2	0	0	0	0	0	0	0	294
07:00	89	78	170	172	125	33	4	0	0	0	0	0	0	0	0	671
08:00	157	121	123	133	73	13	2	1	0	0	0	0	0	0	0	623
09:00	200	82	147	149	68	9	1	0	0	0	0	0	0	0	0	656
10:00	40	50	113	182	108	28	3	0	0	0	0	0	0	0	0	524
11:00	23	35	121	205	117	15	0	0	0	0	0	0	0	0	0	516
12:00	40	27	118	239	125	24	2	0	0	0	0	0	0	0	2	577
13:00	59	63	154	196	84	19	1	1	0	0	0	0	0	0	0	577
14:00	49	49	122	228	120	33	6	0	0	0	0	0	0	0	0	607
15:00	26	46	145	208	145	28	3	0	0	0	0	0	0	0	0	601
16:00	48	81	166	235	115	24	2	0	0	0	0	0	0	0	0	671
17:00	96	101	162	183	107	15	4	0	0	0	0	0	0	0	0	668
18:00	162	129	171	179	63	5	1	0	0	0	0	0	0	0	0	710
19:00	37	100	148	187	103	14	1	0	0	0	0	0	0	0	0	590
20:00	13	12	71	169	109	20	4	0	0	0	0	0	0	0	0	398
21:00	1	3	44	132	89	16	0	1	0	0	0	0	0	0	0	286
22:00	1	8	26	96	102	20	3	0	0	0	0	0	0	0	0	256
23:00	0	2	12	51	39	10	2	0	0	0	0	0	0	0	0	116
24:00	0	3	4	16	24	14	2	1	0	0	0	0	0	0	0	64
DAY TOTAL	1042	991	2055	3068	1923	432	56	9	1	0	0	0	0	0	2	9579
PERCENTS	10.9%	10.4%	21.5%	32.1%	20.1%	4.5%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100%

Statistical Information...

15th Percentile Speed
21.0 mph

Median Speed
30.2 mph

10 MPH Pace Speed
24 mph to 34 mph
5123 vehicles in pace
Representing 53.4% of the total vehicles

85th Percentile Speed
36.6 mph

Average Speed
28.6 mph

Vehicles > 65 MPH
2
0.0%

Site Reference: 180040000798
Site ID: 000000000101
Location: ROUTE 126 SOUTH OF MAPLE ST.
Direction: NORTH
Lane: 1

File: SPDC1.prn
City: BELLINGHAM
County: SPEED NB&SB

TIME	19	24	29	34	39	44	49	54	59	64	69	74	79	85	86+	Tota
01:00	0	0	1	8	13	5	1	0	0	0	0	0	0	0	0	28
02:00	0	0	1	4	6	3	3	0	0	0	0	0	0	0	0	17
03:00	0	0	0	4	3	6	0	1	0	0	0	0	0	0	0	14
04:00	0	0	1	7	9	6	2	0	0	0	0	0	0	0	0	25
05:00	0	0	3	14	32	21	7	0	0	0	0	0	0	0	0	77
06:00	3	10	29	82	116	36	6	1	0	0	0	0	0	0	2	285
07:00	116	83	133	176	120	28	3	0	0	0	0	0	0	0	0	659
08:00	166	84	139	116	81	16	1	0	0	0	0	0	0	0	0	603
09:00	190	128	140	130	54	2	2	1	0	0	0	0	0	0	0	647
DAY TOTAL	475	305	447	541	434	123	25	3	0	0	0	0	0	0	2	2355
PERCENTS	20.2%	13.0%	19.0%	23.0%	18.5%	5.2%	1.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100%

Statistical Information...

15th Percentile Speed
14.1 mph

Median Speed
28.5 mph

10 MPH Pace Speed
24 mph to 34 mph
988 vehicles in pace
Representing 41.9% of the total vehicles

85th Percentile Speed
36.7 mph

Average Speed
26.5 mph

Vehicles > 65 MPH
2
0.1%

STA. 1 SB

Site Reference: 180040000798
Site ID: 000000000101
Location: ROUTE 126 SOUTH OF MAPLE ST.
Direction: SOUTH
Lane: 2

File: SPDC1.prn
City: BELLINGHAM
County: SPEED NB&SB

TIME	19	24	29	34	39	44	49	54	59	64	69	74	79	85	86+	Tota
12:00	4	19	176	232	58	2	0	0	0	0	0	0	0	0	0	491
13:00	23	31	191	259	44	2	0	0	0	0	0	0	0	0	0	550
14:00	4	13	187	244	58	2	0	0	0	0	0	0	0	0	0	508
15:00	17	66	250	246	50	4	0	0	0	0	0	0	0	0	0	633
16:00	5	29	297	341	88	1	0	0	1	0	0	0	0	0	0	762
17:00	62	54	249	300	50	2	1	0	0	0	0	0	0	0	0	718
18:00	180	97	213	162	25	1	0	1	0	0	0	0	0	0	0	679
19:00	21	32	237	260	46	1	0	0	0	0	0	0	0	0	0	597
20:00	2	1	133	166	44	1	1	0	0	0	0	0	0	0	0	348
21:00	2	9	43	132	37	3	0	0	0	0	0	0	0	0	0	226
22:00	3	2	16	50	44	7	0	0	0	0	0	0	0	0	0	122
23:00	0	0	6	58	23	5	0	0	0	0	0	0	0	0	0	92
24:00	0	0	5	25	32	6	1	0	0	0	0	0	0	0	0	69
DAY TOTAL	323	353	2003	2475	599	37	3	1	1	0	0	0	0	0	0	5795
PERCENTS	5.6%	6.1%	34.6%	42.8%	10.3%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100%

Statistical Information...

15th Percentile Speed
24.5 mph

85th Percentile Speed
33.5 mph

Median Speed
29.5 mph

Average Speed
28.5 mph

10 MPH Pace Speed
24 mph to 34 mph
4478 vehicles in pace
Representing 77.2% of the total vehicles

Vehicles > 65 MPH
0
0.0%

Site Reference: 180040000798
Site ID: 000000000101
Location: ROUTE 126 SOUTH OF MAPLE ST.
Direction: SOUTH
Lane: 2

File: SPDC1.prn
City: BELLINGHAM
County: SPEED NB&SB

TIME	19	24	29	34	39	44	49	54	59	64	69	74	79	85	86+	Tota
01:00	0	2	2	15	13	2	1	0	0	0	0	0	0	0	0	35
02:00	0	0	2	6	8	1	0	0	0	0	0	0	0	0	0	17
03:00	0	0	4	6	3	0	0	0	0	0	0	0	0	0	0	13
04:00	0	1	0	5	7	3	1	0	0	0	0	0	0	0	0	17
05:00	0	1	4	16	17	4	1	0	0	0	0	0	0	0	0	43
06:00	0	4	24	64	35	4	0	0	0	0	0	0	0	0	0	131
07:00	1	6	67	136	72	6	0	0	0	0	0	0	0	0	0	288
08:00	22	35	193	228	79	5	0	0	0	0	0	0	0	0	0	562
09:00	11	38	213	284	60	0	0	0	0	0	0	0	0	0	0	606
10:00	9	18	140	255	63	6	0	0	0	0	0	0	0	0	0	491
11:00	4	9	142	250	79	4	2	0	0	0	0	0	0	0	0	490
12:00	6	24	129	283	70	5	1	1	0	0	0	0	0	0	0	519
13:00	5	32	195	286	72	2	0	0	0	0	0	0	0	0	0	592
14:00	6	9	159	274	81	4	2	0	0	0	0	0	0	0	0	535
15:00	14	40	245	305	50	0	0	0	0	0	0	0	0	0	0	654
16:00	16	55	272	329	88	1	0	0	0	0	0	0	0	0	0	761
17:00	7	41	291	355	70	6	0	0	0	0	0	0	0	0	0	770
18:00	21	31	260	346	39	1	0	0	0	0	0	0	0	0	0	698
19:00	39	40	287	256	22	1	0	0	0	0	0	0	0	0	0	645
20:00	0	4	114	240	59	3	0	0	0	0	0	0	0	0	0	420
21:00	1	4	54	147	60	5	0	0	0	0	0	0	0	0	0	271
22:00	1	3	15	83	47	1	0	0	0	0	0	0	0	0	0	150
23:00	0	0	7	41	30	4	2	0	0	0	0	0	0	0	0	84
24:00	0	0	4	50	29	7	2	1	0	0	0	0	0	0	0	93
DAY TOTAL	163	397	2823	4260	1153	75	12	2	0	0	0	0	0	0	0	8885
PERCENTS	1.9%	4.5%	31.8%	48.0%	12.9%	0.8%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100%

Statistical Information...

15th Percentile Speed
25.4 mph

85th Percentile Speed
33.9 mph

Median Speed
30.3 mph

Average Speed
29.8 mph

10 MPH Pace Speed
24 mph to 34 mph
7083 vehicles in pace
Representing 79.7% of the total vehicles

Vehicles > 65 MPH
0
0.0%

Site Reference: 180040000798
Site ID: 000000000101
Location: ROUTE 126 SOUTH OF MAPLE ST.
Direction: SOUTH
Lane: 2

File: SPDC1.prn
City: BELLINGHAM
County: SPEED NB&SB

TIME	19	24	29	34	39	44	49	54	59	64	69	74	79	85	86+	Tota
01:00	0	0	4	15	12	2	0	0	0	0	0	0	0	0	0	33
02:00	0	0	4	6	9	2	0	0	0	0	0	0	0	0	0	21
03:00	0	0	1	6	5	1	0	0	0	0	0	0	0	0	0	13
04:00	0	1	2	8	9	2	0	0	0	0	0	0	0	0	0	22
05:00	0	1	8	10	11	4	0	0	0	0	0	0	0	0	0	34
06:00	0	8	22	59	38	6	0	0	0	0	0	0	0	0	0	133
07:00	3	4	52	168	59	5	0	0	0	0	0	0	0	0	0	291
08:00	18	41	196	272	59	2	0	0	0	0	0	0	0	0	0	588
09:00	6	42	248	259	47	5	0	0	0	0	0	0	0	0	0	607
10:00	25	48	158	228	55	1	0	0	0	0	0	0	0	0	0	515
11:00	3	20	171	227	48	2	1	0	0	0	0	0	0	0	0	472
12:00	3	26	164	282	66	2	0	0	0	0	0	0	0	0	0	543
13:00	11	39	148	284	66	3	0	0	0	0	0	0	0	0	0	551
14:00	3	33	174	262	70	3	0	0	0	0	0	0	0	0	0	545
15:00	6	52	202	282	82	3	1	0	0	0	0	0	0	0	0	628
16:00	2	63	245	317	96	8	0	0	0	0	0	0	0	0	0	731
17:00	37	42	216	323	103	4	0	0	0	0	0	0	0	0	0	725
18:00	34	53	312	273	49	7	1	0	0	0	0	0	0	0	0	729
19:00	13	41	222	265	40	5	0	0	0	0	0	0	0	0	0	586
20:00	1	13	151	219	43	4	0	0	0	0	0	0	0	0	0	431
21:00	0	5	58	157	56	5	0	0	0	0	0	0	0	0	0	281
22:00	1	1	29	102	39	3	0	0	0	0	0	0	0	0	0	175
23:00	0	0	25	62	28	5	2	0	0	0	0	0	0	0	0	122
24:00	1	1	4	39	28	4	2	0	0	0	0	0	0	0	0	79
DAY TOTAL	167	534	2816	4125	1118	88	7	0	0	0	0	0	0	0	0	8855
PERCENTS	1.9%	6.1%	31.9%	46.6%	12.6%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100%

Statistical Information...

15th Percentile Speed
25.1 mph

Median Speed
30.1 mph

10 MPH Pace Speed
24 mph to 34 mph
6941 vehicles in pace
Representing 78.3% of the total vehicles

85th Percentile Speed
33.9 mph

Average Speed
29.6 mph

Vehicles > 65 MPH
0
0.0%

Site Reference: 180040000798
Site ID: 000000000101
Location: ROUTE 126 SOUTH OF MAPLE ST.
Direction: SOUTH
Lane: 2

File: SPDC1.prn
City: BELLINGHAM
County: SPEED NB&SB

TIME	19	24	29	34	39	44	49	54	59	64	69	74	79	85	86+	Tota
01:00	0	0	2	14	15	3	0	0	0	0	0	0	0	0	0	34
02:00	0	0	3	8	7	0	0	0	0	0	0	0	0	0	0	18
03:00	0	0	1	4	5	0	0	0	0	0	0	0	0	0	0	10
04:00	0	0	4	5	9	1	0	0	0	0	0	0	0	0	0	19
05:00	0	1	5	17	14	1	0	0	0	0	0	0	0	0	0	38
06:00	5	9	16	58	28	4	0	0	0	0	0	0	0	0	0	120
07:00	0	9	62	145	58	5	0	0	0	0	0	0	0	0	0	279
08:00	18	43	191	251	47	0	0	0	0	0	0	0	0	0	0	550
09:00	28	44	249	217	34	1	0	0	0	0	0	0	0	0	0	573
DAY TOTAL	51	106	533	719	217	15	0	0	0	0	0	0	0	0	0	1641
PERCENTS	3.2%	6.5%	32.4%	43.8%	13.2%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100%

Statistical Information...

