

**TRAFFIC ASSESSMENT FOR THE
ASHLAND PUBLIC SAFETY COMPLEX
ASHLAND, MASSACHUSETTS**

**SUBMITTED TO:
HKT ARCHITECTS
35 MEDFORD STREET
SOMERVILLE, MA 02143**

**SUBMITTED BY:
PARE CORPORATION
8 BLACKSTONE VALLEY PLACE
LINCOLN, RI 02865**

April 2020



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Introduction

The following represents the traffic study completed for the construction of a public safety complex to be located in Ashland, Massachusetts. The proposed complex is expected to be approximately 41,650 square feet in size. The proposed site is located in the southeast quadrant of the intersection of Union Street/Waverly Street (Route 135) with East Union Street. The complex is proposed to have two driveways, one onto Union Street south of the intersection for general use and one at the intersection for official vehicles.

Presented within are existing conditions in the vicinity of the project site, a safety analysis of the study area, an analysis of the traffic based on existing, future 2026 no-build and future 2026 build conditions, and proposed mitigation measures, where required. A locus map of the study area is provided in Figure 1 and a conceptual plan for the site is provided in Figure 2.

Data Collection

It is anticipated that the site's greatest impact will occur during the weekday commuter peak hours. As such, manual turning movement counts (MTMC) were completed on Wednesday, October 16, 2019, from 7:00 a.m. to 9:00 a.m. and from 4:00 p.m. to 6:00 p.m. at the intersection of Union Street/Waverly Street (Route 135) with East Union Street. Additionally, an automatic traffic recorder count (ATR) was captured in the vicinity of the proposed general-use driveway for a 48-hour period. The data obtained was utilized in determining the proposed trip distribution to and from the site and to complete a capacity analysis of the study area intersections.

Crash data for the roadway network in the vicinity of the project site was obtained from the MassDOT Crash Portal for the three (3) year period from January 2016 through December 2018.

A field review of the study area was conducted, with geometric measurements taken and other field observations recorded at the proposed site and along the significant roadways in the vicinity of the project site that provide access to and egress from the proposed site. The information obtained was used in the assessment of the study area.





● = Study Intersection



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Project No. 17044.03

Date: April 2020

Figure 1
Locus Map
 Ashland Public Safety Complex
 Ashland, MA

Existing Roadway Conditions

The proposed public safety complex will be located on the east side of Union Street in Ashland, Massachusetts with access to and egress from the site via two proposed driveways, one located on Union Street south of the intersection with East Union Street for general use and one located within the intersection for official use only.

Land use surrounding the proposed site consists primarily of commercial uses along Union Street/Waverly Street. The Ashland High School is located approximately ¼ mile east of the site.

The study area is defined as the significant roadways and intersections in the vicinity of the proposed site that may be impacted by traffic due to the addition of the public safety complex. The following roadways and intersections are included in the study area for the proposed site:

Study Area Roadways

- Union Street from north of Fountain Street to East Union Street

Study Area Intersections

- Union Street/Waverly Street (Route 135) with East Union Street – Signalized

Union Street (Route 135)

Union Street (Route 135) is classified as an urban principal arterial under Town jurisdiction. Near the proposed general-use driveway, the roadway has a paved width of 30 feet, including a 14-foot travel lane and a 1-foot striped shoulder in each direction. There is granite curbing and a 5-foot sidewalk along the eastern side of the road. In front of the proposed site, the sidewalk is setback an additional five feet, forming a 6-foot shoulder. The roadway has a posted speed limit of 35 miles per hour in the study area.



Photo 1: Union Street (Route 135) Looking NB at Site

Union Street/Waverly Street at East Union Street

The intersection of Union Street/Waverly Street (Route 135) and East Union Street forms a three-legged signalized intersection. Union Street/Waverly Street runs north/south while East Union Street approaches from the east. The signal operates in two phases; the first phase is for the Union Street/Waverly Street movements and the second phase is for the East Union Street movements. In the vicinity of the intersection, Union Street flares to a 25-foot northbound lane to accommodate a through lane as well as a right-turn lane. The east leg of the intersection on East Union Street has a 32-foot paved with a 12-foot travel lane and a 4-foot shoulder in each direction. There is granite curbing and a 5-foot sidewalk along the eastern side of the road. There are no crosswalks or pedestrian accommodations at the intersection. The posted speed limit on East Union Street is 25 miles per hour. East Union Street is classified as an urban collector under Town jurisdiction.



*Photo 2: Union Street/Waverly Street at East Union Street –
Looking Southbound*

In addition to the roadway and intersection characteristics outlined above, the following observations were made during the site visit conducted midday on Wednesday, October 16, 2019:

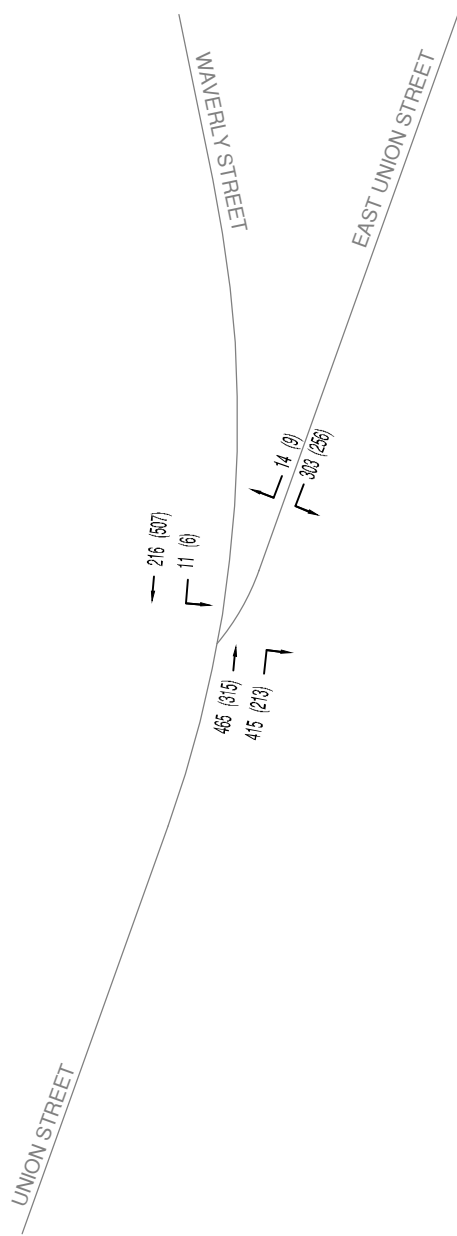
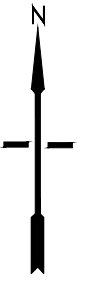
- Southbound left-turn movements cause delay for southbound through movements.
- Due to the extreme angle of the intersection, the westbound and southbound signal heads are visible from both approaches.
- The “stop here on red” sign facing northbound traffic is generally ignored by those in the right-turn lane.
- Utility poles run along both sides of Union Street/Waverly Street (Route 135) and along the west side of East Union Street.
- Other utilities located within the roadway/sidewalk include drainage and sewer.



Existing Traffic Volumes

Based on the traffic count data gathered at the study area intersection, the weekday a.m. peak hour occurred between 7:30 a.m. and 8:30 a.m. and the weekday p.m. peak hour occurred between 4:30 p.m. and 5:30 p.m. Based on the nearest continuous count station (411) there is no need for a seasonal adjustment of the count data. Existing a.m. and p.m. peak hour traffic volumes are shown in Figure 3.





XXX AM PEAK HOUR
(XXX) PM PEAK HOUR



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FIGURE 3
ASHLAND PUBLIC SAFETY COMPLEX
Existing (2019) Traffic Volumes
WEEKDAY AM & PM PEAK HOURS
Ashland, MA

Safety Analysis

Crash Data

Crash data from the MassDOT Crash Portal database was obtained for the latest three (3) year period, from January 2016 through December 2018. Crash data was reviewed to determine the presence of safety concerns within the study area.

According to the data received there were 4 total incidents that occurred in the study area. Of these 4 total incidents, 2 incidents occurred at the intersection and 2 incidents occurred on study area roadways not specifically at a study area intersection. Of the 4 total incidents, none resulted in an injury or fatality. A breakdown of the incidents by type and number of injuries can be seen below in Table 1.

Table 1: Crash Summary

Roadway	Non-Fatal Injuries	Fatal Injuries	Angle	Head-On	Loss of Control	Object	Other	Rear-End	Side-Swipe
Union Street	0	0	0	0	0	1	0	1	0
Union/Waverly at E. Union	0	0	0	0	0	0	0	2	0

The data received shows a higher occurrence of rear-end incidents. These are generally low severity incidents and are the most common types of incidents expected at signalized intersections. The only incident that was not a rear-end collision involved a single-vehicle collision with a utility pole. There were no trends or intensities of incidents noticed that would require or lend themselves to mitigation. A summary table of all crash data reviewed is provided in Appendix B.

Speed Study

The ATR captured along Union Street included the collection of speed data. A full report of the speed data is provided in Appendix C and the results are summarized in Table 2.

Table 2: Speed Data Result

		Posted Speed Limit	Average Speed	True Median (50 th Percentile)	85 th Percentile	10 MPH Pace	% over Speed Limit
Union Street	Northbound	35	32	33	39	31-40	40%
	Southbound	35	30	32	38	31-40	34%

The speed data information gathered was used to determine the design speed for Union Street in the vicinity of the proposed general use driveway. Typically, a roadway should be designed to accommodate the 85th percentile speed. Based on the results of the speed analysis, a design speed of 40 miles per hour is recommended for Union Street.

Sight Distance

According to the American Association of State Highway and Transportation Officials (AASHTO) publication titled *A Policy on the Geometric Design of Highways and Streets, Sixth Edition 2011*, the minimum safe stopping sight distance (SSD) for a 40 mile per hour speed is 305 feet. The minimum required intersection sight distance (ISD) for a 40 mile per hour speed is 445 feet.



The available sight distance was measured in each direction from the proposed general use driveway. There is adequate stopping and intersection sight distance in both directions from the proposed driveway. The results of the sight distance analysis are summarized in Table 3.

Table 3: Sight Distance Summary

		Required SSD (ft)	Measured SSD (ft)	Required ISD (ft)	Measured ISD (ft)
Proposed General Use Driveway	To the North	305	650/700 ¹	445	650/700 ¹
	To the South	305	>900	445	>900

SSD – Stopping Sight Distance

ISD – Intersection Sight Distance

1. Sight distance measured along East Union Street/Waverly Street due to the angle of the intersection.

Future Conditions

To account for background growth along the roadways within the vicinity of the project site, the existing traffic volumes were projected over a seven-year horizon from 2019 to 2026. Recent Census data for the Town of Ashland was reviewed to determine the appropriate growth rate. The available Census data showed a 11.3% increase in population from 2000 to 2010. To provide a conservative analysis of the project area, a growth rate of 1.5% per year was used for the seven-year projection. A copy of the available Census Data can be found in Appendix D.

Traffic volumes for the a.m. and p.m. peak hours of the future 2020 no-build condition are provided in Figure 4.

Build Conditions

The future 2020 build condition represents the future 2020 no-build condition plus traffic associated with the proposed public safety complex.

Site Description

The proposed public safety complex will be approximately 41,650 square feet in size. A driveway for general use will be located along the southern edge of the site and a driveway for official vehicles only will be located along the northern edge of the site within the signalized intersection.