15th Percentile Speed
24.8 mph

Median Speed
29.9 mph

10 MPH Pace Speed
24 mph to 34 mph
1252 vehicles in pace
Representing 76.2% of the total vehicles

85th Percentile Speed
33.9 mph

Average Speed
29.3 mph

Vehicles > 65 MPH
0
0.0%

MassDOT Highway Division
SPEED SUMMARY
Mon 2/12/2018

STA. 2 EB

Site Reference: 180040000668
Site ID: 000000000203
Location: MAPLE STREET EAST OF RTE. 126
Direction: EAST
Lane: 1

File: SPDC2.prn
City: BELLINGHAM
County: SPEED EB&WB

TIME	19	24	29	34	39	44	49	54	59	64	69	74	79	85	86+	Tota
12:00	16	1	35	60	132	37	7	7	0	0	0	0	0	0	0	295
13:00	55	5	4	61	135	60	0	1	0	0	0	0	0	0	0	321
14:00	9	1	21	37	115	85	16	0	0	0	0	0	0	0	0	284
15:00	25	5	17	61	170	74	16	0	0	0	0	0	0	0	0	368
16:00	38	0	1	49	188	117	21	3	0	0	0	0	0	0	0	417
17:00	35	5	7	75	151	119	28	6	0	0	0	0	0	0	0	426
18:00	58	9	2	86	226	106	13	3	0	0	0	0	0	0	0	503
19:00	36	1	5	46	226	75	7	1	0	0	0	0	0	0	0	397
20:00	1	0	5	28	108	28	17	2	0	0	0	0	0	0	0	189
21:00	0	1	4	32	60	34	9	5	0	0	0	0	0	0	0	145
22:00	5	0	0	16	28	32	1	0	0	0	0	0	0	0	0	82
23:00	2	0	0	8	17	19	15	0	0	0	0	0	0	0	0	61
24:00	0	0	0	2	15	8	6	5	0	0	0	0	0	0	0	36
DAY TOTAL	280	28	101	561	1571	794	156	33	0	0	0	0	0	0	0	3524
PERCENTS	8.0%	0.8%	2.9%	16.0%	44.5%	22.5%	4.4%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100%

Statistical Information...

15th Percentile Speed
30.1 mph

85th Percentile Speed
41.9 mph

Median Speed
36.5 mph

Average Speed
34.9 mph

10 MPH Pace Speed
34 mph to 44 mph
2365 vehicles in pace
Representing 67.1% of the total vehicles

Vehicles > 65 MPH
0
0.0%

Site Reference: 180040000668
Site ID: 000000000203
Location: MAPLE STREET EAST OF RTE. 126
Direction: EAST
Lane: 1

File: SPDC2.prn
City: BELLINGHAM
County: SPEED EB&WB

TIME	19	24	29	34	39	44	49	54	59	64	69	74	79	85	86+	Tota
01:00	0	0	0	4	5	7	3	0	0	0	0	0	0	0	0	19
02:00	0	0	0	0	0	4	0	2	0	0	0	0	0	0	0	6
03:00	0	0	0	6	5	7	0	0	0	0	0	0	0	0	0	18
04:00	0	0	0	2	16	1	0	0	0	0	0	0	0	0	0	19
05:00	17	0	0	0	22	8	0	0	0	0	0	0	0	0	0	47
06:00	24	0	6	35	41	19	1	1	0	0	0	0	0	0	0	127
07:00	64	0	0	34	202	25	31	0	0	0	0	0	0	0	0	356
08:00	161	0	5	33	127	110	33	0	0	0	0	0	0	0	0	469
09:00	78	0	21	92	87	128	25	0	0	0	0	0	0	0	0	431
10:00	43	2	21	50	123	33	3	0	0	0	0	0	0	0	0	275
11:00	30	0	0	39	62	75	11	7	0	0	0	0	0	0	0	224
12:00	26	21	5	39	107	73	12	0	0	0	0	0	0	0	0	283
13:00	16	0	5	52	138	112	8	0	0	0	0	0	0	0	0	331
14:00	18	1	1	42	87	100	21	3	0	0	0	0	0	0	0	273
15:00	37	2	13	77	130	86	17	0	0	0	0	0	0	0	0	362
16:00	57	1	10	62	195	95	10	1	0	0	0	0	0	0	0	431
17:00	48	7	1	50	218	120	28	3	0	1	0	0	0	0	0	476
18:00	40	0	9	45	232	105	11	3	0	0	0	0	0	0	0	445
19:00	32	0	1	57	165	82	21	1	0	1	0	0	0	0	0	360
20:00	6	3	4	38	102	46	15	0	0	0	0	0	0	0	0	214
21:00	0	0	10	18	96	73	12	1	0	0	0	0	0	0	0	210
22:00	0	0	3	26	54	32	17	3	0	0	0	0	0	0	0	135
23:00	0	0	0	4	23	19	9	5	0	0	0	0	0	0	0	60
24:00	0	0	0	3	14	6	12	0	0	0	0	0	0	0	0	35
DAY TOTAL	697	37	115	808	2251	1366	300	30	0	2	0	0	0	0	0	5606
PERCENTS	12.5%	0.7%	2.1%	14.5%	40.1%	24.3%	5.3%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100%

Statistical Information...

15th Percentile Speed
28.7 mph

Median Speed
36.6 mph

10 MPH Pace Speed
34 mph to 44 mph
3617 vehicles in pace
Representing 64.5% of the total vehicles

85th Percentile Speed
42.1 mph

Average Speed
34.0 mph

Vehicles > 65 MPH
0
0.0%

Site Reference: 180040000668
Site ID: 000000000203
Location: MAPLE STREET EAST OF RTE. 126
Direction: EAST
Lane: 1

File: SPDC2.prn
City: BELLINGHAM
County: SPEED EB&WB

TIME	19	24	29	34	39	44	49	54	59	64	69	74	79	85	86+	Tota
01:00	2	0	0	12	4	2	2	3	0	0	0	0	0	0	0	25
02:00	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	3
03:00	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	3
04:00	0	0	0	5	5	5	0	0	0	0	1	0	0	0	0	16
05:00	0	0	0	10	33	13	0	0	0	0	0	0	0	0	0	56
06:00	4	0	2	46	58	30	13	0	0	0	0	0	0	0	0	153
07:00	80	0	0	53	110	96	6	0	0	0	0	0	0	0	0	345
08:00	97	12	14	78	176	48	27	3	0	0	0	0	0	0	0	455
09:00	89	0	1	58	134	109	16	0	0	0	0	0	0	0	0	407
10:00	37	0	3	60	144	59	7	0	2	0	0	0	0	0	0	312
11:00	17	0	9	82	108	63	18	0	0	0	0	0	0	0	0	297
12:00	23	4	0	66	109	98	4	1	0	0	0	0	0	0	0	305
13:00	18	8	3	79	115	66	26	0	0	0	0	0	0	0	0	315
14:00	35	6	6	55	126	82	16	0	0	0	0	0	0	0	0	326
15:00	26	0	0	32	171	100	27	3	0	0	0	0	0	0	0	359
16:00	37	3	6	53	195	101	32	0	0	0	0	0	0	0	0	427
17:00	46	2	0	45	203	150	24	5	1	0	0	0	0	0	0	476
18:00	46	1	2	46	219	131	11	1	0	0	0	0	0	0	0	457
19:00	13	0	6	34	177	92	22	1	0	0	0	0	0	0	0	345
20:00	15	1	0	20	102	66	6	1	0	0	0	0	0	0	0	211
21:00	0	5	2	29	68	31	8	0	0	0	0	0	0	0	0	143
22:00	5	0	0	22	69	19	8	1	0	0	0	0	0	0	0	124
23:00	0	0	5	22	17	20	3	1	0	0	0	0	0	0	0	68
24:00	0	0	0	1	14	12	7	0	1	0	0	0	0	0	0	35
DAY TOTAL	590	42	59	908	2360	1396	283	20	4	0	1	0	0	0	0	5663
PERCENTS	10.5%	0.8%	1.1%	16.1%	41.7%	24.6%	4.9%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100%

Statistical Information...

15th Percentile Speed
29.9 mph

Median Speed
36.6 mph

10 MPH Pace Speed
34 mph to 44 mph
3756 vehicles in pace
Representing 66.3% of the total vehicles

85th Percentile Speed
42.1 mph

Average Speed
34.5 mph

Vehicles > 65 MPH
1
0.0%

Site Reference: 180040000668
Site ID: 000000000203
Location: MAPLE STREET EAST OF RTE. 126
Direction: EAST
Lane: 1

File: SPDC2.prn
City: BELLINGHAM
County: SPEED EB&WB

TIME	19	24	29	34	39	44	49	54	59	64	69	74	79	85	86+	Tota
01:00	0	0	0	6	6	2	7	4	0	0	0	0	0	0	0	25
02:00	0	0	0	0	2	0	6	0	0	0	0	0	0	0	0	8
03:00	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	5
04:00	0	4	0	0	12	5	0	0	0	0	0	0	0	0	0	21
05:00	0	0	0	12	2	25	0	0	0	0	0	0	0	0	0	39
06:00	8	0	9	35	27	28	18	0	0	0	0	0	0	0	0	125
07:00	78	0	4	57	91	54	36	0	0	0	0	0	0	0	0	320
08:00	97	3	1	73	153	96	42	0	0	0	0	0	0	0	0	465
09:00	71	0	25	80	132	64	28	1	0	1	0	0	0	0	0	402
DAY TOTAL	254	12	39	263	425	274	137	5	0	1	0	0	0	0	0	1410
PERCENTS	18.1%	0.9%	2.8%	18.7%	30.1%	19.4%	9.7%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100%

Statistical Information...

15th Percentile Speed
15.8 mph

Median Speed
35.6 mph

10 MPH Pace Speed
34 mph to 44 mph
699 vehicles in pace
Representing 49.5% of the total vehicles

85th Percentile Speed
42.8 mph

Average Speed
32.3 mph

Vehicles > 65 MPH
0
0.0%

Site Reference: 180040000668
Site ID: 000000000203
Location: MAPLE STREET EAST OF RTE. 126
Direction: WEST
Lane: 2

File: SPDC2.prn
City: BELLINGHAM
County: SPEED EB&WB

TIME	19	24	29	34	39	44	49	54	59	64	69	74	79	85	86+	Tota
12:00	26	0	16	38	168	60	10	1	0	0	0	0	0	0	0	319
13:00	61	11	3	57	104	79	1	1	1	0	0	0	2	0	0	320
14:00	34	0	27	53	129	59	16	3	0	0	0	0	0	0	0	321
15:00	97	1	10	71	98	98	7	3	1	0	3	0	0	0	6	395
16:00	153	0	4	40	207	86	26	16	0	0	0	0	0	4	0	536
17:00	121	0	4	56	162	125	18	3	0	0	0	4	0	0	0	493
18:00	171	30	2	102	182	75	3	6	0	0	0	0	0	0	0	571
19:00	125	1	18	78	162	56	2	0	0	0	0	0	0	0	0	442
20:00	29	0	6	25	94	40	0	0	1	0	0	0	0	0	0	195
21:00	3	1	5	62	59	25	6	0	0	0	0	0	0	0	0	161
22:00	4	0	3	17	18	39	12	0	0	0	0	0	0	0	0	93
23:00	3	0	0	13	39	9	11	0	0	0	0	0	0	0	0	75
24:00	3	0	0	5	17	9	10	0	0	0	0	0	0	0	0	44
DAY TOTAL	830	44	98	617	1439	760	122	33	3	0	3	4	2	4	6	3965
PERCENTS	21.0%	1.2%	2.5%	15.6%	36.3%	19.2%	3.1%	0.8%	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%	0.1%	100%

Statistical Information...