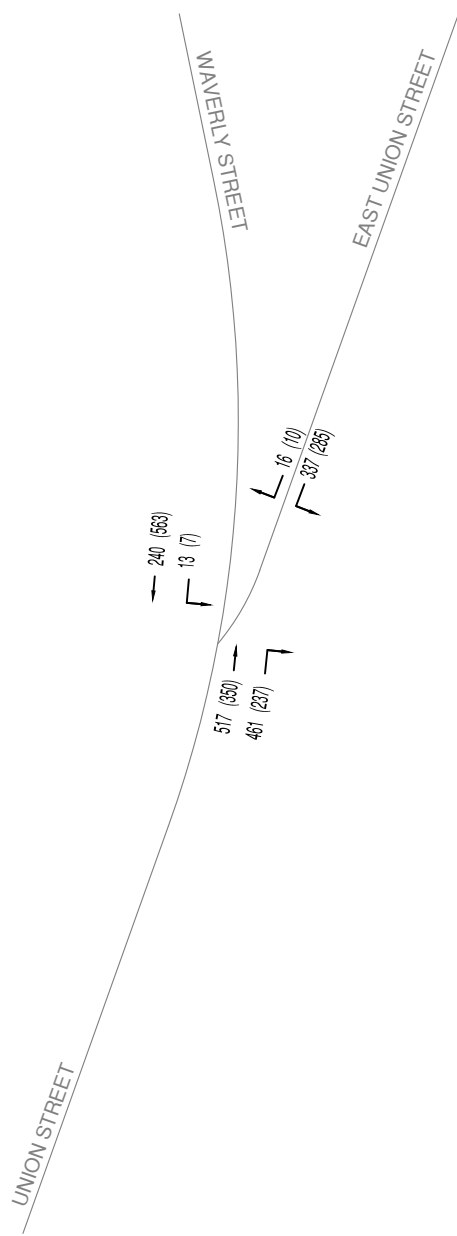
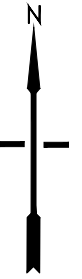
Trip Generation

Trip generation for particular land uses are typically calculated using rates provided in the Institute of Transportation Engineers *Trip Generation Manual*. Trip generation rates for public safety complexes are provided under land use code (LUC) 575 – Fire and Rescue Station. This use has projections for the p.m. commuter peak only. To present a conservative analysis, the a.m. commuter peak was assumed to have reverse trips from the p.m. commuter peak. The results of the trip generation calculations are summarized in Table 4.

Table 4: Trip Generation

Time of Day	Entering Site Trips	Exiting Site Trips	Total Site Trips
Weekday, A.M. Peak Hour	14	6	20
Weekday, P.M. Peak Hour	6	14	20





XXX AM PEAK HOUR
(XXX) PM PEAK HOUR



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FIGURE 4
ASHLAND PUBLIC SAFETY COMPLEX
No-Build (2026) Traffic Volumes
WEEKDAY AM & PM PEAK HOURS
Ashland, MA

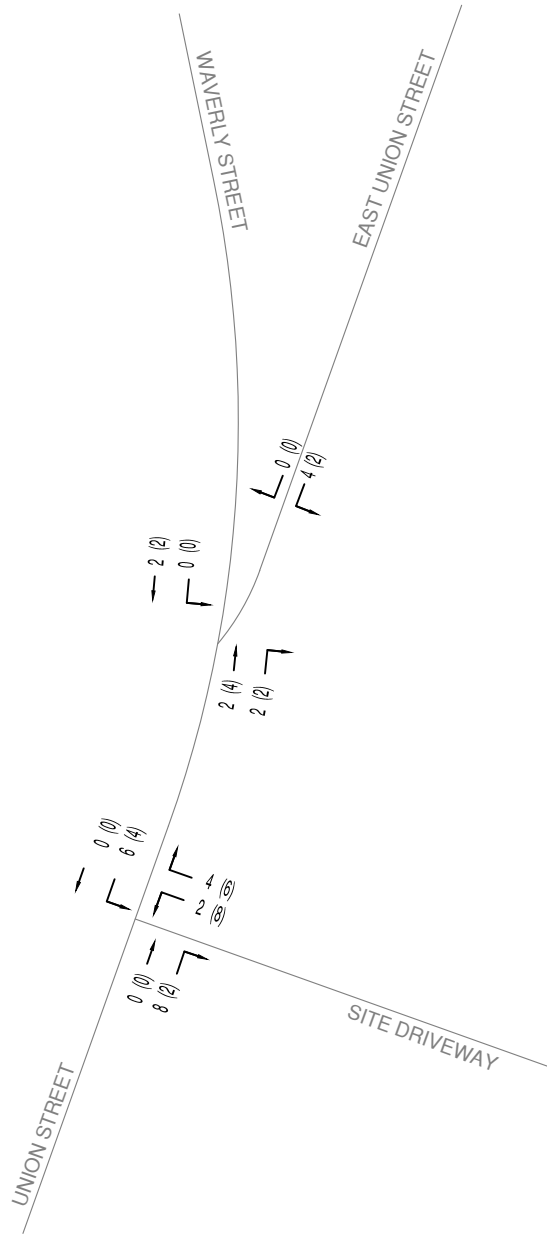
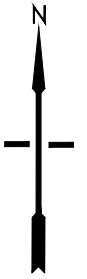
Trip Distribution

Trip distribution was completed for the proposed public safety complex by adding the proposed traffic into the existing traffic stream using the existing travel patterns based on the MTMC data.

Traffic volumes for the a.m. and p.m. peak hours of site generated trips and the future 2020 build condition are shown in Figures 5 and 6 respectively.

Complete trip generation and distribution calculations are provided in Appendix E.





XXX AM PEAK HOUR
(XXX) PM PEAK HOUR

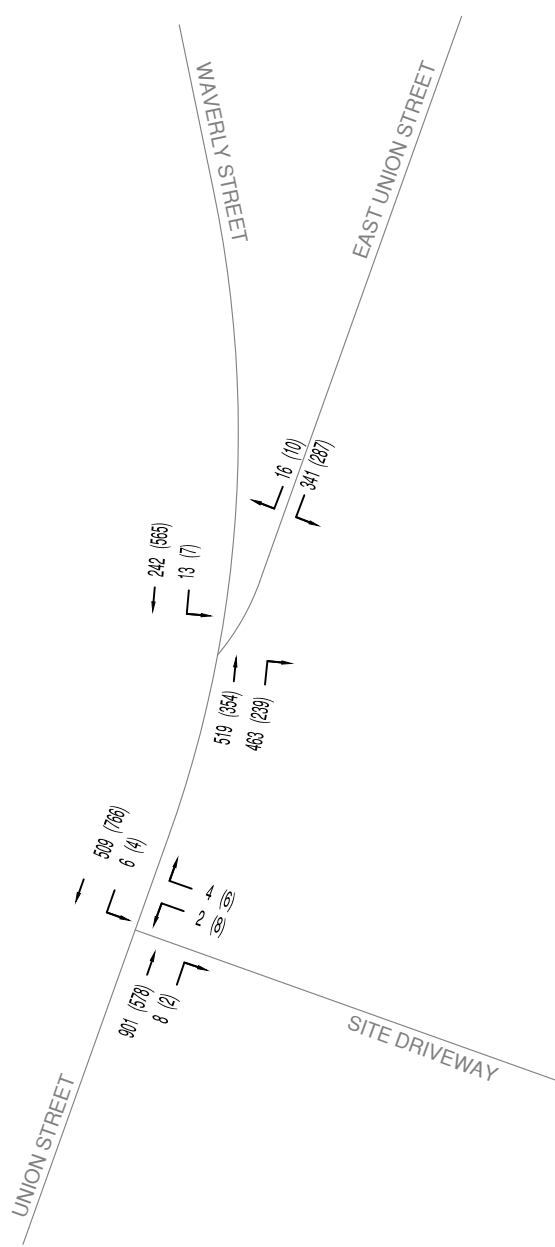
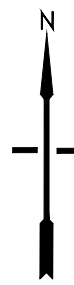


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FIGURE 5
ASHLAND PUBLIC SAFETY COMPLEX
Site Generated Traffic Volumes
WEEKDAY AM & PM PEAK HOURS
Ashland, MA



XXX AM PEAK HOUR
(XXX) PM PEAK HOUR



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FIGURE 6
ASHLAND PUBLIC SAFETY COMPLEX
Build (2026) Traffic Volumes
WEEKDAY AM & PM PEAK HOURS
Ashland, MA

Capacity Analysis – Existing, Future No-Build, and Future Build Conditions

Capacity analysis was completed for all study intersections for existing, future 2026 no-build, and future 2026 build conditions. Capacity analysis characterizes intersections based on their level of service (LOS). LOS is a quality measure describing operational conditions within a traffic stream, generally in terms of service measures such as speed, travel times, traffic interruptions, etc. Six LOS, from A to F, are defined for intersections with A representing the best operating conditions and F representing the worst operating conditions. The LOS criteria for signalized and unsignalized intersections are provided in Table 5 below.

Table 5: LOS Criteria for Intersections

	Signalized Intersection	Unsignalized Intersection
LOS	Delay Time (sec/veh)	Delay Time (sec/veh)
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

Union Street/Waverly Street at East Union Street

At the signalized intersection of Union Street/Waverly Street with East Union Street, all approaches operate at the same LOS in the build condition as they do in the no-build condition with no more than 3 seconds of additional delay. Though the proposed development does not alter the LOS as proposed, the northbound approach is expected to operate at LOS F under the no-build and build conditions.

Due to the poor LOS already projected with the current 3-leg, 2-phase intersection and signal configuration, the proposed site could not accommodate a general-use driveway at the intersection. This would require an additional phase of the signal and would further deteriorate the LOS along the existing approaches. The proposed placement of the emergency-vehicle driveway within the intersection does not have this effect, because it will not call the signal regularly. The access to and from the emergency driveway will operate as needed by use of a preemption system. When the preemption is triggered, the roadway approach signals will advance to all-red, permitting the emergency vehicle to proceed in any direction needed.

Union Street at the Proposed Site Driveway

At the proposed general-use site driveway, the Union Street approaches will operate at LOS A and the site driveway will operate at LOS C with delays less than 25 seconds per vehicle. The LOS computed is based on traffic volumes; however, it is important to ensure the general-use driveway is as accessible as possible given the proximity of the site to the signalized intersection.

The queues along Union Street and East Union Street extend beyond the limits of the site during the two peak hours assessed. It is also reasonable to assume that the westbound queue exceeds the limit of the site property during most times of the day given the short frontage north of the intersection. It is therefore ideal to place a general-use driveway as far from the intersection as possible to minimize interference with the queueing. To further improve accessibility to the general-use driveway during times the queue may extend beyond the site, do-not-block striping could be placed in front of the driveway.