15th Percentile Speed
13.6 mph

Median Speed
35.4 mph

10 MPH Pace Speed
34 mph to 44 mph
2199 vehicles in pace
Representing 55.4% of the total vehicles

85th Percentile Speed
41.3 mph

Average Speed
31.2 mph

Vehicles > 65 MPH
19
0.5%

Site Reference: 180040000668
Site ID: 000000000203
Location: MAPLE STREET EAST OF RTE. 126
Direction: WEST
Lane: 2

File: SPDC2.prn
City: BELLINGHAM
County: SPEED EB&WB

TIME	19	24	29	34	39	44	49	54	59	64	69	74	79	85	86+	Tota
01:00	0	0	0	8	8	9	0	0	0	0	0	0	0	0	0	25
02:00	0	0	0	5	4	0	0	0	0	0	0	0	0	0	0	9
03:00	0	0	5	4	5	5	0	0	0	0	0	0	0	0	0	19
04:00	0	0	0	2	2	6	3	0	0	0	0	0	0	0	0	13
05:00	0	0	0	1	12	6	7	3	0	0	0	0	0	0	0	29
06:00	2	0	6	11	44	27	25	1	0	0	0	0	0	0	0	116
07:00	23	0	4	34	129	100	18	3	1	1	0	0	0	0	0	313
08:00	54	0	3	39	190	137	18	0	0	0	0	0	0	0	0	441
09:00	54	3	11	61	148	87	25	1	0	0	0	0	0	0	0	390
10:00	38	0	7	52	104	37	13	0	0	0	0	0	0	4	0	255
11:00	17	0	4	22	121	66	22	0	0	0	0	0	0	0	0	252
12:00	20	0	4	26	153	61	20	0	0	3	0	0	0	0	0	287
13:00	50	0	8	25	193	46	7	3	0	0	0	0	0	0	0	332
14:00	42	0	2	61	126	53	15	0	0	0	6	0	0	0	0	305
15:00	127	4	8	50	100	86	19	0	0	0	0	0	0	0	0	394
16:00	146	6	4	26	162	124	9	0	3	0	1	0	0	0	0	481
17:00	124	1	8	47	151	153	31	9	7	0	0	0	0	0	0	531
18:00	126	2	1	59	196	84	20	14	0	0	0	0	11	0	3	516
19:00	103	0	26	88	180	37	11	0	4	0	0	0	0	0	1	450
20:00	24	0	0	64	126	20	8	0	0	0	0	0	0	0	0	242
21:00	36	0	14	42	90	36	11	0	0	0	0	0	0	0	0	229
22:00	10	0	1	34	70	33	10	0	0	0	0	0	0	0	0	158
23:00	4	0	0	5	43	15	1	1	0	0	0	0	0	0	0	69
24:00	0	0	0	13	10	10	7	0	0	0	0	0	0	0	0	40
DAY TOTAL	1000	16	116	779	2367	1238	300	35	15	4	7	0	11	4	4	5896
PERCENTS	17.0%	0.3%	2.0%	13.3%	40.2%	21.0%	5.1%	0.6%	0.3%	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	100%

Statistical Information...

15th Percentile Speed
16.8 mph

85th Percentile Speed
42.0 mph

Median Speed
36.2 mph

Average Speed
32.9 mph

10 MPH Pace Speed
34 mph to 44 mph
3605 vehicles in pace
Representing 61.1% of the total vehicles

Vehicles > 65 MPH
26
0.4%

Site Reference: 180040000668
Site ID: 000000000203
Location: MAPLE STREET EAST OF RTE. 126
Direction: WEST
Lane: 2

File: SPDC2.prn
City: BELLINGHAM
County: SPEED EB&WB

TIME	19	24	29	34	39	44	49	54	59	64	69	74	79	85	86+	Tota
01:00	0	0	5	6	2	7	2	0	0	0	0	0	0	0	0	22
02:00	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	5
03:00	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	6
04:00	0	0	0	0	8	7	1	1	0	0	0	0	0	0	0	17
05:00	0	0	3	1	16	11	5	1	0	0	0	0	0	0	0	37
06:00	5	0	6	30	17	39	13	4	0	0	0	0	0	0	0	114
07:00	19	0	3	40	140	107	17	0	0	0	0	0	0	0	0	326
08:00	49	2	2	30	153	136	31	3	0	0	0	0	2	0	0	408
09:00	55	4	17	67	173	57	14	5	0	4	0	0	0	0	0	396
10:00	31	0	9	48	154	69	9	0	0	0	0	0	0	0	0	320
11:00	37	9	5	44	101	65	50	0	0	0	0	0	0	0	0	311
12:00	30	4	8	25	111	83	21	7	0	0	0	0	0	0	0	289
13:00	34	12	30	56	127	111	6	0	0	0	0	0	0	0	0	376
14:00	37	1	9	52	138	80	21	14	0	0	0	0	0	0	0	352
15:00	49	8	4	56	137	119	36	3	0	0	0	0	0	0	0	412
16:00	107	23	8	38	184	120	22	0	0	0	0	0	0	0	0	502
17:00	130	0	9	36	172	164	15	1	0	0	0	0	0	0	1	528
18:00	182	4	3	52	183	60	16	0	0	0	0	0	0	0	0	500
19:00	97	8	8	74	167	64	16	0	0	0	0	2	0	0	0	436
20:00	29	0	2	42	81	53	8	6	0	0	0	0	0	0	0	221
21:00	13	5	7	38	70	35	1	5	0	0	0	0	0	0	0	174
22:00	3	0	19	47	64	18	6	0	0	0	0	0	0	0	0	157
23:00	2	0	1	5	48	34	1	0	0	0	0	0	0	0	0	91
24:00	0	0	0	0	25	22	0	0	0	0	0	0	0	0	0	47
DAY TOTAL	909	80	158	787	2282	1461	311	50	0	4	0	2	2	0	1	6047
PERCENTS	15.1%	1.4%	2.7%	13.1%	37.7%	24.1%	5.1%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100%

Statistical Information...

15th Percentile Speed
19.0 mph

Median Speed
36.4 mph

10 MPH Pace Speed
34 mph to 44 mph
3743 vehicles in pace
Representing 61.8% of the total vehicles

85th Percentile Speed
42.2 mph

Average Speed
33.2 mph

Vehicles > 65 MPH
5
0.1%

Site Reference: 180040000668
Site ID: 000000000203
Location: MAPLE STREET EAST OF RTE. 126
Direction: WEST
Lane: 2

File: SPDC2.prn
City: BELLINGHAM
County: SPEED EB&WB

TIME	19	24	29	34	39	44	49	54	59	64	69	74	79	85	86+	Tota
01:00	0	0	0	12	2	5	5	1	0	0	0	0	0	0	0	25
02:00	0	0	0	6	0	7	0	0	0	0	0	0	0	0	0	13
03:00	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	4
04:00	0	0	1	3	2	1	7	1	0	0	0	0	0	0	0	15
05:00	0	0	0	1	19	9	2	1	0	0	0	0	0	0	0	32
06:00	0	0	12	37	36	19	10	3	0	0	0	0	0	0	0	117
07:00	10	0	6	50	112	107	11	0	4	0	0	0	0	0	0	300
08:00	35	1	3	59	185	117	29	0	0	0	0	0	0	0	2	431
09:00	65	1	9	51	128	97	19	3	0	0	0	1	0	0	0	374
DAY TOTAL	110	4	31	219	484	364	83	9	4	0	0	1	0	0	2	1311
PERCENTS	8.4%	0.4%	2.4%	16.8%	37.0%	27.7%	6.3%	0.6%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	100%

Statistical Information...

15th Percentile Speed
30.2 mph

Median Speed
37.0 mph

10 MPH Pace Speed
34 mph to 44 mph
848 vehicles in pace
Representing 64.6% of the total vehicles

85th Percentile Speed
42.7 mph

Average Speed
35.4 mph

Vehicles > 65 MPH
3
0.2%

MassDOT Highway Division
SPEED SUMMARY
Mon 2/12/2018

STA. 3 SB

Site Reference: 180040000400
Site ID: 000000000302
Location: ROUTE 126 NORTH OF MAPLE ST.
Direction: SOUTH
Lane: 1

File: SPD302.prn
City: BELLINGHAM
County: SPEED SB

TIME	19	24	29	34	39	44	49	54	59	64	69	74	79	85	86+	Tota
12:00	202	1	0	21	191	145	14	0	0	0	0	0	0	0	0	574
13:00	186	13	32	65	261	107	30	0	0	0	0	0	0	0	0	694
14:00	217	8	13	43	196	179	21	0	0	0	0	0	0	0	0	677
15:00	192	12	20	34	200	198	45	3	0	0	0	0	0	0	0	704
16:00	220	16	22	64	175	180	54	0	0	0	0	0	0	0	0	731
17:00	241	2	2	66	255	148	25	0	0	1	0	0	0	0	0	740
18:00	226	8	11	111	238	97	12	0	0	0	0	0	0	0	0	703
19:00	198	8	4	60	222	136	37	0	0	0	0	0	0	0	0	665
20:00	177	2	6	10	159	167	14	2	0	0	0	0	0	0	0	537
21:00	89	0	3	20	83	228	43	0	0	3	0	0	0	0	0	469
22:00	38	3	0	9	106	123	61	0	0	0	0	0	0	0	0	340
23:00	6	0	0	7	27	156	43	4	0	0	0	0	0	0	0	243
24:00	4	0	0	1	20	66	47	8	0	0	0	0	0	0	0	146
DAY TOTAL	1996	73	113	511	2133	1930	446	17	0	4	0	0	0	0	0	7223
PERCENTS	27.7%	1.1%	1.6%	7.1%	29.5%	26.7%	6.1%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100%

Statistical Information...

15th Percentile Speed
10.3 mph

85th Percentile Speed
42.4 mph

Median Speed
36.2 mph

Average Speed
30.4 mph

10 MPH Pace Speed
34 mph to 44 mph
4063 vehicles in pace
Representing 56.2% of the total vehicles

Vehicles > 65 MPH
0
0.0%

Site Reference: 180040000400
Site ID: 000000000302
Location: ROUTE 126 NORTH OF MAPLE ST.
Direction: SOUTH
Lane: 1

File: SPD302.prn
City: BELLINGHAM
County: SPEED SB

TIME	19	24	29	34	39	44	49	54	59	64	69	74	79	85	86+	Tota
01:00	1	0	6	1	12	27	33	13	1	0	0	0	0	0	0	94
02:00	0	0	0	3	0	19	12	3	0	0	0	0	0	0	0	37
03:00	0	0	0	0	8	35	3	0	0	0	0	0	0	0	0	46
04:00	0	0	9	0	2	21	38	1	1	0	0	0	0	0	0	72
05:00	24	0	10	10	26	64	55	16	0	0	0	0	0	0	0	205
06:00	90	10	6	16	68	196	70	0	0	0	0	0	0	9	0	465
07:00	389	13	2	31	64	63	47	13	0	0	0	0	0	0	0	622
08:00	254	8	7	20	120	138	76	9	4	0	0	0	0	0	0	636
09:00	239	5	5	40	157	190	49	3	0	0	0	0	0	0	0	688
10:00	158	4	23	40	178	180	52	5	0	2	3	4	0	0	1	650
11:00	90	1	9	34	238	295	66	8	1	1	4	3	2	3	5	760
12:00	64	1	7	51	251	288	87	14	1	3	4	4	2	3	1	781
13:00	79	1	5	58	300	300	74	11	0	5	5	1	3	1	0	843
14:00	74	6	12	76	282	345	60	2	0	0	3	0	0	1	1	862
15:00	70	10	30	84	377	321	61	5	0	0	0	1	0	0	3	962
16:00	109	4	26	150	434	229	45	2	2	3	0	1	0	2	4	1011
17:00	128	5	26	97	379	269	54	7	4	0	1	4	0	0	6	980
18:00	136	2	13	106	410	313	41	6	1	1	2	0	0	0	3	1034
19:00	94	2	10	84	372	268	51	5	0	1	0	1	1	1	5	895
20:00	31	0	2	39	304	299	46	6	0	1	2	0	0	0	0	730
21:00	28	1	6	26	181	251	78	5	0	0	1	1	0	1	1	580
22:00	10	2	1	9	116	148	56	5	2	1	0	0	0	2	0	352
23:00	4	1	1	4	34	87	36	9	5	0	0	0	0	0	0	181
24:00	2	0	1	5	28	66	28	6	1	1	1	0	0	0	0	139
DAY TOTAL	2074	76	217	984	4341	4412	1218	154	23	19	26	20	8	23	30	13625
PERCENTS	15.3%	0.6%	1.6%	7.3%	31.9%	32.4%	9.0%	1.2%	0.1%	0.1%	0.1%	0.1%	0.0%	0.1%	0.2%	100%

Statistical Information...

15th Percentile Speed
18.7 mph

Median Speed
38.0 mph

10 MPH Pace Speed
34 mph to 44 mph
8753 vehicles in pace
Representing 64.2% of the total vehicles

85th Percentile Speed
43.4 mph

Average Speed
34.8 mph

Vehicles > 65 MPH
107
0.8%

Site Reference: 180040000400
Site ID: 000000000302
Location: ROUTE 126 NORTH OF MAPLE ST.
Direction: SOUTH
Lane: 1

File: SPD302.prn
City: BELLINGHAM
County: SPEED SB

TIME	19	24	29	34	39	44	49	54	59	64	69	74	79	85	86+	Tota
01:00	0	0	0	3	16	28	16	1	1	0	0	2	0	0	0	67
02:00	0	1	0	1	9	8	13	3	1	0	0	0	0	0	0	36
03:00	0	0	0	0	7	14	1	0	0	0	0	0	0	0	0	22
04:00	0	0	1	1	8	18	22	6	2	0	0	0	0	0	0	58
05:00	0	0	1	6	21	42	50	23	1	0	0	0	0	0	0	144
06:00	47	0	1	13	67	163	101	15	6	0	2	2	2	5	4	428
07:00	84	6	13	41	222	370	101	20	1	2	2	2	2	0	3	869
08:00	121	7	11	67	283	338	88	21	1	1	2	0	0	1	1	942
09:00	89	3	16	71	313	331	82	3	4	0	4	0	0	2	2	920
10:00	93	1	3	68	248	267	89	16	3	4	4	7	2	2	3	810
11:00	97	2	17	65	214	278	72	12	6	6	8	2	5	1	1	786
12:00	115	7	12	24	213	310	72	12	5	0	10	1	1	3	1	786
13:00	136	2	8	34	199	264	82	7	5	7	10	4	0	2	2	762
14:00	171	0	4	43	247	216	55	8	3	2	4	2	1	0	4	760
15:00	254	5	32	60	155	163	16	0	0	0	0	0	0	0	0	685
16:00	246	4	15	33	210	150	20	1	0	0	0	0	0	0	4	683
17:00	231	23	21	67	201	176	25	2	0	0	0	0	0	0	0	746
18:00	211	6	27	75	223	154	28	1	3	4	5	2	4	1	0	744
19:00	157	2	16	102	265	169	42	7	1	4	5	2	1	0	1	774
20:00	82	0	7	59	191	232	48	10	4	4	8	5	3	0	0	653
21:00	49	2	8	32	158	192	44	8	0	3	1	10	4	0	0	511
22:00	40	2	2	28	106	152	67	14	1	0	6	0	0	1	2	421
23:00	11	0	0	6	84	110	36	8	0	4	5	0	5	0	0	269
24:00	4	3	0	2	27	77	51	6	0	6	0	0	0	0	0	176
DAY TOTAL	2238	76	215	901	3687	4222	1221	204	48	47	76	41	30	18	28	13052
PERCENTS	17.2%	0.6%	1.7%	7.0%	28.3%	32.4%	9.4%	1.5%	0.3%	0.3%	0.5%	0.3%	0.2%	0.1%	0.2%	100%

Statistical Information...

15th Percentile Speed
16.6 mph

85th Percentile Speed
43.7 mph

Median Speed
38.2 mph

Average Speed
34.7 mph

10 MPH Pace Speed
34 mph to 44 mph
7909 vehicles in pace
Representing 60.5% of the total vehicles

Vehicles > 65 MPH
193
1.5%

Site Reference: 180040000400
Site ID: 000000000302
Location: ROUTE 126 NORTH OF MAPLE ST.
Direction: SOUTH
Lane: 1

File: SPD302.prn
City: BELLINGHAM
County: SPEED SB

TIME	19	24	29	34	39	44	49	54	59	64	69	74	79	85	86+	Tota
01:00	0	1	0	2	13	36	26	7	0	0	0	0	0	0	0	85
02:00	0	0	0	0	14	20	11	2	1	0	0	0	0	0	0	48
03:00	0	0	0	0	5	20	5	0	0	0	0	0	0	0	0	30
04:00	10	0	8	1	6	24	19	1	0	0	0	0	0	0	0	69
05:00	18	0	3	0	46	52	40	4	5	0	0	0	0	0	0	168
06:00	153	4	0	15	68	112	78	0	0	0	0	0	0	0	0	430
07:00	342	8	4	11	86	121	38	8	0	3	0	0	0	3	0	624
08:00	265	32	26	45	113	146	24	0	0	0	0	0	0	0	0	651
09:00	255	19	16	33	188	109	24	0	0	0	1	0	0	0	0	645
DAY TOTAL	1043	64	57	107	539	640	265	22	6	3	1	0	0	3	0	2750
PERCENTS	38.0%	2.4%	2.1%	3.9%	19.6%	23.2%	9.6%	0.8%	0.2%	0.1%	0.0%	0.0%	0.0%	0.1%	0.0%	100%

Statistical Information...

15th Percentile Speed
7.5 mph

Median Speed
35.0 mph

10 MPH Pace Speed
34 mph to 44 mph
1179 vehicles in pace
Representing 42.8% of the total vehicles

85th Percentile Speed
43.1 mph

Average Speed
27.9 mph

Vehicles > 65 MPH
4
0.1%

Appendix C:
Crash Data Analysis

Collision Diagram Look-up
MassDOT 2011-2015 Crash Data

Index	Crash Number	Police Report ID	Crash Time	Crash Date	Crash Location	Crash Severity	Manner of Collision	Vehicle Traveled Direction	Road Surface	Ambient Light Condition	Weather	Bike/ Ped	Vehicle Action
1	2680767	11-6-AC	9:45 AM	2011-01-05	Hartford Ave / Maple St	Property damage only	Rear-end	V1:Eastbound / V2:Eastbound	Dry	Daylight	Clear		V1: Slowing or stopped in traffic / V2:Travelling straight ahead
2	2685541	11-60-AC	10:58 AM	2011-01-31	Hartford Avenue	Property damage only	Rear-end	V1:Westbound / V2:Westbound	Dry	Daylight	Clear		V1: Slowing or stopped in traffic / V2:Travelling straight ahead
3	2715374	11-189-AC	8:36 AM	2011-04-13	50 Feet E From Stallbroook School	Property damage only	Rear-end	V1:Westbound / V2:Westbound	Wet	Daylight	Rain		V1: Slowing or stopped in traffic / V2:Travelling straight ahead
4	2751067	11-329-AC	10:27 PM	2011-07-29	Hartford Avenue	Property damage only	Angle	V1:Eastbound / V2:Westbound	Wet	Dark - lighted roadw	Clear		V1: Slowing or stopped in traffic / V2:Turning left
5	2949458	12-99-AC	6:35 PM	2012-03-07	Maple St	Property damage only	Rear-end	V1:Northbound / V2:Northbound	Dry	Dark - lighted roadw	Clear		V1: Slowing or stopped in traffic / V2:Travelling straight ahead
6	3047971	12-140-AC	2:47 PM	2012-04-12	Hartford Ave	Property damage only	Rear-end	V1:Northbound / V2:Northbound	Wet	Daylight	Rain		V1: Travelling straight ahead / V2:Travelling straight ahead
7	3245098	12-365-AC	8:39 AM	2012-08-20	Hartford Ave / Maple St	Property damage only	Rear-end	V1:Westbound / V2:Westbound	Dry	Daylight	Cloudy		V1: Slowing or stopped in traffic / V2:Travelling straight ahead
8	3288084	12-496-AC	6:52 PM	2012-11-05	Hartford Ave	Property damage only	Rear-end	V1:Northbound / V2:Northbound	Dry	Dark - lighted roadw	Clear		V1: Slowing or stopped in traffic / V2:Travelling straight ahead
9	3319090	12-555-AC	4:21 PM	2012-12-12	Hartford Ave	Property damage only	Rear-end	V1:Northbound / V2:Northbound	Dry	Dusk	Clear		V1: Slowing or stopped in traffic / V2:Travelling straight ahead
10	3381815	13-126-AC	4:55 PM	2013-04-01	Hartford Ave	Property damage only	Rear-end	V1:Eastbound / V2:Eastbound	Wet	Daylight	Rain		V1: Slowing or stopped in traffic / V2:Travelling straight ahead
11	3434123	13-233-AC	7:25 AM	2013-06-03	Hartford Ave / Maple St	Property damage only	Angle	V1:Northbound / V2:Eastbound	Wet	Daylight	Rain		V1: Travelling straight ahead / V2:Turning left
12	3471521	13-247-AC	4:11 PM	2013-06-10	200 Feet E From Intersection 318 Hartfor	Property damage only	Rear-end	V1:Eastbound / V2:Westbound / V3:E	Wet	Daylight	Rain		V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic / V3:Trave
13	3595354	13-429-AC	11:38 AM	2013-09-21	Hartford Ave	Property damage only	Rear-end	V1:Eastbound / V2:Eastbound	Dry	Daylight	Clear		V1: Travelling straight ahead / V2:Slowing or stopped in traffic
14	3710099	13-594-AC	5:46 PM	2013-12-26	Hartford Ave	Non-fatal injury	Rear-end	V1:Westbound / V2:Westbound	Snow/Ice	Dark - lighted roadw	Snow		V1: Slowing or stopped in traffic / V2:Travelling straight ahead
15	3750359	14-110-AC	10:50 AM	2014-02-27	Hartford Ave	Property damage only	Head-on	V1:Eastbound / V2:Northbound	Dry	Daylight	Clear		V1: Travelling straight ahead / V2:Travelling straight ahead
16	3791588	14-177-AC	3:34 PM	2014-04-13	Hartford Ave	Property damage only	Rear-end	V1:Eastbound / V2:Eastbound	Dry	Daylight	Clear		V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic
17	3881497	14-309-AC	2:59 PM	2014-07-05	Hartford Ave	Non-fatal injury	Unknown	V1:Eastbound / V2:Eastbound	Dry	Daylight	Clear		V1: Travelling straight ahead / V2:Travelling straight ahead
18	4030834	15-201-AC	7:48 AM	2015-04-06	Hartford Avenue / Maple Street	Property damage only	Rear-end	V1:Westbound / V2:Westbound / V3:\	Dry	Daylight	Clear		V1: Travelling straight ahead / V2:Travelling straight ahead / V3:Travelling s
19	4155506	15-648-AC	5:08 PM	2015-11-05	Hartford Ave / Maple St	Property damage only	Rear-end	V1:Eastbound / V2:Eastbound	Dry	Dark - lighted roadw	Clear		V1: Travelling straight ahead / V2:Travelling straight ahead
20	4155507	15-649-AC	6:00 AM	2015-11-06	Hartford Ave	Non-fatal injury	Rear-end	V1:Eastbound / V2:Eastbound / V3:E	Wet	Daylight	Cloudy		V1: Slowing or stopped in traffic / V2:Slowing or stopped in traffic / V3:Slowi

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Bellingham | COUNT DATE : 2/12/2018 – 2/14/2018

DISTRICT : 3 | UNSIGNALIZED : | SIGNALIZED : X

~ INTERSECTION DATA ~

MAJOR STREET : Route 126 (Hartford Ave)

MINOR STREET(S) : Maple Street

Driveway

INTERSECTION DIAGRAM

PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	WB	EB		
PEAK HOURLY VOLUMES (AM/PM) :	695	675	240	8		1,618

" K " FACTOR : **0.090**

INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **17,972**

TOTAL # OF CRASHES : 20 | # OF YEARS : 5 | AVERAGE # OF CRASHES PER YEAR (**A**) : **4.00**

CRASH RATE CALCULATION : **0.61**

$$\text{RATE} = \frac{(A * 1{,}000{,}000)}{(V * 365)}$$

Comments : 2016 District 3 average for signalized intersections = 0.89

Project Title & Date: Hartford Avenue and Maple Street Intersection Redesign Study, July 2018

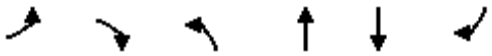
Appendix D:
Intersection Levels of Service

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	130	180	655	40	65	430
Future Volume (vph)	130	180	655	40	65	430
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	1625	0	1720	0	1616	1749
Flt Permitted	0.980				0.156	
Satd. Flow (perm)	1625	0	1720	0	265	1749
Right Turn on Red		No		No		
Satd. Flow (RTOR)						
Link Speed (mph)	30		30			30
Link Distance (ft)	1130		962			231
Travel Time (s)	25.7		21.9			5.3
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	2%	2%	6%	5%	8%	5%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	323	0	724	0	68	448
Turn Type	Prot		NA		pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases					6	
Detector Phase	8		2		1	6
Switch Phase						
Minimum Initial (s)	6.0		15.0		6.0	15.0
Minimum Split (s)	11.0		20.0		11.0	20.0
Total Split (s)	20.0		50.0		20.0	70.0
Total Split (%)	22.2%		55.6%		22.2%	77.8%
Yellow Time (s)	4.0		4.0		4.0	4.0
All-Red Time (s)	1.0		1.0		1.0	1.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	5.0		5.0		5.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?						
Recall Mode	None		Min		None	Min
Act Effct Green (s)	15.8		35.2		43.9	43.9
Actuated g/C Ratio	0.23		0.50		0.63	0.63
v/c Ratio	0.88		0.84		0.23	0.41
Control Delay	59.5		25.6		6.0	7.1
Queue Delay	0.0		0.0		0.0	0.0
Total Delay	59.5		25.6		6.0	7.1
LOS	E		C		A	A
Approach Delay	59.5		25.6			6.9
Approach LOS	E		C			A
Queue Length 50th (ft)	149		265		9	80
Queue Length 95th (ft)	#349		430		20	123
Internal Link Dist (ft)	1050		882			151
Turn Bay Length (ft)						
Base Capacity (vph)	365		1156		469	1543
Starvation Cap Reductn	0		0		0	0
Spillback Cap Reductn	0		0		0	0
Storage Cap Reductn	0		0		0	0

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Reduced v/c Ratio	0.88		0.63		0.14	0.29

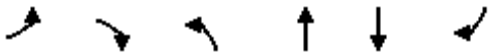
Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 70.2			
Natural Cycle: 70			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.88			
Intersection Signal Delay: 26.4		Intersection LOS: C	
Intersection Capacity Utilization 72.7%		ICU Level of Service C	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 1: Hartford Ave (Rt. 126) & Maple Street