Table 6: A.M. Peak Hour LOS Table

		Weekday A.M. Peak Hour					
		Existing		Future No-Build		Future Build	
		LOS (Delay, sec/veh)	95 th % Queue Length (feet)	LOS (Delay, sec/veh)	95 th % Queue Length (feet)	LOS (Delay, sec/veh)	95 th % Queue Length (feet)
Union Street/Waverly Street at East Union Street							
Northbound	Approach	D (40.1)	#570	F (80.2)	#671	F (83.1)	#675
Southbound	Approach	B (10.3)	94	B (13.7)	127	B (13.9)	129
Westbound	Approach	C (28.6)	178	C (29.6)	200	C (29.9)	#207
Intersection		C (32.3)		E (58.3)		E (60.1)	
Union Street at Proposed Site Driveway							
Northbound	Approach	-		-		N/C	-
Southbound	Approach	-		-		A (0.1)	0
Westbound	Approach	-		-		C (23.3)	3

– 95th percentile queue exceeds capacity, queue may be longer; N/C – No Conflict

Table 7: P.M. Peak Hour LOS Table

		Weekday A.M. Peak Hour					
		Existing		Future No-Build		Future Build	
		LOS (Delay, sec/veh)	95 th % Queue Length (feet)	LOS (Delay, sec/veh)	95 th % Queue Length (feet)	LOS (Delay, sec/veh)	95 th % Queue Length (feet)
Union Street/Waverly Street at East Union Street							
Northbound	Approach	A (9.4)	192	B (11.5)	249	B (11.7)	254
Southbound	Approach	B (10.7)	218	B (12.0)	254	B (12.1)	256
Westbound	Approach	C (25.0)	144	C (25.6)	160	C (25.6)	161
Intersection		B (13.3)		B (14.6)		B (14.7)	
Union Street at Proposed Site Driveway							
Northbound	Approach	-		-		N/C	-
Southbound	Approach	-		-		A (0.0)	0
Westbound	Approach	-		-		C (24.5)	5

– 95th percentile queue exceeds capacity, queue may be longer; N/C – No Conflict

Mitigation

Due to the poor LOS projected for the a.m. peak period for the northbound movement and the intersection as whole, potential means of mitigation were assessed. In the existing layout, the northbound approach widens to form a second lane at the stop line; however, this does not provide sufficient storage length to allow right-turning vehicles to bypass the through movement queue. Further, the signal phasing does not accommodate a free-right movement during the East Union phase. The site reconstruction allows for the realignment of this curblin on the east side of the road, providing the development of a dedicated right-turn lane. This additional storage, combined with a free-right movement, improves the LOS significantly. The capacity analysis with mitigation can be seen in Table 8.



Table 8: Peak Hour LOS with Mitigation

		AM Build		AM Build w/ Mit		PM Build		PM Build w/ Mit	
		LOS (Delay, sec/veh)	95 th % Queue Length (feet)	LOS (Delay, sec/veh)	LOS (Delay, sec/veh)	LOS (Delay, sec/veh)	95 th % Queue Length (feet)	LOS (Delay, sec/veh)	95 th % Queue Length (feet)
Union Street/Waverly Street at East Union Street									
Northbound	T	-	-	B (17.0)	233	-	-	A (9.6)	144
	R	-	-	A (1.9)	0	-	-	A (0.2)	0
	App	F (83.1)	#675	A (9.9)		B (11.7)	254	A (5.8)	
Southbound	App	B (13.9)	129	B (10.9)	102	B (12.1)	256	B (12.8)	266
Westbound	App	C (29.9)	#207	C (20.4)	198	C (25.6)	161	C (23.8)	156
Intersection		E (60.1)		B (12.4)		B (14.7)		B (12.2)	

Conclusions

The crash data reviewed from the MassDOT Crash Portal database for the study area indicated a minimal number of crashes. Of the incidents, most were rear-end collisions which are generally of low severity. It is not expected that the additional traffic generated by the public safety complex on the roadways adjacent to the site will have an impact on the safety of the roadways or create a safety concern.

The available sight distance from the proposed site driveway exceeds the AASHTO requirements for the design speed limit selected. Both stopping and intersection sight distances are met.

Level of service and delay impacts at the intersections surrounding the proposed safety complex are expected to be minimal. The approaches to all study intersections are expected to continue operating at the same LOS as the no-build condition, with overall delay increases of less than three seconds per vehicle. All approaches will operate at favorable levels-of-service with the exception of the northbound approach during the a.m. peak. This approach is projected to operate at LOS F in the no-build condition during the a.m. peak and will continue to operate at LOS F under the build condition unless mitigation is implemented to adjust the site curblines and provide a free-right movement. With mitigation, the northbound approach could improve to LOS A with the intersection overall operating at LOS B.

Based on the analysis, the proposed public safety complex is expected to have minimal impact on the safety and operations of the roadways adjacent to the project site.

Recommendations

Although the traffic generated by the proposed safety complex is not expected to affect the safety and operations of the roadway network within the study area, the following could be considered to help alleviate existing or potential concerns:

- Utilize separate mast arms to reposition the signal heads for the southbound and westbound approaches to reduce the existing ambiguity and add signal heads facing the fire station apron.
- Add do-not-block striping in front of the proposed general-use site driveway.
- Adjust the site curblines to allow for a two-lane northbound approach and provide a free-right movement during the East Union phase of the signal cycle.





Appendix A

Traffic Counts



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 tel (781) 587-0086 cell (781) 439-4999

N/S: Waverly/Union (Route 135)
 E: E. Union Street
 City, State: Ashland, MA
 Client: Pare/A. Archer

File Name : 05260A
 Site Code : 05260
 Start Date : 10/16/2019
 Page No : 1

Groups Printed- Cars & Peds - Trucks & Buses - Bikes by Direction

Start Time	Waverly Street (Route 135) From North			E. Union Street From East			Union Street (Route 135) From South			Int. Total
	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	
07:00 AM	49	0	0	0	37	0	46	144	0	276
07:15 AM	60	1	0	1	45	0	58	140	0	305
07:30 AM	65	5	0	2	70	0	78	137	0	357
07:45 AM	50	2	1	5	87	1	136	91	0	373
Total	224	8	1	8	239	1	318	512	0	1311
08:00 AM	52	3	0	5	79	0	143	94	0	376
08:15 AM	49	1	1	2	67	0	58	143	0	321
08:30 AM	60	1	0	0	44	0	42	158	0	305
08:45 AM	42	0	0	1	47	0	34	157	0	281
Total	203	5	1	8	237	0	277	552	0	1283
Grand Total	427	13	2	16	476	1	595	1064	0	2594
Apprch %	96.6	2.9	0.5	3.2	96.6	0.2	35.9	64.1	0	
Total %	16.5	0.5	0.1	0.6	18.4	0	22.9	41	0	
Cars & Peds	409	13	2	16	456	1	576	1052	0	2525
% Cars & Peds	95.8	100	100	100	95.8	100	96.8	98.9	0	97.3
Trucks & Buses	17	0	0	0	20	0	17	12	0	66
% Trucks & Buses	4	0	0	0	4.2	0	2.9	1.1	0	2.5
Bikes by Direction	1	0	0	0	0	0	2	0	0	3
% Bikes by Direction	0.2	0	0	0	0	0	0.3	0	0	0.1

Start Time	Waverly Street (Route 135) From North				E. Union Street From East				Union Street (Route 135) From South				Int. Total
	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	65	5	0	70	2	70	0	72	78	137	0	215	357
07:45 AM	50	2	1	53	5	87	1	93	136	91	0	227	373
08:00 AM	52	3	0	55	5	79	0	84	143	94	0	237	376
08:15 AM	49	1	1	51	2	67	0	69	58	143	0	201	321
Total Volume	216	11	2	229	14	303	1	318	415	465	0	880	1427
% App. Total	94.3	4.8	0.9		4.4	95.3	0.3		47.2	52.8	0		
PHF	.831	.550	.500	.818	.700	.871	.250	.855	.726	.813	.000	.928	.949
Cars & Peds	208	11	2	221	14	285	1	300	398	458	0	856	1377
% Cars & Peds	96.3	100	100	96.5	100	94.1	100	94.3	95.9	98.5	0	97.3	96.5
Trucks & Buses	7	0	0	7	0	18	0	18	16	7	0	23	48
% Trucks & Buses	3.2	0	0	3.1	0	5.9	0	5.7	3.9	1.5	0	2.6	3.4
Bikes by Direction	1	0	0	1	0	0	0	0	1	0	0	1	2
% Bikes by Direction	0.5	0	0	0.4	0	0	0	0	0.2	0	0	0.1	0.1

Transportation Data Corporation

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N/S: Waverly/Union (Route 135)
E: E. Union Street
City, State: Ashland, MA
Client: Pare/A. Archer

File Name : 05260A
Site Code : 05260
Start Date : 10/16/2019
Page No : 1

Groups Printed- Cars & Peds

Start Time	Waverly Street (Route 135) From North			E. Union Street From East			Union Street (Route 135) From South			Int. Total
	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	
07:00 AM	48	0	0	0	37	0	46	143	0	274
07:15 AM	58	1	0	1	43	0	57	139	0	299
07:30 AM	61	5	0	2	70	0	76	134	0	348
07:45 AM	49	2	1	5	78	1	127	88	0	351
Total	216	8	1	8	228	1	306	504	0	1272
08:00 AM	50	3	0	5	71	0	138	94	0	361
08:15 AM	48	1	1	2	66	0	57	142	0	317
08:30 AM	55	1	0	0	44	0	41	157	0	298
08:45 AM	40	0	0	1	47	0	34	155	0	277
Total	193	5	1	8	228	0	270	548	0	1253
Grand Total	409	13	2	16	456	1	576	1052	0	2525
Apprch %	96.5	3.1	0.5	3.4	96.4	0.2	35.4	64.6	0	
Total %	16.2	0.5	0.1	0.6	18.1	0	22.8	41.7	0	

Start Time	Waverly Street (Route 135) From North				E. Union Street From East				Union Street (Route 135) From South				Int. Total
	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	61	5	0	66	2	70	0	72	76	134	0	210	348
07:45 AM	49	2	1	52	5	78	1	84	127	88	0	215	351
08:00 AM	50	3	0	53	5	71	0	76	138	94	0	232	361
08:15 AM	48	1	1	50	2	66	0	68	57	142	0	199	317
Total Volume	208	11	2	221	14	285	1	300	398	458	0	856	1377
% App. Total	94.1	5	0.9		4.7	95	0.3		46.5	53.5	0		
PHF	.852	.550	.500	.837	.700	.913	.250	.893	.721	.806	.000	.922	.954

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N/S: Waverly/Union (Route 135)
E: E. Union Street
City, State: Ashland, MA
Client: Pare/A. Archer

File Name : 05260A
Site Code : 05260
Start Date : 10/16/2019
Page No : 1

Groups Printed- Trucks & Buses

Start Time	Waverly Street (Route 135) From North			E. Union Street From East			Union Street (Route 135) From South			Int. Total
	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	
07:00 AM	1	0	0	0	0	0	0	1	0	2
07:15 AM	2	0	0	0	2	0	1	1	0	6
07:30 AM	4	0	0	0	0	0	2	3	0	9
07:45 AM	0	0	0	0	9	0	8	3	0	20
Total	7	0	0	0	11	0	11	8	0	37
08:00 AM	2	0	0	0	8	0	5	0	0	15
08:15 AM	1	0	0	0	1	0	1	1	0	4
08:30 AM	5	0	0	0	0	0	0	1	0	6
08:45 AM	2	0	0	0	0	0	0	2	0	4
Total	10	0	0	0	9	0	6	4	0	29
Grand Total	17	0	0	0	20	0	17	12	0	66
Apprch %	100	0	0	0	100	0	58.6	41.4	0	
Total %	25.8	0	0	0	30.3	0	25.8	18.2	0	

Start Time	Waverly Street (Route 135) From North				E. Union Street From East				Union Street (Route 135) From South				Int. Total
	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:15 AM													
07:15 AM	2	0	0	2	0	2	0	2	1	1	0	2	6
07:30 AM	4	0	0	4	0	0	0	0	2	3	0	5	9
07:45 AM	0	0	0	0	0	9	0	9	8	3	0	11	20
08:00 AM	2	0	0	2	0	8	0	8	5	0	0	5	15
Total Volume	8	0	0	8	0	19	0	19	16	7	0	23	50
% App. Total	100	0	0		0	100	0		69.6	30.4	0		
PHF	.500	.000	.000	.500	.000	.528	.000	.528	.500	.583	.000	.523	.625