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	10	15	20	815	490	10
Future Volume (vph)	10	15	20	815	490	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	1643	0	0	1749	1746	0
Flt Permitted	0.980			0.999		
Satd. Flow (perm)	1643	0	0	1749	1746	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	589			231	621	
Travel Time (s)	13.4			5.3	14.1	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	2%	0%	0%	5%	5%	0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	27	0	0	879	527	0
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	69.0%	ICU Level of Service	C
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	10	15	20	815	490	10
Future Volume (Veh/h)	10	15	20	815	490	10
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	11	16	21	858	516	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				231		
pX, platoon unblocked	0.63					
vC, conflicting volume	1422	522	527			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1375	522	527			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	89	97	98			
cM capacity (veh/h)	99	559	1050			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	27	879	527
Volume Left	11	21	0
Volume Right	16	0	11
cSH	193	1050	1700
Volume to Capacity	0.14	0.02	0.31
Queue Length 95th (ft)	12	2	0
Control Delay (s)	26.7	0.5	0.0
Lane LOS	D	A	
Approach Delay (s)	26.7	0.5	0.0
Approach LOS	D		

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	69.0%	ICU Level of Service	C
Analysis Period (min)	15		

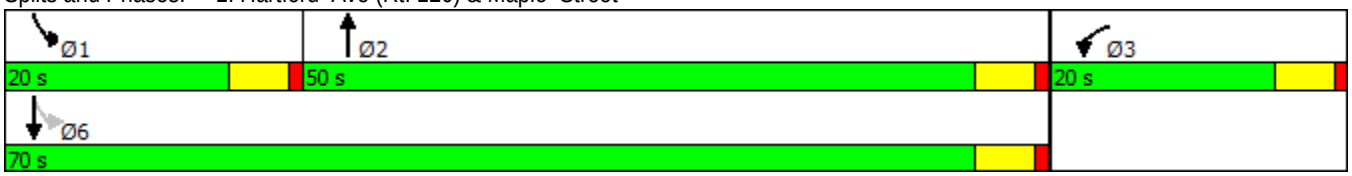
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	80	90	575	120	200	655
Future Volume (vph)	80	90	575	120	200	655
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	1636	0	1759	0	1728	1801
Flt Permitted	0.977				0.130	
Satd. Flow (perm)	1636	0	1759	0	236	1801
Right Turn on Red		No		No		
Satd. Flow (RTOR)						
Link Speed (mph)	30		30			30
Link Distance (ft)	1130		962			231
Travel Time (s)	25.7		21.9			5.3
Confl. Peds. (#/hr)		2				
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles (%)	1%	0%	2%	2%	1%	2%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	187	0	764	0	220	720
Turn Type	Prot		NA		pm+pt	NA
Protected Phases	3		2		1	6
Permitted Phases					6	
Detector Phase	3		2		1	6
Switch Phase						
Minimum Initial (s)	6.0		15.0		6.0	15.0
Minimum Split (s)	11.0		20.0		11.0	20.0
Total Split (s)	20.0		50.0		20.0	70.0
Total Split (%)	22.2%		55.6%		22.2%	77.8%
Yellow Time (s)	4.0		4.0		4.0	4.0
All-Red Time (s)	1.0		1.0		1.0	1.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	5.0		5.0		5.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?						
Recall Mode	None		Min		None	Min
Act Effct Green (s)	13.0		37.6		52.7	52.7
Actuated g/C Ratio	0.17		0.49		0.69	0.69
v/c Ratio	0.67		0.88		0.61	0.58
Control Delay	45.2		31.2		16.1	8.2
Queue Delay	0.0		0.0		0.0	0.0
Total Delay	45.2		31.2		16.1	8.2
LOS	D		C		B	A
Approach Delay	45.2		31.2			10.0
Approach LOS	D		C			B
Queue Length 50th (ft)	88		311		33	159
Queue Length 95th (ft)	#191		#606		99	238
Internal Link Dist (ft)	1050		882			151
Turn Bay Length (ft)						
Base Capacity (vph)	334		1077		468	1519
Starvation Cap Reductn	0		0		0	0
Spillback Cap Reductn	0		0		0	0

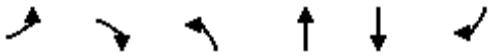
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Storage Cap Reductn	0		0		0	0
Reduced v/c Ratio	0.56		0.71		0.47	0.47

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 76.1			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.88			
Intersection Signal Delay: 22.1		Intersection LOS: C	
Intersection Capacity Utilization 71.2%		ICU Level of Service C	
Analysis Period (min) 15			

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

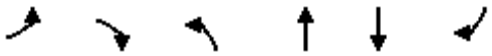
Splits and Phases: 1: Hartford Ave (Rt. 126) & Maple Street





Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	5	20	5	660	835	5
Future Volume (vph)	5	20	5	660	835	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	1624	0	0	1801	1799	0
Flt Permitted	0.989					
Satd. Flow (perm)	1624	0	0	1801	1799	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	589			231	621	
Travel Time (s)	13.4			5.3	14.1	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	2%	2%	0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	28	0	0	739	934	0
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 54.3%		ICU Level of Service A	
Analysis Period (min) 15			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	20	5	660	835	5
Future Volume (Veh/h)	5	20	5	660	835	5
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	6	22	6	733	928	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				231		
pX, platoon unblocked	0.62					
vC, conflicting volume	1676	931	934			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1782	931	934			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	89	93	99			
cM capacity (veh/h)	57	326	741			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	28	739	934
Volume Left	6	6	0
Volume Right	22	0	6
cSH	161	741	1700
Volume to Capacity	0.17	0.01	0.55
Queue Length 95th (ft)	15	1	0
Control Delay (s)	32.0	0.2	0.0
Lane LOS	D	A	
Approach Delay (s)	32.0	0.2	0.0
Approach LOS	D		

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	54.3%	ICU Level of Service	A
Analysis Period (min)	15		

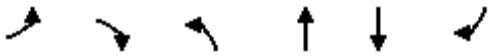
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	140	190	685	45	70	450
Future Volume (vph)	140	190	685	45	70	450
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	1625	0	1720	0	1616	1749
Flt Permitted	0.979				0.102	
Satd. Flow (perm)	1625	0	1720	0	173	1749
Right Turn on Red		No		No		
Satd. Flow (RTOR)						
Link Speed (mph)	30		30			30
Link Distance (ft)	1130		962			231
Travel Time (s)	25.7		21.9			5.3
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Growth Factor	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	2%	2%	6%	5%	8%	5%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	361	0	798	0	77	492
Turn Type	Perm		NA		pm+pt	NA
Protected Phases			2		1	6
Permitted Phases	3				6	
Detector Phase	3		2		1	6
Switch Phase						
Minimum Initial (s)	6.0		15.0		6.0	15.0
Minimum Split (s)	11.0		20.5		11.0	20.0
Total Split (s)	25.0		45.0		20.0	65.0
Total Split (%)	27.8%		50.0%		22.2%	72.2%
Yellow Time (s)	4.0		4.0		4.0	4.0
All-Red Time (s)	1.0		1.0		1.0	1.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	5.0		5.0		5.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Recall Mode	None		Min		None	Min
Act Effct Green (s)	20.1		40.2		49.8	49.8
Actuated g/C Ratio	0.25		0.50		0.62	0.62
v/c Ratio	0.88		0.92		0.33	0.45
Control Delay	55.4		38.4		9.5	9.4
Queue Delay	0.0		0.0		0.0	0.0
Total Delay	55.4		38.4		9.5	9.4
LOS	E		D		A	A
Approach Delay	55.4		38.4			9.4
Approach LOS	E		D			A
Queue Length 50th (ft)	181		373		14	114
Queue Length 95th (ft)	#347		#642		29	176
Internal Link Dist (ft)	1050		882			151
Turn Bay Length (ft)						
Base Capacity (vph)	408		864		380	1319
Starvation Cap Reductn	0		0		0	0
Spillback Cap Reductn	0		0		0	0

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Storage Cap Reductn	0		0		0	0
Reduced v/c Ratio	0.88		0.92		0.20	0.37

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 79.9			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.92			
Intersection Signal Delay: 32.4		Intersection LOS: C	
Intersection Capacity Utilization 78.6%		ICU Level of Service D	
Analysis Period (min) 15			

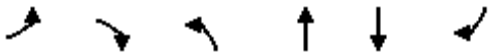
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Hartford Ave (Rt. 126) & Maple Street



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	10	15	20	855	515	10
Future Volume (vph)	10	15	20	855	515	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	1641	0	0	1749	1746	0
Flt Permitted	0.981			0.999		
Satd. Flow (perm)	1641	0	0	1749	1746	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	589			231	621	
Travel Time (s)	13.4			5.3	14.1	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	2%	0%	0%	5%	5%	0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	28	0	0	967	580	0
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 74.1%		ICU Level of Service D	
Analysis Period (min) 15			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	10	15	20	855	515	10
Future Volume (Veh/h)	10	15	20	855	515	10
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	11	17	22	945	569	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				231		
pX, platoon unblocked	0.56					
vC, conflicting volume	1564	574	580			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1614	574	580			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	82	97	98			
cM capacity (veh/h)	62	522	1004			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	28	967	580
Volume Left	11	22	0
Volume Right	17	0	11
cSH	134	1004	1700
Volume to Capacity	0.21	0.02	0.34
Queue Length 95th (ft)	19	2	0
Control Delay (s)	38.8	0.6	0.0
Lane LOS	E	A	
Approach Delay (s)	38.8	0.6	0.0
Approach LOS	E		

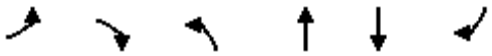
Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	74.1%	ICU Level of Service	D
Analysis Period (min)	15		

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	80	90	575	120	200	655
Future Volume (vph)	80	90	575	120	200	655
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	1635	0	1759	0	1728	1801
Flt Permitted	0.977				0.111	
Satd. Flow (perm)	1635	0	1759	0	202	1801
Right Turn on Red		No		No		
Satd. Flow (RTOR)						
Link Speed (mph)	30		30			30
Link Distance (ft)	1130		962			231
Travel Time (s)	25.7		21.9			5.3
Confl. Peds. (#/hr)		2				
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	1%	0%	2%	2%	1%	2%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	196	0	801	0	231	756
Turn Type	Perm		NA		pm+pt	NA
Protected Phases			2		1	6
Permitted Phases	8				6	
Detector Phase	8		2		1	6
Switch Phase						
Minimum Initial (s)	5.0		15.0		6.0	15.0
Minimum Split (s)	11.0		20.0		11.0	20.0
Total Split (s)	20.0		50.0		20.0	70.0
Total Split (%)	22.2%		55.6%		22.2%	77.8%
Yellow Time (s)	4.0		4.0		4.0	4.0
All-Red Time (s)	1.0		1.0		1.0	1.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	5.0		5.0		5.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Recall Mode	None		Min		None	Min
Act Effct Green (s)	13.4		40.1		56.0	56.0
Actuated g/C Ratio	0.17		0.50		0.70	0.70
v/c Ratio	0.72		0.91		0.66	0.60
Control Delay	49.5		34.5		21.3	8.4
Queue Delay	0.0		0.0		0.0	0.0
Total Delay	49.5		34.5		21.3	8.4
LOS	D		C		C	A
Approach Delay	49.5		34.5			11.4
Approach LOS	D		C			B
Queue Length 50th (ft)	101		358		47	172
Queue Length 95th (ft)	#205		#653		123	259
Internal Link Dist (ft)	1050		882			151
Turn Bay Length (ft)						
Base Capacity (vph)	316		1020		437	1467
Starvation Cap Reductn	0		0		0	0

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Spillback Cap Reductn	0		0		0	0
Storage Cap Reductn	0		0		0	0
Reduced v/c Ratio	0.62		0.79		0.53	0.52

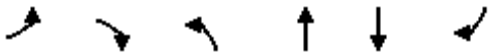
Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 79.7			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.91			
Intersection Signal Delay: 24.5		Intersection LOS: C	
Intersection Capacity Utilization 74.1%		ICU Level of Service D	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 1: Hartford Ave (Rt. 126) & Maple Street



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	5	20	5	660	835	5
Future Volume (vph)	5	20	5	660	835	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	1624	0	0	1801	1799	0
Flt Permitted	0.990					
Satd. Flow (perm)	1624	0	0	1801	1799	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	589			231	621	
Travel Time (s)	13.4			5.3	14.1	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	0%	0%	0%	2%	2%	0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	29	0	0	776	980	0
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 56.5%		ICU Level of Service B	
Analysis Period (min) 15			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	20	5	660	835	5
Future Volume (Veh/h)	5	20	5	660	835	5
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	6	23	6	770	974	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				231		
pX, platoon unblocked	0.59					
vC, conflicting volume	1759	977	980			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1935	977	980			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	86	93	99			
cM capacity (veh/h)	43	307	712			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	29	776	980
Volume Left	6	6	0
Volume Right	23	0	6
cSH	136	712	1700
Volume to Capacity	0.21	0.01	0.58
Queue Length 95th (ft)	19	1	0
Control Delay (s)	38.7	0.2	0.0
Lane LOS	E	A	
Approach Delay (s)	38.7	0.2	0.0
Approach LOS	E		

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	56.5%	ICU Level of Service	B
Analysis Period (min)	15		

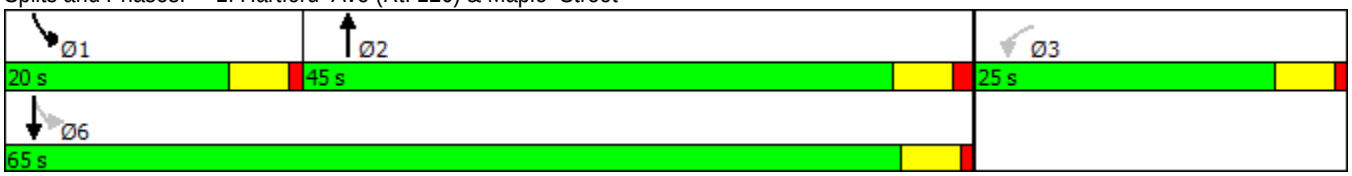
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	140	190	685	45	70	450
Future Volume (vph)	140	190	685	45	70	450
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.922		0.992			
Flt Protected	0.979				0.950	
Satd. Flow (prot)	1625	0	1720	0	1616	1749
Flt Permitted	0.979				0.103	
Satd. Flow (perm)	1625	0	1720	0	175	1749
Right Turn on Red		No		No		
Satd. Flow (RTOR)						
Link Speed (mph)	30		30			30
Link Distance (ft)	1130		962			231
Travel Time (s)	25.7		21.9			5.3
Adj. Flow (vph)	153	208	749	49	77	492
Lane Group Flow (vph)	361	0	798	0	77	492
Turn Type	Perm		NA		pm+pt	NA
Protected Phases			2		1	6
Permitted Phases	3				6	
Detector Phase	3		2		1	6
Switch Phase						
Minimum Initial (s)	6.0		15.0		6.0	15.0
Minimum Split (s)	11.0		20.5		11.0	20.0
Total Split (s)	25.0		45.0		20.0	65.0
Total Split (%)	27.8%		50.0%		22.2%	72.2%
Yellow Time (s)	4.0		4.0		4.0	4.0
All-Red Time (s)	1.0		1.5		1.0	1.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	5.0		5.5		5.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Recall Mode	None		Min		None	Min
Act Effct Green (s)	20.1		39.7		49.8	49.8
Actuated g/C Ratio	0.25		0.50		0.62	0.62
v/c Ratio	0.88		0.94		0.33	0.45
Control Delay	55.4		40.7		9.5	9.4
Queue Delay	0.0		0.0		0.0	0.0
Total Delay	55.4		40.7		9.5	9.4
LOS	E		D		A	A
Approach Delay	55.4		40.7			9.4
Approach LOS	E		D			A
Queue Length 50th (ft)	181		378		14	114
Queue Length 95th (ft)	#347		#648		29	176
Internal Link Dist (ft)	1050		882			151
Turn Bay Length (ft)						
Base Capacity (vph)	408		853		380	1319
Starvation Cap Reductn	0		0		0	0
Spillback Cap Reductn	0		0		0	0

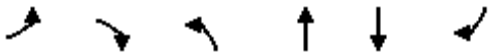
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Storage Cap Reductn	0		0		0	0
Reduced v/c Ratio	0.88		0.94		0.20	0.37

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 79.9			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.94			
Intersection Signal Delay: 33.4		Intersection LOS: C	
Intersection Capacity Utilization 79.0%		ICU Level of Service D	
Analysis Period (min) 15			

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

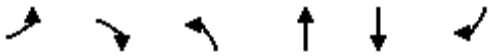
Splits and Phases: 1: Hartford Ave (Rt. 126) & Maple Street





Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	10	15	20	855	515	10
Future Volume (vph)	10	15	20	855	515	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.918				0.997	
Flt Protected	0.981			0.999		
Satd. Flow (prot)	1641	0	0	1749	1746	0
Flt Permitted	0.981			0.999		
Satd. Flow (perm)	1641	0	0	1749	1746	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	589			231	621	
Travel Time (s)	13.4			5.3	14.1	
Adj. Flow (vph)	11	17	22	945	569	11
Lane Group Flow (vph)	28	0	0	967	580	0
Sign Control	Stop			Free	Free	

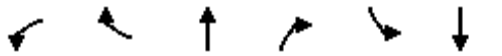
Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 74.1%		ICU Level of Service D	
Analysis Period (min) 15			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	10	15	20	855	515	10
Future Volume (Veh/h)	10	15	20	855	515	10
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	11	17	22	945	569	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				231		
pX, platoon unblocked	0.55					
vC, conflicting volume	1564	574	580			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1615	574	580			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	82	97	98			
cM capacity (veh/h)	62	522	1004			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	28	967	580
Volume Left	11	22	0
Volume Right	17	0	11
cSH	133	1004	1700
Volume to Capacity	0.21	0.02	0.34
Queue Length 95th (ft)	19	2	0
Control Delay (s)	39.2	0.6	0.0
Lane LOS	E	A	
Approach Delay (s)	39.2	0.6	0.0
Approach LOS	E		

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	74.1%	ICU Level of Service	D
Analysis Period (min)	15		



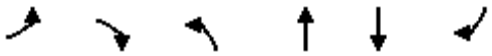
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	80	90	575	120	200	655
Future Volume (vph)	80	90	575	120	200	655
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	1635	0	1759	0	1728	1801
Flt Permitted	0.977				0.116	
Satd. Flow (perm)	1635	0	1759	0	211	1801
Right Turn on Red		No		No		
Satd. Flow (RTOR)						
Link Speed (mph)	30		30			30
Link Distance (ft)	1130		962			231
Travel Time (s)	25.7		21.9			5.3
Confl. Peds. (#/hr)		2				
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	1%	0%	2%	2%	1%	2%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	196	0	801	0	231	756
Turn Type	Perm		NA		pm+pt	NA
Protected Phases			2		1	6
Permitted Phases	8				6	
Detector Phase	8		2		1	6
Switch Phase						
Minimum Initial (s)	5.0		15.0		6.0	15.0
Minimum Split (s)	11.0		20.5		11.0	20.0
Total Split (s)	20.0		50.0		20.0	70.0
Total Split (%)	22.2%		55.6%		22.2%	77.8%
Yellow Time (s)	4.0		4.0		4.0	4.0
All-Red Time (s)	1.0		1.5		1.0	1.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	5.0		5.5		5.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Recall Mode	None		Min		None	Min
Act Effct Green (s)	13.4		40.2		56.6	56.6
Actuated g/C Ratio	0.17		0.50		0.71	0.71
v/c Ratio	0.72		0.91		0.66	0.60
Control Delay	49.9		35.5		20.1	8.4
Queue Delay	0.0		0.0		0.0	0.0
Total Delay	49.9		35.5		20.1	8.4
LOS	D		D		C	A
Approach Delay	49.9		35.5			11.1
Approach LOS	D		D			B
Queue Length 50th (ft)	100		362		43	172
Queue Length 95th (ft)	#205		#659		118	259
Internal Link Dist (ft)	1050		882			151
Turn Bay Length (ft)						
Base Capacity (vph)	313		999		439	1461
Starvation Cap Reductn	0		0		0	0

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Spillback Cap Reductn	0		0		0	0
Storage Cap Reductn	0		0		0	0
Reduced v/c Ratio	0.63		0.80		0.53	0.52

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 80.2			
Natural Cycle: 70			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.91			
Intersection Signal Delay: 24.8		Intersection LOS: C	
Intersection Capacity Utilization 74.5%		ICU Level of Service D	
Analysis Period (min) 15			

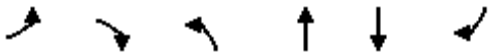
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Hartford Ave (Rt. 126) & Maple Street



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	5	20	5	660	835	5
Future Volume (vph)	5	20	5	660	835	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	1624	0	0	1801	1799	0
Flt Permitted	0.990					
Satd. Flow (perm)	1624	0	0	1801	1799	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	589			231	621	
Travel Time (s)	13.4			5.3	14.1	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	0%	0%	0%	2%	2%	0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	29	0	0	776	980	0
Sign Control	Stop			Free	Free	

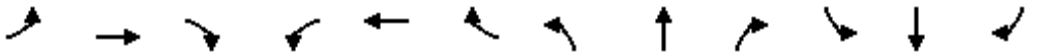
Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 56.5%		ICU Level of Service B	
Analysis Period (min) 15			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	20	5	660	835	5
Future Volume (Veh/h)	5	20	5	660	835	5
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	6	23	6	770	974	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				231		
pX, platoon unblocked	0.59					
vC, conflicting volume	1759	977	980			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1936	977	980			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	86	93	99			
cM capacity (veh/h)	43	307	712			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	29	776	980
Volume Left	6	6	0
Volume Right	23	0	6
cSH	135	712	1700
Volume to Capacity	0.21	0.01	0.58
Queue Length 95th (ft)	19	1	0
Control Delay (s)	38.7	0.2	0.0
Lane LOS	E	A	
Approach Delay (s)	38.7	0.2	0.0
Approach LOS	E		

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	56.5%	ICU Level of Service	B
Analysis Period (min)	15		



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	5	140	0	190	5	685	45	70	450	0
Future Volume (vph)	0	0	5	140	0	190	5	685	45	70	450	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	1589	0	0	1625	0	0	1718	0	1616	1749	0
Flt Permitted					0.861			0.997		0.223		
Satd. Flow (perm)	0	1589	0	0	1429	0	0	1713	0	379	1749	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		649			1130			962			231	
Travel Time (s)		14.8			25.7			21.9			5.3	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	2%	2%	0%	2%	2%	2%	25%	6%	5%	8%	5%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	5	0	0	361	0	0	803	0	77	492	0
Turn Type		NA		Perm	NA		Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		15.0	15.0		6.0	15.0	
Minimum Split (s)	11.0	11.0		11.0	11.0		20.5	20.5		11.0	20.0	
Total Split (s)	30.0	30.0		30.0	30.0		45.0	45.0		15.0	60.0	
Total Split (%)	33.3%	33.3%		33.3%	33.3%		50.0%	50.0%		16.7%	66.7%	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.5	1.5		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0		0.0	0.0	
Total Lost Time (s)		5.0			5.0			5.5		5.0	5.0	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Recall Mode	None	None		None	None		Min	Min		None	Min	
Act Effct Green (s)		23.7			23.7			39.9		50.1	50.1	
Actuated g/C Ratio		0.28			0.28			0.48		0.60	0.60	
v/c Ratio		0.01			0.90			0.99		0.23	0.47	
Control Delay		23.0			56.7			53.9		9.1	11.4	
Queue Delay		0.0			0.0			0.0		0.0	0.0	
Total Delay		23.0			56.7			53.9		9.1	11.4	
LOS		C			E			D		A	B	
Approach Delay		23.0			56.7			53.9			11.1	
Approach LOS		C			E			D			B	
Queue Length 50th (ft)		2			189			~480		16	138	
Queue Length 95th (ft)		10			#358			#719		34	210	
Internal Link Dist (ft)		569			1050			882			151	
Turn Bay Length (ft)												
Base Capacity (vph)		478			430			815		375	1159	
Starvation Cap Reductn		0			0			0		0	0	
Spillback Cap Reductn		0			0			0		0	0	

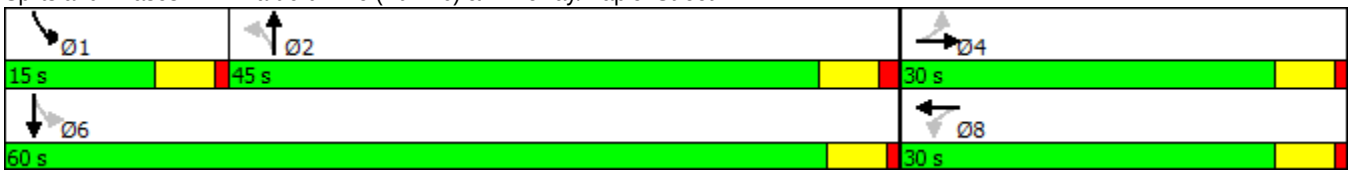
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn		0			0			0		0	0	
Reduced v/c Ratio		0.01			0.84			0.99		0.21	0.42	

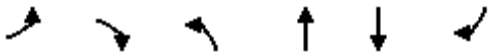
Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 83.8			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.99			
Intersection Signal Delay: 40.4		Intersection LOS: D	
Intersection Capacity Utilization 90.8%		ICU Level of Service E	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

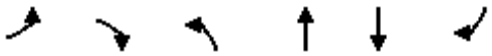
Splits and Phases: 1: Hartford Ave (Rt. 126) & Driveway/Maple Street





Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	10	15	20	855	520	10
Future Volume (vph)	10	15	20	855	520	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	1641	0	0	1749	1746	0
Flt Permitted	0.981			0.999		
Satd. Flow (perm)	1641	0	0	1749	1746	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	589			231	599	
Travel Time (s)	13.4			5.3	13.6	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	2%	0%	0%	5%	5%	0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	28	0	0	967	586	0
Sign Control	Stop			Free	Free	

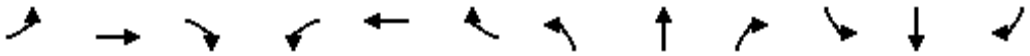
Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 74.1%		ICU Level of Service D	
Analysis Period (min) 15			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	10	15	20	855	520	10
Future Volume (Veh/h)	10	15	20	855	520	10
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	11	17	22	945	575	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				231		
pX, platoon unblocked	0.54					
vC, conflicting volume	1570	580	586			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1628	580	586			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	82	97	98			
cM capacity (veh/h)	60	518	999			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	28	967	586
Volume Left	11	22	0
Volume Right	17	0	11
cSH	129	999	1700
Volume to Capacity	0.22	0.02	0.34
Queue Length 95th (ft)	20	2	0
Control Delay (s)	40.5	0.6	0.0
Lane LOS	E	A	
Approach Delay (s)	40.5	0.6	0.0
Approach LOS	E		

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	74.1%	ICU Level of Service	D
Analysis Period (min)	15		

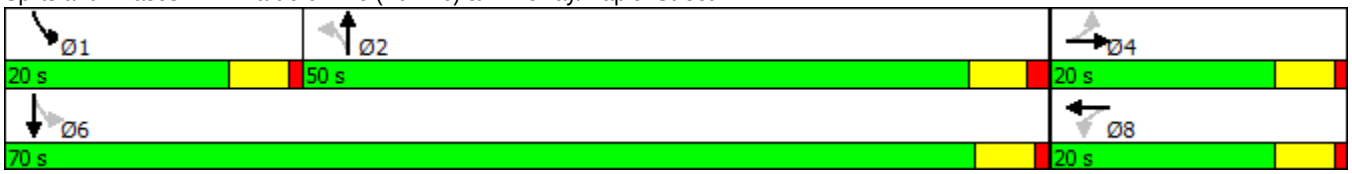


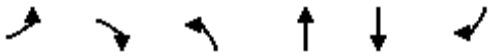
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	10	80	0	90	5	570	120	200	655	0
Future Volume (vph)	0	0	10	80	0	90	5	570	120	200	655	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	1589	0	0	1635	0	0	1759	0	1728	1801	0
Flt Permitted					0.844			0.995		0.249		
Satd. Flow (perm)	0	1589	0	0	1412	0	0	1751	0	453	1801	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		649			1130			962			231	
Travel Time (s)		14.8			25.7			21.9			5.3	
Confl. Peds. (#/hr)	2					2	1					2
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	2%	2%	0%	1%	2%	0%	0%	2%	2%	1%	2%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	12	0	0	196	0	0	802	0	231	756	0
Turn Type		NA		Perm	NA		Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		15.0	15.0		5.0	15.0	
Minimum Split (s)	11.0	11.0		11.0	11.0		20.5	20.5		11.0	20.0	
Total Split (s)	20.0	20.0		20.0	20.0		50.0	50.0		20.0	70.0	
Total Split (%)	22.2%	22.2%		22.2%	22.2%		55.6%	55.6%		22.2%	77.8%	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.5	1.5		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0		0.0	0.0	
Total Lost Time (s)		5.0			5.0			5.5		5.0	5.0	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Recall Mode	None	None		None	None		Min	Min		None	Min	
Act Effct Green (s)		14.2			14.2			40.8		55.7	55.7	
Actuated g/C Ratio		0.18			0.18			0.51		0.70	0.70	
v/c Ratio		0.04			0.78			0.90		0.50	0.60	
Control Delay		30.2			56.4			33.2		8.1	8.8	
Queue Delay		0.0			0.0			0.0		0.0	0.0	
Total Delay		30.2			56.4			33.2		8.1	8.8	
LOS		C			E			C		A	A	
Approach Delay		30.2			56.4			33.2			8.7	
Approach LOS		C			E			C			A	
Queue Length 50th (ft)		5			100			348		35	172	
Queue Length 95th (ft)		21			#217			#626		59	261	
Internal Link Dist (ft)		569			1050			882			151	
Turn Bay Length (ft)												
Base Capacity (vph)		302			268			987		557	1473	
Starvation Cap Reductn		0			0			0		0	0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Spillback Cap Reductn		0			0			0		0	0	
Storage Cap Reductn		0			0			0		0	0	
Reduced v/c Ratio		0.04			0.73			0.81		0.41	0.51	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 80			
Natural Cycle: 75			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.90			
Intersection Signal Delay: 23.3		Intersection LOS: C	
Intersection Capacity Utilization 105.8%		ICU Level of Service G	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

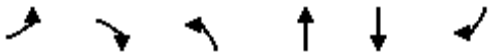
Splits and Phases: 1: Hartford Ave (Rt. 126) & Driveway/Maple Street





Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	5	20	5	655	835	5
Future Volume (vph)	5	20	5	655	835	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	1624	0	0	1801	1799	0
Flt Permitted	0.990					
Satd. Flow (perm)	1624	0	0	1801	1799	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	589			231	590	
Travel Time (s)	13.4			5.3	13.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	0%	0%	0%	2%	2%	0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	29	0	0	770	980	0
Sign Control	Stop			Free	Free	

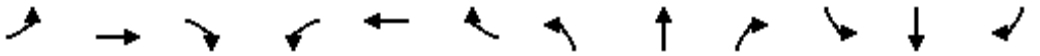
Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 56.5%		ICU Level of Service B	
Analysis Period (min) 15			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	20	5	655	835	5
Future Volume (Veh/h)	5	20	5	655	835	5
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	6	23	6	764	974	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				231		
pX, platoon unblocked	0.60					
vC, conflicting volume	1753	977	980			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1922	977	980			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	86	93	99			
cM capacity (veh/h)	44	307	712			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	29	770	980
Volume Left	6	6	0
Volume Right	23	0	6
cSH	138	712	1700
Volume to Capacity	0.21	0.01	0.58
Queue Length 95th (ft)	19	1	0
Control Delay (s)	38.0	0.2	0.0
Lane LOS	E	A	
Approach Delay (s)	38.0	0.2	0.0
Approach LOS	E		

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	56.5%	ICU Level of Service	B
Analysis Period (min)	15		

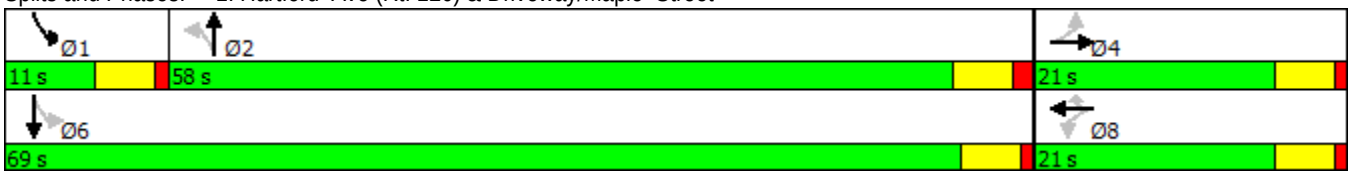


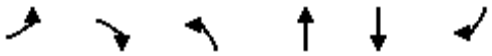
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	5	140	0	190	5	685	45	70	450	0
Future Volume (vph)	0	0	5	140	0	190	5	685	45	70	450	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		75	0		0	0		0
Storage Lanes	0		0	0		1	0		0	1		0
Taper Length (ft)	0			0			0			0		
Satd. Flow (prot)	0	1589	0	0	1711	1531	0	1718	0	1616	1749	0
Flt Permitted					0.754			0.997		0.265		
Satd. Flow (perm)	0	1589	0	0	1358	1531	0	1713	0	451	1749	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		649			1130			962			231	
Travel Time (s)		14.8			25.7			21.9			5.3	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	2%	2%	0%	2%	2%	2%	25%	6%	5%	8%	5%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	5	0	0	153	208	0	803	0	77	492	0
Turn Type		NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Detector Phase	4	4		8	8	8	2	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	15.0	15.0		6.0	15.0	
Minimum Split (s)	11.0	11.0		11.0	11.0	11.0	20.5	20.5		11.0	20.0	
Total Split (s)	21.0	21.0		21.0	21.0	21.0	58.0	58.0		11.0	69.0	
Total Split (%)	23.3%	23.3%		23.3%	23.3%	23.3%	64.4%	64.4%		12.2%	76.7%	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.5	1.5		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)		5.0			5.0	5.0		5.5		5.0	5.0	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Recall Mode	None	None		None	None	None	Min	Min		None	Min	
Act Effct Green (s)		14.4			14.4	14.4		40.3		48.8	48.8	
Actuated g/C Ratio		0.19			0.19	0.19		0.54		0.66	0.66	
v/c Ratio		0.02			0.58	0.70		0.86		0.19	0.43	
Control Delay		30.4			42.7	47.2		26.3		5.2	6.8	
Queue Delay		0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay		30.4			42.7	47.2		26.3		5.2	6.8	
LOS		C			D	D		C		A	A	
Approach Delay		30.4			45.3			26.3			6.6	
Approach LOS		C			D			C			A	
Queue Length 50th (ft)		2			72	100		331		11	95	
Queue Length 95th (ft)		12			#159	#222		511		23	144	
Internal Link Dist (ft)		569			1050			882			151	
Turn Bay Length (ft)						75						

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)		379			323	365		1215		400	1436	
Starvation Cap Reductn		0			0	0		0		0	0	
Spillback Cap Reductn		0			0	0		0		0	0	
Storage Cap Reductn		0			0	0		0		0	0	
Reduced v/c Ratio		0.01			0.47	0.57		0.66		0.19	0.34	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 74.3			
Natural Cycle: 80			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.86			
Intersection Signal Delay: 23.8		Intersection LOS: C	
Intersection Capacity Utilization 78.6%		ICU Level of Service D	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

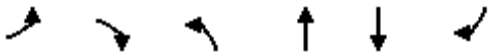
Splits and Phases: 1: Hartford Ave (Rt. 126) & Driveway/Maple Street





Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	10	15	20	855	520	10
Future Volume (vph)	10	15	20	855	520	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	1641	0	0	1749	1746	0
Flt Permitted	0.981			0.999		
Satd. Flow (perm)	1641	0	0	1749	1746	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	589			231	599	
Travel Time (s)	13.4			5.3	13.6	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	2%	0%	0%	5%	5%	0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	28	0	0	967	586	0
Sign Control	Stop			Free	Free	

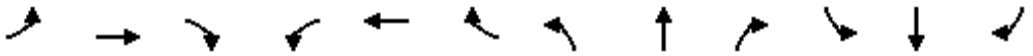
Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 74.1%		ICU Level of Service D	
Analysis Period (min) 15			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	10	15	20	855	520	10
Future Volume (Veh/h)	10	15	20	855	520	10
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	11	17	22	945	575	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				231		
pX, platoon unblocked	0.59					
vC, conflicting volume	1570	580	586			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1618	580	586			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	83	97	98			
cM capacity (veh/h)	66	518	999			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	28	967	586
Volume Left	11	22	0
Volume Right	17	0	11
cSH	140	999	1700
Volume to Capacity	0.20	0.02	0.34
Queue Length 95th (ft)	18	2	0
Control Delay (s)	37.1	0.6	0.0
Lane LOS	E	A	
Approach Delay (s)	37.1	0.6	0.0
Approach LOS	E		

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	74.1%	ICU Level of Service	D
Analysis Period (min)	15		