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N/S: Waverly/Union (Route 135)
 E: E. Union Street
 City, State: Ashland, MA
 Client: Pare/A. Archer

File Name : 05260A
 Site Code : 05260
 Start Date : 10/16/2019
 Page No : 1

Groups Printed- Bikes by Direction

Start Time	Waverly Street (Route 135) From North			E. Union Street From East			Union Street (Route 135) From South			Int. Total
	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	
07:00 AM	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0
07:45 AM	1	0	0	0	0	0	1	0	0	2
Total	1	0	0	0	0	0	1	0	0	2
08:00 AM	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	1	0	0	1
08:45 AM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	1	0	0	1
Grand Total	1	0	0	0	0	0	2	0	0	3
Apprch %	100	0	0	0	0	0	100	0	0	
Total %	33.3	0	0	0	0	0	66.7	0	0	

Start Time	Waverly Street (Route 135) From North				E. Union Street From East				Union Street (Route 135) From South				Int. Total
	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:45 AM													
07:45 AM	1	0	0	1	0	0	0	0	1	0	0	1	2
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	1	0	0	1	1
Total Volume	1	0	0	1	0	0	0	0	2	0	0	2	3
% App. Total	100	0	0		0	0	0		100	0	0		
PHF	.250	.000	.000	.250	.000	.000	.000	.000	.500	.000	.000	.500	.375

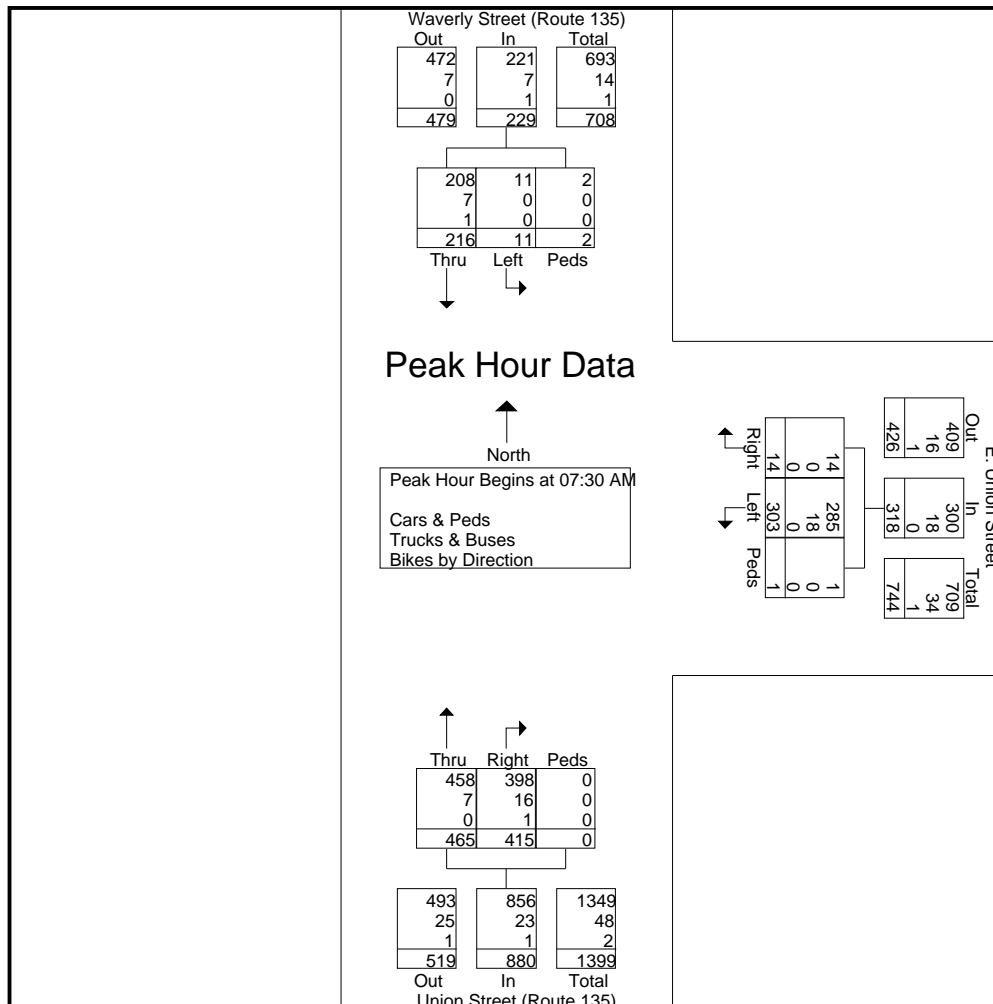
Transportation Data Corporation

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E: E. Union Street
City, State: Ashland, MA
Client: Pare/A. Archer

File Name : 05260A
Site Code : 05260
Start Date : 10/16/2019
Page No : 1

Start Time	Waverly Street (Route 135) From North				E. Union Street From East				Union Street (Route 135) From South				Int. Total
	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	65	5	0	70	2	70	0	72	78	137	0	215	357
07:45 AM	50	2	1	53	5	87	1	93	136	91	0	227	373
08:00 AM	52	3	0	55	5	79	0	84	143	94	0	237	376
08:15 AM	49	1	1	51	2	67	0	69	58	143	0	201	321
Total Volume	216	11	2	229	14	303	1	318	415	465	0	880	1427
% App. Total	94.3	4.8	0.9		4.4	95.3	0.3		47.2	52.8	0		
PHF	.831	.550	.500	.818	.700	.871	.250	.855	.726	.813	.000	.928	.949
Cars & Peds	208	11	2	221	14	285	1	300	398	458	0	856	1377
% Cars & Peds	96.3	100	100	96.5	100	94.1	100	94.3	95.9	98.5	0	97.3	96.5
Trucks & Buses	7	0	0	7	0	18	0	18	16	7	0	23	48
% Trucks & Buses	3.2	0	0	3.1	0	5.9	0	5.7	3.9	1.5	0	2.6	3.4
Bikes by Direction	1	0	0	1	0	0	0	0	1	0	0	1	2
% Bikes by Direction	0.5	0	0	0.4	0	0	0	0	0.2	0	0	0.1	0.1



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N/S: Waverly/Union (Route 135)
E: E. Union Street
City, State: Ashland, MA
Client: Pare/A. Archer

File Name : 05260AA
Site Code : 05260
Start Date : 10/16/2019
Page No : 1

Groups Printed- Cars & Peds

Start Time	Waverly Street (Route 135) From North			E. Union Street From East			Union Street (Route 135) From South			Int. Total
	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	
04:00 PM	104	3	0	2	54	0	40	66	0	269
04:15 PM	112	2	0	1	52	0	41	81	0	289
04:30 PM	138	1	0	1	73	0	47	90	0	350
04:45 PM	124	3	0	2	65	0	53	76	1	324
Total	478	9	0	6	244	0	181	313	1	1232
05:00 PM	124	1	0	3	67	0	54	72	2	323
05:15 PM	120	1	0	3	50	0	58	71	0	303
05:30 PM	127	1	0	3	66	0	63	90	0	350
05:45 PM	105	2	0	3	58	0	71	82	0	321
Total	476	5	0	12	241	0	246	315	2	1297
Grand Total	954	14	0	18	485	0	427	628	3	2529
Apprch %	98.6	1.4	0	3.6	96.4	0	40.4	59.4	0.3	
Total %	37.7	0.6	0	0.7	19.2	0	16.9	24.8	0.1	

Start Time	Waverly Street (Route 135) From North				E. Union Street From East				Union Street (Route 135) From South				Int. Total
	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:30 PM													
04:30 PM	138	1	0	139	1	73	0	74	47	90	0	137	350
04:45 PM	124	3	0	127	2	65	0	67	53	76	1	130	324
05:00 PM	124	1	0	125	3	67	0	70	54	72	2	128	323
05:15 PM	120	1	0	121	3	50	0	53	58	71	0	129	303
Total Volume	506	6	0	512	9	255	0	264	212	309	3	524	1300
% App. Total	98.8	1.2	0		3.4	96.6	0		40.5	59	0.6		
PHF	.917	.500	.000	.921	.750	.873	.000	.892	.914	.858	.375	.956	.929

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City, State: Ashland, MA
Client: Pare/A. Archer

File Name : 05260AA
Site Code : 05260
Start Date : 10/16/2019
Page No : 1

Groups Printed- Trucks & Buses

Start Time	Waverly Street (Route 135) From North			E. Union Street From East			Union Street (Route 135) From South			Int. Total
	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	
04:00 PM	2	0	0	0	0	0	0	1	0	3
04:15 PM	1	0	0	0	1	0	0	2	0	4
04:30 PM	0	0	0	0	1	0	0	0	0	1
04:45 PM	0	0	0	0	0	0	0	4	0	4
Total	3	0	0	0	2	0	0	7	0	12
05:00 PM	1	0	0	0	0	0	0	1	0	2
05:15 PM	0	0	0	0	0	0	1	1	0	2
05:30 PM	0	0	0	0	1	0	0	0	0	1
05:45 PM	1	0	0	0	0	0	1	0	0	2
Total	2	0	0	0	1	0	2	2	0	7
Grand Total	5	0	0	0	3	0	2	9	0	19
Apprch %	100	0	0	0	100	0	18.2	81.8	0	
Total %	26.3	0	0	0	15.8	0	10.5	47.4	0	

Start Time	Waverly Street (Route 135) From North				E. Union Street From East				Union Street (Route 135) From South				Int. Total
	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:00 PM													
04:00 PM	2	0	0	2	0	0	0	0	0	1	0	1	3
04:15 PM	1	0	0	1	0	1	0	1	0	2	0	2	4
04:30 PM	0	0	0	0	0	1	0	1	0	0	0	0	1
04:45 PM	0	0	0	0	0	0	0	0	0	4	0	4	4
Total Volume	3	0	0	3	0	2	0	2	0	7	0	7	12
% App. Total	100	0	0		0	100	0		0	100	0		
PHF	.375	.000	.000	.375	.000	.500	.000	.500	.000	.438	.000	.438	.750

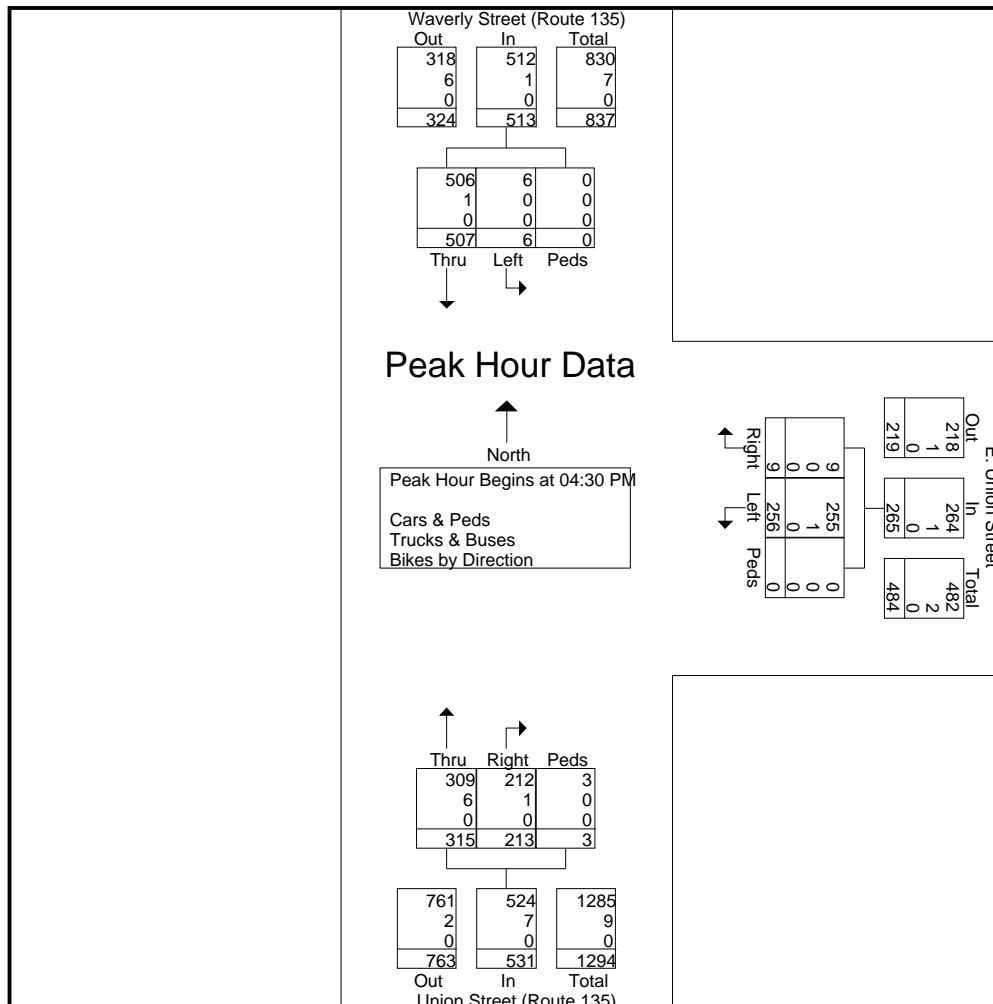
Transportation Data Corporation

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N/S: Waverly/Union (Route 135)
E: E. Union Street
City, State: Ashland, MA
Client: Pare/A. Archer

File Name : 05260AA
Site Code : 05260
Start Date : 10/16/2019
Page No : 1

Start Time	Waverly Street (Route 135) From North				E. Union Street From East				Union Street (Route 135) From South				Int. Total
	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:30 PM													
04:30 PM	138	1	0	139	1	74	0	75	47	90	0	137	351
04:45 PM	124	3	0	127	2	65	0	67	53	80	1	134	328
05:00 PM	125	1	0	126	3	67	0	70	54	73	2	129	325
05:15 PM	120	1	0	121	3	50	0	53	59	72	0	131	305
Total Volume	507	6	0	513	9	256	0	265	213	315	3	531	1309
% App. Total	98.8	1.2	0		3.4	96.6	0		40.1	59.3	0.6		
PHF	.918	.500	.000	.923	.750	.865	.000	.883	.903	.875	.375	.969	.932
Cars & Peds	506	6	0	512	9	255	0	264	212	309	3	524	1300
% Cars & Peds	99.8	100	0	99.8	100	99.6	0	99.6	99.5	98.1	100	98.7	99.3
Trucks & Buses	1	0	0	1	0	1	0	1	1	6	0	7	9
% Trucks & Buses	0.2	0	0	0.2	0	0.4	0	0.4	0.5	1.9	0	1.3	0.7
Bikes by Direction	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bikes by Direction	0	0	0	0	0	0	0	0	0	0	0	0	0



Transportation Data Corporation

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Union Street (Route 135)
south of E. Union Street
City, State: Ashland, MA
Client: Pare/A. Archer

05260Aclass
Site Code: 05260

Northbound

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
10/16/19	0	11	5	0	2	0	0	0	0	0	0	0	0	18
01:00	0	12	0	0	0	0	0	0	0	0	0	0	0	12
02:00	0	9	1	0	0	1	0	0	0	0	0	0	0	11
03:00	0	6	1	0	3	0	0	0	0	0	0	0	0	10
04:00	0	30	6	0	2	1	0	0	1	0	0	0	0	40
05:00	1	164	53	1	13	0	0	0	3	0	0	0	0	235
06:00	2	511	172	7	27	3	1	3	1	0	0	0	0	727
07:00	4	622	146	8	26	1	1	3	1	0	0	0	0	812
08:00	2	644	117	8	19	3	0	0	1	0	0	0	0	794
09:00	3	466	121	4	26	5	1	3	1	0	0	0	0	630
10:00	2	328	98	4	27	3	2	3	1	0	0	0	0	468
11:00	3	328	78	3	28	1	2	2	0	0	0	0	0	445
12 PM	4	298	75	3	15	1	1	1	1	0	0	0	0	399
13:00	1	280	79	6	24	6	0	0	1	0	0	0	0	397
14:00	2	328	84	16	25	7	0	0	0	0	0	0	0	462
15:00	3	391	88	4	19	5	0	0	2	0	0	0	0	512
16:00	3	364	63	4	20	2	0	2	1	0	0	0	0	459
17:00	2	430	65	2	18	2	0	1	0	0	0	0	0	520
18:00	3	388	76	2	14	0	0	0	0	0	0	0	0	483
19:00	2	261	57	1	9	0	0	0	0	0	0	0	0	330
20:00	1	186	31	0	3	0	0	0	0	0	0	0	0	221
21:00	1	147	29	0	7	0	0	2	0	0	0	0	0	186
22:00	2	99	12	0	0	0	0	0	0	0	0	0	0	113
23:00	0	36	12	0	1	0	0	0	0	0	0	0	0	49
Day Total	41	6339	1469	73	328	41	8	20	14	0	0	0	0	8333
Percent	0.5%	76.1%	17.6%	0.9%	3.9%	0.5%	0.1%	0.2%	0.2%	0.0%	0.0%	0.0%	0.0%	
AM Peak	07:00	08:00	06:00	07:00	11:00	09:00	10:00	06:00	05:00					07:00
Vol.	4	644	172	8	28	5	2	3	3					812
PM Peak	12:00	17:00	15:00	14:00	14:00	14:00	12:00	16:00	15:00					17:00
Vol.	4	430	88	16	25	7	1	2	2					520

Transportation Data Corporation

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Union Street (Route 135)
south of E. Union Street
City, State: Ashland, MA
Client: Pare/A. Archer

05260Aclass
Site Code: 05260

Northbound

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
10/17/19	0	11	3	0	0	0	0	0	0	0	0	0	0	14
01:00	1	9	1	0	2	1	0	0	0	0	0	0	0	14
02:00	0	9	2	0	0	0	0	0	0	0	0	0	0	11
03:00	0	9	3	0	2	0	0	0	0	0	0	0	0	14
04:00	0	33	13	0	4	2	0	0	1	0	0	0	0	53
05:00	0	172	53	1	13	0	0	0	0	0	0	0	0	239
06:00	2	494	126	7	27	1	0	2	1	0	0	0	0	660
07:00	4	587	148	9	25	3	2	5	1	0	0	0	0	784
08:00	5	652	109	5	18	8	0	2	0	0	0	0	0	799
09:00	1	427	117	6	27	5	0	3	1	0	0	0	0	587
10:00	3	319	89	1	46	4	0	2	3	0	0	0	0	467
11:00	2	320	103	3	23	7	0	2	0	0	0	0	0	460
12 PM	3	310	93	3	29	4	0	6	0	0	0	0	0	448
13:00	3	273	78	3	21	5	1	0	0	0	0	0	0	384
14:00	2	359	91	14	17	3	0	2	0	0	0	0	0	488
15:00	5	362	84	13	23	7	0	1	1	0	0	0	0	496
16:00	6	361	83	2	16	2	0	1	0	0	0	0	0	471
17:00	2	382	76	3	18	1	0	0	1	0	0	0	0	483
18:00	4	385	69	0	9	2	0	0	0	0	0	0	0	469
19:00	2	260	46	0	13	2	0	2	0	0	0	0	0	325
20:00	1	183	28	0	5	1	0	0	0	0	0	0	0	218
21:00	1	152	24	0	6	0	0	0	0	0	0	0	0	183
22:00	0	87	18	0	1	0	0	0	0	0	0	0	0	106
23:00	0	46	6	0	3	0	0	0	0	0	0	0	0	55
Day Total	47	6202	1463	70	348	58	3	28	9	0	0	0	0	8228
Percent	0.6%	75.4%	17.8%	0.9%	4.2%	0.7%	0.0%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak	08:00	08:00	07:00	07:00	10:00	08:00	07:00	07:00	10:00					08:00
Vol.	5	652	148	9	46	8	2	5	3					799
PM Peak	16:00	18:00	12:00	14:00	12:00	15:00	13:00	12:00	15:00					15:00
Vol.	6	385	93	14	29	7	1	6	1					496
Grand Total	88	12541	2932	143	676	99	11	48	23	0	0	0	0	16561
Percent	0.5%	75.7%	17.7%	0.9%	4.1%	0.6%	0.1%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	

Transportation Data Corporation

Mario Perone, mperone1@verizon.net
tel (781) 587-0086 cell (781) 439-4999

Union Street (Route 135)
south of E. Union Street
City, State: Ashland, MA
Client: Pare/A. Archer

05260Aclass
Site Code: 05260

Southbound

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
10/16/19	0	30	2	0	1	0	0	0	0	0	0	0	0	33
01:00	0	10	3	0	1	0	0	0	0	0	0	0	0	14
02:00	0	4	2	0	0	0	0	0	0	0	0	0	0	6
03:00	0	6	1	0	3	0	0	0	0	0	0	0	0	10
04:00	0	22	2	0	1	1	0	0	0	0	0	0	0	26
05:00	0	76	17	1	12	0	0	0	2	0	0	0	0	108
06:00	2	161	57	1	28	2	0	0	0	0	0	0	0	251
07:00	3	287	79	16	25	2	1	1	0	0	0	0	0	414
08:00	5	297	70	7	23	3	0	4	0	0	0	0	0	409
09:00	5	210	69	2	24	2	0	2	0	0	0	0	0	314
10:00	2	214	61	4	36	1	0	2	0	0	0	0	0	320
11:00	1	223	73	0	29	6	0	1	2	0	0	0	0	335
12 PM	2	281	73	7	30	4	0	3	0	0	0	0	0	400
13:00	3	264	78	1	51	8	0	3	0	0	0	0	0	408
14:00	4	385	91	5	18	4	1	1	0	0	0	0	0	509
15:00	1	455	87	11	31	4	0	3	0	0	0	0	0	592
16:00	5	549	98	4	27	1	0	5	1	0	0	0	0	690
17:00	1	577	83	5	27	3	0	2	0	0	0	0	0	698
18:00	2	467	75	2	23	0	0	1	0	0	1	0	0	571
19:00	3	339	73	2	25	1	0	0	0	0	0	0	0	443
20:00	3	269	39	0	11	1	0	0	0	0	0	0	0	323
21:00	5	189	36	0	11	0	0	0	1	0	0	0	0	242
22:00	2	113	20	0	3	0	0	0	1	0	0	0	0	139
23:00	0	75	12	0	4	0	0	0	0	0	0	0	0	91
Day Total	49	5503	1201	68	444	43	2	28	7	0	1	0	0	7346
Percent	0.7%	74.9%	16.3%	0.9%	6.0%	0.6%	0.0%	0.4%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak	08:00	08:00	07:00	07:00	10:00	11:00	07:00	08:00	05:00					07:00
Vol.	5	297	79	16	36	6	1	4	2					414
PM Peak	16:00	17:00	16:00	15:00	13:00	13:00	14:00	16:00	16:00		18:00			17:00
Vol.	5	577	98	11	51	8	1	5	1		1			698