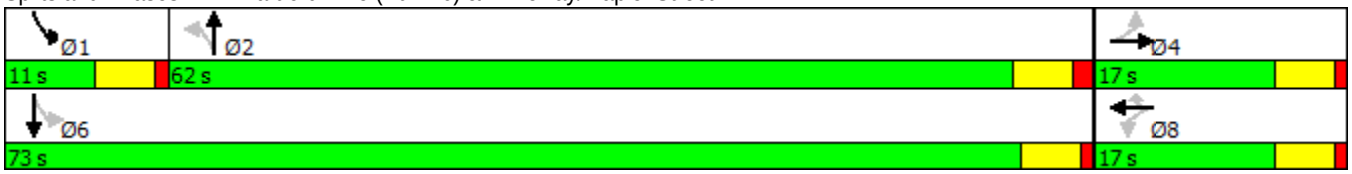


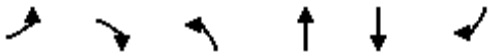
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	10	80	0	90	5	570	120	200	655	0
Future Volume (vph)	0	0	10	80	0	90	5	570	120	200	655	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		75	0		0	0		0
Storage Lanes	0		0	0		1	0		0	1		0
Taper Length (ft)	0			0			0			0		
Satd. Flow (prot)	0	1589	0	0	1728	1561	0	1759	0	1728	1801	0
Flt Permitted					0.750			0.995		0.280		
Satd. Flow (perm)	0	1589	0	0	1364	1518	0	1751	0	509	1801	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		649			1130			962			231	
Travel Time (s)		14.8			25.7			21.9			5.3	
Confl. Peds. (#/hr)	2					2	1					2
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	2%	2%	0%	1%	2%	0%	0%	2%	2%	1%	2%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	12	0	0	92	104	0	802	0	231	756	0
Turn Type		NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Detector Phase	4	4		8	8	8	2	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0	6.0	15.0	15.0		5.0	15.0	
Minimum Split (s)	11.0	11.0		11.0	11.0	11.0	20.5	20.5		11.0	20.0	
Total Split (s)	17.0	17.0		17.0	17.0	17.0	62.0	62.0		11.0	73.0	
Total Split (%)	18.9%	18.9%		18.9%	18.9%	18.9%	68.9%	68.9%		12.2%	81.1%	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.5	1.5		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)		5.0			5.0	5.0		5.5		5.0	5.0	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Recall Mode	None	None		None	None	None	Min	Min		None	Min	
Act Effct Green (s)		9.8			9.8	9.8		38.3		50.9	52.7	
Actuated g/C Ratio		0.14			0.14	0.14		0.57		0.75	0.78	
v/c Ratio		0.05			0.47	0.47		0.81		0.46	0.54	
Control Delay		32.1			40.3	39.6		20.0		6.3	6.2	
Queue Delay		0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay		32.1			40.3	39.6		20.0		6.3	6.2	
LOS		C			D	D		B		A	A	
Approach Delay		32.1			39.9			20.0			6.2	
Approach LOS		C			D			B			A	
Queue Length 50th (ft)		5			37	42		264		26	128	
Queue Length 95th (ft)		22			99	108		433		49	219	
Internal Link Dist (ft)		569			1050			882			151	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)						75						
Base Capacity (vph)		308			264	294		1428		501	1646	
Starvation Cap Reductn		0			0	0		0		0	0	
Spillback Cap Reductn		0			0	0		0		0	0	
Storage Cap Reductn		0			0	0		0		0	0	
Reduced v/c Ratio		0.04			0.35	0.35		0.56		0.46	0.46	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 67.7			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.81			
Intersection Signal Delay: 15.2		Intersection LOS: B	
Intersection Capacity Utilization 99.9%		ICU Level of Service F	
Analysis Period (min) 15			

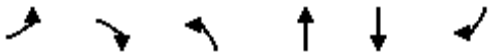
Splits and Phases: 1: Hartford Ave (Rt. 126) & Driveway/Maple Street





Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	5	20	5	655	835	5
Future Volume (vph)	5	20	5	655	835	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	1624	0	0	1801	1799	0
Flt Permitted	0.990					
Satd. Flow (perm)	1624	0	0	1801	1799	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	589			231	590	
Travel Time (s)	13.4			5.3	13.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	0%	0%	0%	2%	2%	0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	29	0	0	770	980	0
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 56.5%		ICU Level of Service B	
Analysis Period (min) 15			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	20	5	655	835	5
Future Volume (Veh/h)	5	20	5	655	835	5
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	6	23	6	764	974	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				231		
pX, platoon unblocked	0.65					
vC, conflicting volume	1753	977	980			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1891	977	980			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	88	93	99			
cM capacity (veh/h)	50	307	712			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	29	770	980
Volume Left	6	6	0
Volume Right	23	0	6
cSH	149	712	1700
Volume to Capacity	0.19	0.01	0.58
Queue Length 95th (ft)	17	1	0
Control Delay (s)	35.0	0.2	0.0
Lane LOS	D	A	
Approach Delay (s)	35.0	0.2	0.0
Approach LOS	D		

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	56.5%	ICU Level of Service	B
Analysis Period (min)	15		

Appendix E:
MassDOT Highway **Division's**
Project Development Process

Overview of the Project Development Process

Transportation decision-making is complex and can be influenced by legislative mandates, environmental regulations, financial limitations, agency programmatic commitments, and partnering opportunities. Decision-makers and reviewing agencies, when consulted early and often throughout the project development process, can ensure that all participants understand the potential impact these factors can have on project implementation. Project development is the process that takes a transportation improvement from concept through construction.

The MassDOT Highway Division has developed a comprehensive project development process which is contained in Chapter 2 of the *MassDOT Highway Division's Project Development and Design Guide*. The eight-step process covers a range of activities extending from identification of a project need, through completion of a set of finished contract plans, to construction of the project. The sequence of decisions made through the project development process progressively narrows the project focus and, ultimately, leads to a project that addresses the identified needs. The descriptions provided below are focused on the process for a highway project, but the same basic process will need to be followed for non-highway projects as well.

1. Needs Identification

For each of the locations at which an improvement is to be implemented, MassDOT leads an effort to define the problem, establishes project goals and objectives, and defines the scope of the planning needed for implementation. To that end, it has to complete a Project Need Form (PNF), which states in general terms the deficiencies or needs related to the transportation facility or location. The PNF documents the problems and explains why corrective action is needed. For this study, the information defining the need for the project will be drawn primarily, perhaps exclusively, from the present report. Also, at this point in the process, MassDOT meets with potential participants, such as the Metropolitan Planning Organization (MPO) and community members, to allow for an informal review of the project.

The PNF is reviewed by the MassDOT Highway Division district office whose jurisdiction includes the location of the proposed project. MassDOT also sends the PNF to the MPO, for informational purposes. The outcome of this step determines whether the project requires further planning, whether it is already well supported by prior planning studies, and, therefore, whether it is ready to move forward into the design phase, or whether it should be dismissed from further consideration.

2. Planning

This phase will likely not be required for the implementation of the improvements proposed in this planning study, as this planning report should constitute the outcome of this step. However, in general, the purpose of this implementation step is for the project proponent to identify issues, impacts, and approvals that may need to be obtained, so that the subsequent design and permitting processes are understood.

The level of planning needed will vary widely, based on the complexity of the project. Typical tasks include: define the existing context, confirm project need, establish goals and objectives, initiate public outreach, define the project, collect data, develop and analyze alternatives, make recommendations, and provide documentation. Likely outcomes include consensus on the project definition to enable it to move forward into environmental documentation (if needed) and design, or a recommendation to delay the project or dismiss it from further consideration.

3. Project Initiation

At this point in the process, the proponent, MassDOT Highway Division, fills out a Project Initiation Form (PIF) for each improvement, which is reviewed by its Project Review Committee (PRC) and the MPO. The PRC is composed of the Chief Engineer, each District Highway Director, and representatives of the Project Management, Environmental, Planning, Right-of-Way, Traffic, and Bridge departments, and the MassDOT Federal Aid Program Office (FAPO). The PIF documents the project type and description, summarizes the project planning process, identifies likely funding and project management responsibility, and defines a plan for interagency and public participation. First the PRC reviews and evaluates the proposed project based on the MassDOT's statewide priorities and criteria. If the result is positive, MassDOT Highway Division moves the project forward to the design phase, and to programming review by the MPO. The PRC may provide a Project Management Plan to define roles and responsibilities for subsequent steps. The MPO review includes project evaluation based on the MPO's regional priorities and criteria. The MPO may assign project evaluation criteria score, a Transportation Improvement Program (TIP) year, a tentative project category, and a tentative funding category.

4. Environmental Permitting, Design, and Right-of-Way Process

This step has four distinct but closely integrated elements: public outreach, environmental documentation and permitting (if required), design, and right-of-way acquisition (if required). The outcome of this step is a fully designed and permitted project ready for construction. However, a project does not have to be fully designed in order for the MPO to program it in the TIP. The sections below provide more detailed information on the four elements of this step of the project development process.

Public Outreach

Continued public outreach in the design and environmental process is essential to maintain public support for the project and to seek meaningful input on the design elements. The public outreach is often in the form of required public hearings, but can also include less formal dialogues with those interested in and affected by a proposed project.

Environmental Documentation and Permitting

The project proponent, in coordination with the Environmental Services section of the MassDOT Highway Division, will be responsible for identifying and complying with all applicable federal, state, and local environmental laws and requirements. This includes determining the appropriate project category for both the Massachusetts Environmental Protection Act (MEPA) and the National Environmental Protection Act (NEPA). Environmental documentation and permitting is often completed in conjunction with the **Preliminary Design** phase described below.

Design

There are three major phases of design. The first is **Preliminary Design**, which is also referred to as the 25-percent submission. The major components of this phase include full survey of the project area, preparation of base plans, development of basic geometric layout, development of preliminary cost estimates, and submission of a functional design report. Preliminary Design, although not required to, is often completed in conjunction with the Environmental Documentation and Permitting. The next phase is **Final Design**, which is also referred to as the 75-percent and 100-percent submission. The major components of this phase include preparation of a subsurface exploratory plan (if required), coordination of utility relocations, development of traffic management plans through construction zones, development of final cost estimates, and refinement and finalization of the construction plans. Once Final Design is complete, a full set of **Plans, Specifications, and Estimates (PS&E)** is developed for the project.

Right-of-Way Acquisition
A separate set of Right-of-Way plans are required for any project that requires land acquisition or easements. The plans must identify the existing and proposed layout lines, easements, property lines, names of property owners, and the dimensions and areas of estimated takings and easements.

5. Programming (Identification of Funding)
Programming, which typically begins during the design phase, can actually occur at any time during the process, from planning to design. In this step, which is distinct from project initiation, the proponent requests that the MPO place the project in the region's Transportation Improvement Program (TIP). The proponent requesting the project's listing on the TIP can be the community or it can be one of the MPO member agencies (the Regional Planning Agency, MassDOT, and the Regional Transit Authority). The MPO then considers the project in terms of state and regional needs, evaluation criteria, and compliance with the regional Transportation Plan and decides whether to place it in the draft TIP for public review and then in the final TIP.

6. Procurement
Following project design and programming of a highway project, the MassDOT Highway Division publishes a request for proposals. It then reviews the bids and awards the contract to the qualified bidder with the lowest bid.

7. Construction
After a construction contract is awarded, MassDOT Highway Division and the contractor develop a public participation plan and a management plan for the construction process.

8. Project Assessment
The purpose of this step is to receive constituents' comments on the project development process and the project's design elements. MassDOT Highway Division can apply what is learned in this process to future projects.

Project Development Schematic Timetable

Description	Schedule Influence	Typical Duration
Step I: Problem/Need/Opportunity Identification The proponent completes a Project Need Form (PNF). This form is then reviewed by the MassDOT District office which provides guidance to the proponent on the subsequent steps of the process.	The Project Need Form has been developed so that it can be prepared quickly by the proponent, including any supporting data that is readily available. The District office shall return comments to the proponent within one month of PNF submission.	1 to 3 months
Step II: Planning Project planning can range from agreement that the problem should be addressed through a clear solution to a detailed analysis of alternatives and their impacts.	For some projects, no planning beyond preparation of the Project Need Form is required. Some projects require a planning study centered on specific project issues associated with the proposed solution or a narrow family of alternatives. More complex projects will likely require a detailed alternatives analysis.	Project Planning Report: 3 to 24+ months
Step III: Project Initiation The proponent prepares and submits a Project Initiation Form (PIF) and a Transportation Evaluation Criteria (TEC) form in this step. The PIF and TEC are informally reviewed by the Metropolitan Planning Organization (MPO) and MassDOT District office, and formally reviewed by the PRC.	The PIF includes refinement of the preliminary information contained in the PNF. Additional information summarizing the results of the planning process, such as the Project Planning Report, are included with the PIF and TEC. The schedule is determined by PRC staff review (dependent on project complexity) and meeting schedule.	1 to 4 months
Step IV: Design, Environmental, and Right of Way The proponent completes the project design. Concurrently, the proponent completes necessary environmental permitting analyses and files applications for permits. Any right of way needed for the project is identified and the acquisition process begins.	The schedule for this step is dependent upon the size of the project and the complexity of the design, permitting, and right-of-way issues. Design review by the MassDOT district and appropriate sections is completed in this step.	3 to 48+ months
Step V: Programming The MPO considers the project in terms of its regional priorities and determines whether or not to include the project in the draft Regional Transportation Improvement Program (TIP) which is then made available for public comment. The TIP includes a project description and funding source.	The schedule for this step is subject to each MPO's programming cycle and meeting schedule. It is also possible that the MPO will not include a project in its Draft TIP based on its review and approval procedures.	3 to 12+ months
Step VI: Procurement The project is advertised for construction and a contract awarded.	Administration of competing projects can influence the advertising schedule.	1 to 12 months
Step VII: Construction The construction process is initiated including public notification and any anticipated public involvement. Construction continues to project completion.	The duration for this step is entirely dependent upon project complexity and phasing.	3 to 60+ months
Step VIII: Project Assessment The construction period is complete and project elements and processes are evaluated on a voluntary basis.	The duration for this step is dependent upon the proponent's approach to this step and any follow-up required.	1 month

Source: MassDOT Highway Division Project Development and Design Guide