Transportation Data Corporation

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Union Street (Route 135)
south of E. Union Street
City, State: Ashland, MA
Client: Pare/A. Archer
Southbound

05260Aclass
Site Code: 05260

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
10/17/19	0	30	2	0	1	0	0	0	0	0	0	0	0	33
01:00	0	9	2	0	0	0	0	0	0	0	0	0	0	11
02:00	0	5	0	1	0	0	0	0	0	0	0	0	0	6
03:00	0	10	0	0	2	0	0	0	0	0	0	0	0	12
04:00	0	22	3	0	2	1	0	0	1	0	0	0	0	29
05:00	1	70	14	0	12	0	0	0	0	0	0	0	0	97
06:00	2	169	60	0	15	4	0	0	1	0	0	0	0	251
07:00	5	317	84	10	25	1	0	2	1	0	0	0	0	445
08:00	4	332	77	8	18	4	0	0	0	0	0	0	0	443
09:00	1	262	92	2	39	3	0	5	4	0	0	0	0	408
10:00	4	240	99	3	40	5	0	1	1	0	0	0	0	393
11:00	2	275	74	4	41	5	0	1	0	0	0	0	0	402
12 PM	1	168	54	1	25	1	0	2	4	0	0	0	0	256
13:00	3	173	52	2	20	1	0	2	1	0	0	0	0	254
14:00	2	281	59	11	24	5	0	1	1	0	0	0	0	384
15:00	3	325	80	11	22	2	0	3	0	0	0	0	0	446
16:00	5	547	80	2	31	1	1	0	1	0	0	0	0	668
17:00	4	593	81	4	26	2	0	0	1	0	0	0	0	711
18:00	4	409	72	1	28	2	0	0	0	0	0	0	0	516
19:00	1	304	47	1	21	1	0	0	0	0	0	0	0	375
20:00	0	252	36	0	17	1	0	0	0	0	0	0	0	306
21:00	1	217	32	0	12	1	0	0	0	0	0	0	0	263
22:00	1	113	17	0	5	0	0	0	0	0	0	0	0	136
23:00	0	64	13	0	7	0	0	0	0	0	0	0	0	84
Day Total	44	5187	1130	61	433	40	1	17	16	0	0	0	0	6929
Percent	0.6%	74.9%	16.3%	0.9%	6.2%	0.6%	0.0%	0.2%	0.2%	0.0%	0.0%	0.0%	0.0%	
AM Peak	07:00	08:00	10:00	07:00	11:00	10:00		09:00	09:00					07:00
Vol.	5	332	99	10	41	5		5	4					445
PM Peak	16:00	17:00	17:00	14:00	16:00	14:00	16:00	15:00	12:00					17:00
Vol.	5	593	81	11	31	5	1	3	4					711
Grand Total	93	10690	2331	129	877	83	3	45	23	0	1	0	0	14275
Percent	0.7%	74.9%	16.3%	0.9%	6.1%	0.6%	0.0%	0.3%	0.2%	0.0%	0.0%	0.0%	0.0%	

Transportation Data Corporation

Mario Perone, mperone1@verizon.net

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Union Street (Route 135)
south of E. Union Street
City, State: Ashland, MA
Client: Pare/A. Archer

05260Avolume
Site Code: 05260

Start Time	10/16/201 Wed	NB		Hour Totals		SB		Hour Totals		Combined Totals	
		Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00		4	116			12	104				
12:15		7	107			7	100				
12:30		3	92			11	115				
12:45		4	84	18	399	3	81	33	400	51	799
01:00		2	100			4	74				
01:15		2	101			3	106				
01:30		5	87			5	129				
01:45		3	109	12	397	2	99	14	408	26	805
02:00		4	100			2	115				
02:15		1	120			2	101				
02:30		3	110			2	107				
02:45		3	132	11	462	0	186	6	509	17	971
03:00		1	128			3	169				
03:15		3	131			0	147				
03:30		1	121			4	134				
03:45		5	132	10	512	3	142	10	592	20	1104
04:00		3	95			1	161				
04:15		8	119			1	151				
04:30		12	121			12	189				
04:45		17	124	40	459	12	189	26	690	66	1149
05:00		20	119			15	178				
05:15		46	111			21	177				
05:30		62	145			30	182				
05:45		107	145	235	520	42	161	108	698	343	1218
06:00		137	134			41	177				
06:15		178	130			41	137				
06:30		208	120			69	130				
06:45		204	99	727	483	100	127	251	571	978	1054
07:00		186	88			82	100				
07:15		201	86			98	114				
07:30		214	95			123	112				
07:45		211	61	812	330	111	117	414	443	1226	773
08:00		222	53			98	89				
08:15		195	52			115	77				
08:30		185	51			103	69				
08:45		192	65	794	221	93	88	409	323	1203	544
09:00		183	40			80	76				
09:15		190	45			73	58				
09:30		135	55			95	57				
09:45		122	46	630	186	66	51	314	242	944	428
10:00		120	36			74	44				
10:15		99	30			69	39				
10:30		112	26			95	37				
10:45		137	21	468	113	82	19	320	139	788	252
11:00		115	19			79	25				
11:15		117	9			80	25				
11:30		113	12			78	28				
11:45		100	9	445	49	98	13	335	91	780	140
Total		4202	4131			2240	5106			6442	9237
Combined Total		8333				7346				15679	
Percentage	0.0%										

Transportation Data Corporation

Mario Perone, mperone1@verizon.net
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Union Street (Route 135)
south of E. Union Street
City, State: Ashland, MA
Client: Pare/A. Archer

05260Avolume
Site Code: 05260

Start Time	10/17/201 Thu	NB		Hour Totals		SB		Hour Totals		Combined Totals	
		Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00		4	107			17	64				
12:15		6	113			7	77				
12:30		3	109			6	45				
12:45		1	119	14	448	3	70	33	256	47	704
01:00		5	110			4	60				
01:15		5	78			4	64				
01:30		4	95			3	78				
01:45		0	101	14	384	0	52	11	254	25	638
02:00		3	117			2	70				
02:15		2	107			2	75				
02:30		3	143			1	81				
02:45		3	121	11	488	1	158	6	384	17	872
03:00		2	107			0	147				
03:15		4	120			4	97				
03:30		2	143			5	111				
03:45		6	126	14	496	3	91	12	446	26	942
04:00		3	126			4	133				
04:15		7	111			4	189				
04:30		19	116			5	193				
04:45		24	118	53	471	16	153	29	668	82	1139
05:00		15	114			11	178				
05:15		48	116			21	179				
05:30		69	138			28	179				
05:45		107	115	239	483	37	175	97	711	336	1194
06:00		111	136			39	150				
06:15		162	108			39	147				
06:30		198	108			79	118				
06:45		189	117	660	469	94	101	251	516	911	985
07:00		180	83			99	107				
07:15		198	86			113	101				
07:30		216	94			125	88				
07:45		190	62	784	325	108	79	445	375	1229	700
08:00		170	58			123	76				
08:15		204	51			112	82				
08:30		216	57			97	73				
08:45		209	52	799	218	111	75	443	306	1242	524
09:00		186	49			88	87				
09:15		144	54			114	62				
09:30		131	41			106	67				
09:45		126	39	587	183	100	47	408	263	995	446
10:00		121	37			103	40				
10:15		128	22			94	44				
10:30		102	27			95	28				
10:45		116	20	467	106	101	24	393	136	860	242
11:00		109	32			104	30				
11:15		109	12			87	18				
11:30		105	7			140	24				
11:45		137	4	460	55	71	12	402	84	862	139
Total		4102	4126			2530	4399			6632	8525
Combined Total		8228				6929				15157	
Percentage	0.0%										
Total Percent		8304	8257			4770	9505			13074	17762
		50.1%	49.9%			33.4%	66.6%			42.4%	57.6%
ADT	ADT 15,418	AADT 15,418									

Appendix B

Safety Data



Ashland Public Safety Complex
 Ashland, MA
 Crash Data: Jan 2016 to Dec 2018
 Pare Project No. 17044.03
 October 17, 2019



Crash Number	Crash Date	# of Veh	Light Cond	Type of Collision	Road Cond	Fatalities	Injuries	Veh Direction	Weather	Location
4169812	03/28/2016	2	Daylight	Rear-end	Wet	0	0	W / W	Rain	UNION STREET
4464423	10/15/2017	2	Daylight	Rear-end	Dry	0	0	E / E	Clear	UNION ST / E UNION ST / WAVERLY ST
4632225	10/28/2018	3	Daylight	Rear-end	Wet	0	0	E / E / E	Rain	UNION ST / E UNION ST / WAVERLY ST
4632240	11/16/2018	1	Dark - Lighted	Object (UP)	Snow	0	0	E	Snow	UNION ST

Appendix C

Speed Data



Transportation Data Corporation

Mario Perone, mperone1@verizon.net
tel (781) 587-0086 cell (781) 439-4999

Union Street (Route 135)
south of E. Union Street
City, State: Ashland, MA
Client: Pare/A. Archer

05260Aspeed
Site Code: 05260

Northbound

Start Time	1	16	21	26	31	36	41	46	51	56	61	66	71	Total	85th Percent	95th Percent
10/16/19	0	0	0	0	3	6	6	3	0	0	0	0	0	18	45	48
01:00	0	0	0	2	4	3	1	2	0	0	0	0	0	12	45	48
02:00	0	0	0	0	4	2	3	1	1	0	0	0	0	11	46	52
03:00	0	0	0	0	2	3	3	2	0	0	0	0	0	10	46	48
04:00	0	0	0	0	5	16	14	5	0	0	0	0	0	40	44	48
05:00	0	0	0	10	74	89	54	6	2	0	0	0	0	235	42	44
06:00	17	6	31	113	213	267	73	7	0	0	0	0	0	727	39	42
07:00	168	96	80	166	205	77	16	3	1	0	0	0	0	812	34	38
08:00	201	83	38	102	214	135	20	1	0	0	0	0	0	794	36	39
09:00	23	8	19	83	208	225	57	7	0	0	0	0	0	630	39	42
10:00	14	3	3	25	158	214	48	3	0	0	0	0	0	468	39	42
11:00	11	0	6	29	141	187	68	3	0	0	0	0	0	445	40	43
12 PM	7	0	3	27	111	196	47	8	0	0	0	0	0	399	39	43
13:00	17	0	0	34	111	168	58	8	1	0	0	0	0	397	40	44
14:00	30	5	10	53	174	139	44	6	1	0	0	0	0	462	39	43
15:00	35	14	25	72	184	141	40	1	0	0	0	0	0	512	38	41
16:00	33	1	8	60	188	136	31	2	0	0	0	0	0	459	38	41
17:00	31	0	13	81	232	132	28	3	0	0	0	0	0	520	38	40
18:00	19	4	9	91	223	114	23	0	0	0	0	0	0	483	37	39
19:00	9	0	7	32	144	111	24	2	0	0	1	0	0	330	38	42
20:00	4	0	0	24	95	78	17	3	0	0	0	0	0	221	39	42
21:00	2	0	2	18	73	73	15	3	0	0	0	0	0	186	39	42
22:00	0	0	1	11	53	34	14	0	0	0	0	0	0	113	39	42
23:00	0	0	1	11	17	11	6	3	0	0	0	0	0	49	41	45
Total	621	220	256	1044	2836	2557	710	82	6	0.0%	0.0%	0.0%	0.0%	8333		
Percent	7.5%	2.6%	3.1%	12.5%	34.0%	30.7%	8.5%	1.0%	0.1%							
AM Peak	08:00	07:00	07:00	07:00	08:00	06:00	06:00	06:00	05:00					07:00		
Vol.	201	96	80	166	214	267	73	7	2					812		
PM Peak	15:00	15:00	15:00	18:00	17:00	12:00	13:00	12:00	13:00		19:00			17:00		
Vol.	35	14	25	91	232	196	58	8	1		1			520		

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Union Street (Route 135)
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City, State: Ashland, MA
Client: Pare/A. Archer

05260Aspeed
Site Code: 05260

Northbound

Start Time	1	16	21	26	31	36	41	46	51	56	61	66	71	Total	85th Percent	95th Percent
10/17/19	0	0	0	3	6	4	1	0	0	0	0	0	0	14	38	41
01:00	0	0	0	3	4	4	2	1	0	0	0	0	0	14	42	46
02:00	0	0	0	2	3	4	1	1	0	0	0	0	0	11	41	47
03:00	0	0	0	1	3	6	4	0	0	0	0	0	0	14	42	44
04:00	0	0	0	3	13	18	16	3	0	0	0	0	0	53	43	45
05:00	1	0	0	4	54	128	48	4	0	0	0	0	0	239	41	44
06:00	20	16	24	109	255	187	45	2	2	0	0	0	0	660	38	41
07:00	199	78	82	138	174	94	16	3	0	0	0	0	0	784	34	38
08:00	163	51	43	116	245	148	30	3	0	0	0	0	0	799	37	39
09:00	23	7	15	97	213	181	43	7	1	0	0	0	0	587	38	42
10:00	18	1	3	20	140	200	70	15	0	0	0	0	0	467	41	44
11:00	34	5	34	58	128	143	49	8	0	1	0	0	0	460	39	43
12 PM	7	2	10	70	196	135	26	2	0	0	0	0	0	448	38	41
13:00	10	3	18	87	159	91	13	1	2	0	0	0	0	384	37	39
14:00	9	0	9	72	195	158	38	6	0	0	1	0	0	488	39	42
15:00	18	3	10	47	194	179	42	2	1	0	0	0	0	496	39	42
16:00	40	1	6	41	182	148	51	2	0	0	0	0	0	471	39	42
17:00	25	0	12	46	209	140	47	4	0	0	0	0	0	483	39	42
18:00	54	7	14	48	196	118	31	1	0	0	0	0	0	469	38	41
19:00	12	2	6	35	126	106	34	3	1	0	0	0	0	325	39	43
20:00	4	0	1	16	94	79	22	2	0	0	0	0	0	218	39	42
21:00	6	0	0	5	56	72	37	5	0	0	1	1	0	183	42	44
22:00	1	0	0	3	31	48	17	6	0	0	0	0	0	106	42	45
23:00	1	0	0	1	16	18	11	6	1	0	1	0	0	55	44	49
Total	645	176	287	1025	2892	2409	694	87	8	1	3	1	0	8228		
Percent	7.8%	2.1%	3.5%	12.5%	35.1%	29.3%	8.4%	1.1%	0.1%	0.0%	0.0%	0.0%	0.0%			
AM Peak	07:00	07:00	07:00	07:00	06:00	10:00	10:00	10:00	06:00	11:00				08:00		
Vol.	199	78	82	138	255	200	70	15	2	1				799		
PM Peak	18:00	18:00	13:00	13:00	17:00	15:00	16:00	14:00	13:00		14:00	21:00		15:00		
Vol.	54	7	18	87	209	179	51	6	2		1	1		496		
Grand Total	1266	396	543	2069	5728	4966	1404	169	14	1	4	1	0	16561		
Percent	7.6%	2.4%	3.3%	12.5%	34.6%	30.0%	8.5%	1.0%	0.1%	0.0%	0.0%	0.0%	0.0%			

15th Percentile : 25 MPH
 50th Percentile : 33 MPH
 85th Percentile : 39 MPH
 95th Percentile : 42 MPH

Stats 10 MPH Pace Speed : 31-40 MPH
 Number of Vehicles > 35 MPH : 6559
 Percent of Vehicles > 35 MPH : 39.6%
 Mean Speed(Average) : 32 MPH

Transportation Data Corporation

Mario Perone, mperone1@verizon.net
tel (781) 587-0086 cell (781) 439-4999

Union Street (Route 135)
south of E. Union Street
City, State: Ashland, MA
Client: Pare/A. Archer

05260Aspeed
Site Code: 05260

Southbound

Start Time	1	16	21	26	31	36	41	46	51	56	61	66	71	Total	85th Percent	95th Percent
10/16/19	0	0	0	0	6	14	9	4	0	0	0	0	0	33	44	47
01:00	0	0	0	0	3	7	2	2	0	0	0	0	0	14	44	48
02:00	0	0	0	0	2	0	3	1	0	0	0	0	0	6	45	48
03:00	0	0	0	0	2	2	2	4	0	0	0	0	0	10	48	49
04:00	0	0	0	0	6	14	3	3	0	0	0	0	0	26	43	47
05:00	4	0	0	3	24	55	17	3	2	0	0	0	0	108	41	44
06:00	11	0	3	34	89	76	31	5	1	1	0	0	0	251	40	44
07:00	43	23	32	79	147	73	15	2	0	0	0	0	0	414	36	39
08:00	48	14	26	59	144	86	27	5	0	0	0	0	0	409	38	42
09:00	16	0	1	15	105	130	43	4	0	0	0	0	0	314	39	43
10:00	13	0	1	12	97	145	43	6	1	1	0	0	1	320	40	44
11:00	9	0	0	14	105	152	50	5	0	0	0	0	0	335	40	43
12 PM	13	4	7	33	147	157	39	0	0	0	0	0	0	400	39	42
13:00	19	4	14	27	113	172	51	6	2	0	0	0	0	408	39	43
14:00	58	32	26	76	145	141	24	4	2	0	1	0	0	509	38	41
15:00	46	9	28	118	221	148	21	1	0	0	0	0	0	592	37	39
16:00	104	85	89	104	186	109	12	0	1	0	0	0	0	690	35	39
17:00	115	88	102	129	174	73	16	1	0	0	0	0	0	698	34	38
18:00	42	13	37	104	222	127	25	0	1	0	0	0	0	571	37	39
19:00	8	0	7	66	173	167	20	2	0	0	0	0	0	443	38	39
20:00	6	1	11	48	139	104	14	0	0	0	0	0	0	323	38	39
21:00	5	0	2	46	103	73	12	1	0	0	0	0	0	242	38	40
22:00	2	0	0	22	61	42	9	3	0	0	0	0	0	139	38	42
23:00	0	0	1	8	39	29	11	3	0	0	0	0	0	91	40	44
Total	562	273	387	997	2453	2096	499	65	10	2	1	0	1	7346		
Percent	7.7%	3.7%	5.3%	13.6%	33.4%	28.5%	6.8%	0.9%	0.1%	0.0%	0.0%	0.0%	0.0%			
AM Peak	08:00	07:00	07:00	07:00	07:00	11:00	11:00	10:00	05:00	06:00			10:00	07:00		
Vol.	48	23	32	79	147	152	50	6	2	1			1	414		
PM Peak	17:00	17:00	17:00	17:00	18:00	13:00	13:00	13:00	13:00		14:00			17:00		
Vol.	115	88	102	129	222	172	51	6	2		1			698		

Transportation Data Corporation

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Union Street (Route 135)
south of E. Union Street
City, State: Ashland, MA
Client: Pare/A. Archer

05260Aspeed
Site Code: 05260

Southbound

Start Time	1	16	21	26	31	36	41	46	51	56	61	66	71	Total	85th Percent	95th Percent
10/17/19	0	0	1	2	18	8	4	0	0	0	0	0	0	33	39	42
01:00	0	0	0	3	2	2	4	0	0	0	0	0	0	11	42	44
02:00	0	0	1	2	3	0	0	0	0	0	0	0	0	6	33	34
03:00	0	0	0	1	6	2	3	0	0	0	0	0	0	12	42	44
04:00	0	0	0	1	9	10	6	3	0	0	0	0	0	29	43	47
05:00	4	0	0	7	27	42	14	2	0	1	0	0	0	97	40	44
06:00	15	0	4	42	111	55	18	4	2	0	0	0	0	251	38	43
07:00	67	26	32	83	144	71	22	0	0	0	0	0	0	445	36	39
08:00	130	21	24	70	86	88	21	3	0	0	0	0	0	443	37	40
09:00	14	2	7	44	163	133	42	3	0	0	0	0	0	408	39	42
10:00	10	0	2	35	110	184	43	9	0	0	0	0	0	393	39	43
11:00	21	7	24	91	144	96	14	4	1	0	0	0	0	402	37	39
12 PM	12	2	12	29	75	94	28	3	1	0	0	0	0	256	39	43
13:00	22	6	5	20	90	80	27	4	0	0	0	0	0	254	39	43
14:00	23	6	15	72	148	100	17	3	0	0	0	0	0	384	38	40
15:00	32	14	25	56	169	119	27	4	0	0	0	0	0	446	38	41
16:00	398	158	54	19	20	17	2	0	0	0	0	0	0	668	21	31
17:00	192	142	71	100	134	63	8	1	0	0	0	0	0	711	33	37
18:00	135	80	41	80	125	49	6	0	0	0	0	0	0	516	34	37
19:00	23	15	18	48	140	107	21	3	0	0	0	0	0	375	38	41
20:00	8	2	8	37	108	124	17	2	0	0	0	0	0	306	38	41
21:00	3	0	0	5	80	139	31	5	0	0	0	0	0	263	39	43
22:00	3	0	0	8	37	64	19	5	0	0	0	0	0	136	40	44
23:00	1	0	0	0	6	47	21	8	1	0	0	0	0	84	44	47
Total	1113	481	344	855	1955	1694	415	66	5	1	0	0	0	6929		
Percent	16.1%	6.9%	5.0%	12.3%	28.2%	24.4%	6.0%	1.0%	0.1%	0.0%	0.0%	0.0%	0.0%			
AM Peak	08:00	07:00	07:00	11:00	09:00	10:00	10:00	10:00	06:00	05:00				07:00		
Vol.	130	26	32	91	163	184	43	9	2	1				445		
PM Peak	16:00	16:00	17:00	17:00	15:00	21:00	21:00	23:00	12:00					17:00		
Vol.	398	158	71	100	169	139	31	8	1					711		
Grand Total	1675	754	731	1852	4408	3790	914	131	15	3	1	0	1	14275		
Percent	11.7%	5.3%	5.1%	13.0%	30.9%	26.5%	6.4%	0.9%	0.1%	0.0%	0.0%	0.0%	0.0%			

15th Percentile : 18 MPH
 50th Percentile : 32 MPH
 85th Percentile : 38 MPH
 95th Percentile : 41 MPH

Stats 10 MPH Pace Speed : 31-40 MPH

Number of Vehicles > 35 MPH : 4855
 Percent of Vehicles > 35 MPH : 34.0%
 Mean Speed(Average) : 30 MPH

Appendix D

Census Data



Ashland Public Safety Complex
Ashland, MA
Background Growth Rate
Pare Project No. 17044.03
October 17, 2019



**US Census Data
Town of Ashland**

	Population
2010	16593
2000	14674
Years	10

ANNUAL GROWTH RATE 1.24%

SAY 1.50%



Appendix E
Trip Generation & Distribution





Fire and Rescue Station
Land Use Code 575: Fire and Rescue Station
Average Vehicle Trip Ends vs. 1,000 Sq. Feet Gross Floor Area
Proposed: 41,650 Sq. Feet

On a: Weekday, AM*

On a: Weekday Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m.

Average Rate:	41.65*0.48	20
Fitted Curve Equation:	N/A	N/A
Trips Entering	71% * 20	14
Trips Exiting	29% * 20	6
		20

On a: Weekday, PM

On a: Weekday Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m.

Average Rate:	41.65*0.48	20
Fitted Curve Equation:	N/A	N/A
Trips Entering	29% * 20	6
Trips Exiting	71% * 20	14
		20

Note: Assumes PM peak hour with reversed entering and exiting percentages

Ashland Public Safety Complex
 Ashland, MA
 Future 2026 No-Build Traffic Volumes
 Pare Project No. 17044.03
 October 18, 2019

2019-2026
 NO-BUILD TRAFFIC VOLUMES
 Future No-Build Growth Factor = 1.5%

AM Peak Hour
 7:30 - 8:30 AM

PM Peak Hour
 4:30 - 5:30 PM

**Waverly Street/Union Street &
 East Union Street**

	2019 Existing	2026 No-Build
NB - T	465	517
NB - RT	415	461
SB - LT	11	13
SB - T	216	240
WB - LT	303	337
WB - RT	14	16

0.5284

**Waverly Street/Union Street &
 East Union Street**

	2019 Existing	2026 No-Build
NB - T	315	350
NB - RT	213	237
SB - LT	6	7
SB - T	507	563
WB - LT	256	285
WB - RT	9	10

0.4162

**Union Street &
 Fire Station**

	2019 Existing	2026 No-Build
NB - T	811	901
NB - RT	0	0
SB - LT	0	0
SB - T	458	509
WB - LT	0	0
WB - RT	0	0

0.6391

**Union Street &
 Fire Station**

	2019 Existing	2026 No-Build
NB - T	520	578
NB - RT	0	0
SB - LT	0	0
SB - T	690	766
WB - LT	0	0
WB - RT	0	0

Ashland Public Safety Complex
 Ashland, MA
 Future 2026 No-Build Traffic Volumes
 Pare Project No. 17044.03
 October 18, 2019

2019-2026
 BUILD TRAFFIC VOLUMES
 Future No-Build Growth Factor = 1.5%

AM Peak Hour
 7:30 - 8:30 AM

PM Peak Hour
 4:30 - 5:30 PM

**Waverly Street/Union Street &
 East Union Street**

	Site Generated	2026 Build
NB - T	2	519
NB - RT	2	463
SB - LT	0	13
SB - T	2	242
WB - LT	4	341
WB - RT	0	16

**Waverly Street/Union Street &
 East Union Street**

	Site Generated	2026 Build
NB - T	4	354
NB - RT	2	239
SB - LT	0	7
SB - T	2	565
WB - LT	2	287
WB - RT	0	10

**Union Street &
 Fire Station**

	Site Generated	2026 Build
NB - T	0	901
NB - RT	8	8
SB - LT	6	6
SB - T	0	509
WB - LT	2	2
WB - RT	4	4

**Union Street &
 Fire Station**

	Site Generated	2026 Build
NB - T	0	578
NB - RT	2	2
SB - LT	4	4
SB - T	0	766
WB - LT	8	8
WB - RT	6	6












Appendix F
Traffic Capacity Analysis



Lanes, Volumes, Timings
4: Union Street/Waverly Street & East Union Street

Ashland Public Safety Complex
Existing AM Peak Hour

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	303	14	465	415	11	216
Future Volume (vph)	303	14	465	415	11	216
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00		0.99			
Frt	0.994		0.936			
Flt Protected	0.954					0.998
Satd. Flow (prot)	1702	0	1710	0	0	1843
Flt Permitted	0.954					0.751
Satd. Flow (perm)	1702	0	1710	0	0	1387
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	4		107			
Link Speed (mph)	30		30			30
Link Distance (ft)	571		397			441
Travel Time (s)	13.0		9.0			10.0
Confl. Peds. (#/hr)		2		1	1	
Peak Hour Factor	0.86	0.86	0.93	0.93	0.82	0.82
Heavy Vehicles (%)	6%	0%	2%	4%	0%	3%
Adj. Flow (vph)	352	16	500	446	13	263
Shared Lane Traffic (%)						
Lane Group Flow (vph)	368	0	946	0	0	276
Turn Type	Prot		NA		Perm	NA
Protected Phases	8		2			6
Permitted Phases					6	
Detector Phase	8		2		6	6
Switch Phase						
Minimum Initial (s)	5.0		5.0		5.0	5.0
Minimum Split (s)	23.0		23.0		23.0	23.0
Total Split (s)	25.0		35.0		35.0	35.0
Total Split (%)	41.7%		58.3%		58.3%	58.3%
Maximum Green (s)	20.0		30.0		30.0	30.0
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
Total Lost Time (s)	5.0		5.0			5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Recall Mode	None		Max		Max	Max
Walk Time (s)	7.0		7.0		7.0	7.0
Flash Dont Walk (s)	11.0		11.0		11.0	11.0
Pedestrian Calls (#/hr)	0		0		0	0
Act Effect Green (s)	16.2		30.4			30.4
Actuated g/C Ratio	0.29		0.54			0.54
v/c Ratio	0.75		0.98			0.37
Control Delay	28.6		40.1			10.3
Queue Delay	0.0		0.0			0.0
Total Delay	28.6		40.1			10.3

Lanes, Volumes, Timings
 4: Union Street/Waverly Street & East Union Street

Ashland Public Safety Complex
 Existing AM Peak Hour

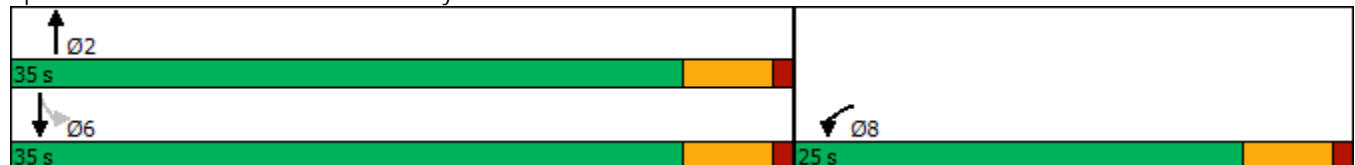


Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
LOS	C		D			B
Approach Delay	28.6		40.1			10.3
Approach LOS	C		D			B
Queue Length 50th (ft)	110		264			50
Queue Length 95th (ft)	178		#570			94
Internal Link Dist (ft)	491		317			361
Turn Bay Length (ft)						
Base Capacity (vph)	606		967			745
Starvation Cap Reductn	0		0			0
Spillback Cap Reductn	0		0			0
Storage Cap Reductn	0		0			0
Reduced v/c Ratio	0.61		0.98			0.37

Intersection Summary










Area Type: Other
 Cycle Length: 60
 Actuated Cycle Length: 56.6
 Natural Cycle: 65
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.98
 Intersection Signal Delay: 32.3
 Intersection LOS: C
 Intersection Capacity Utilization 75.9%
 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: 4: Union Street/Waverly Street & East Union Street



Lanes, Volumes, Timings
4: Union Street/Waverly Street & East Union Street

Ashland Public Safety Complex
Existing PM Peak Hour

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	256	9	315	213	6	507
Future Volume (vph)	256	9	315	213	6	507
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00					
Frt	0.996		0.946			
Flt Protected	0.954					0.999
Satd. Flow (prot)	1805	0	1769	0	0	1898
Flt Permitted	0.954					0.994
Satd. Flow (perm)	1797	0	1769	0	0	1889
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	3		81			
Link Speed (mph)	30		30			30
Link Distance (ft)	571		397			441
Travel Time (s)	13.0		9.0			10.0
Confl. Peds. (#/hr)	3					
Peak Hour Factor	0.88	0.88	0.97	0.97	0.92	0.92
Heavy Vehicles (%)	0%	0%	2%	1%	0%	0%
Adj. Flow (vph)	291	10	325	220	7	551
Shared Lane Traffic (%)						
Lane Group Flow (vph)	301	0	545	0	0	558
Turn Type	Prot		NA		Perm	NA
Protected Phases	8		2			6
Permitted Phases					6	
Detector Phase	8		2		6	6
Switch Phase						
Minimum Initial (s)	5.0		5.0		5.0	5.0
Minimum Split (s)	23.0		24.0		23.0	23.0
Total Split (s)	25.0		35.0		35.0	35.0
Total Split (%)	41.7%		58.3%		58.3%	58.3%
Maximum Green (s)	20.0		30.0		30.0	30.0
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
Total Lost Time (s)	5.0		5.0			5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Recall Mode	None		Max		Max	Max
Walk Time (s)	7.0		7.0		7.0	7.0
Flash Dont Walk (s)	11.0		11.0		11.0	11.0
Pedestrian Calls (#/hr)	0		0		0	0
Act Effect Green (s)	14.1		31.4			31.4
Actuated g/C Ratio	0.25		0.57			0.57
v/c Ratio	0.65		0.53			0.52
Control Delay	25.0		9.4			10.7
Queue Delay	0.0		0.0			0.0
Total Delay	25.0		9.4			10.7

Lanes, Volumes, Timings
 4: Union Street/Waverly Street & East Union Street

Ashland Public Safety Complex
 Existing PM Peak Hour



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
LOS	C		A			B
Approach Delay	25.0		9.4			10.7
Approach LOS	C		A			B
Queue Length 50th (ft)	84		79			99
Queue Length 95th (ft)	144		192			218
Internal Link Dist (ft)	491		317			361
Turn Bay Length (ft)						
Base Capacity (vph)	653		1035			1068
Starvation Cap Reductn	0		0			0
Spillback Cap Reductn	0		0			0
Storage Cap Reductn	0		0			0
Reduced v/c Ratio	0.46		0.53			0.52

Intersection Summary

Area Type:	Other
Cycle Length:	60
Actuated Cycle Length:	55.5
Natural Cycle:	50
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.65
Intersection Signal Delay:	13.3
Intersection LOS:	B
Intersection Capacity Utilization:	54.5%
ICU Level of Service:	A
Analysis Period (min):	15

Splits and Phases: 4: Union Street/Waverly Street & East Union Street



Lanes, Volumes, Timings
4: Union Street/Waverly Street & East Union Street

Ashland Public Safety Complex
No-Build AM Peak Hour



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	337	16	517	461	13	240
Future Volume (vph)	337	16	517	461	13	240
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00		0.99			
Frt	0.994		0.936			
Flt Protected	0.954					0.997
Satd. Flow (prot)	1702	0	1710	0	0	1842
Flt Permitted	0.954					0.552
Satd. Flow (perm)	1702	0	1710	0	0	1020
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	4		107			
Link Speed (mph)	30		30			30
Link Distance (ft)	571		397			441
Travel Time (s)	13.0		9.0			10.0
Confl. Peds. (#/hr)		2		1	1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	6%	0%	2%	4%	0%	3%
Adj. Flow (vph)	366	17	562	501	14	261
Shared Lane Traffic (%)						
Lane Group Flow (vph)	383	0	1063	0	0	275
Turn Type	Prot		NA		Perm	NA
Protected Phases	8		2			6
Permitted Phases					6	
Detector Phase	8		2		6	6
Switch Phase						
Minimum Initial (s)	5.0		5.0		5.0	5.0
Minimum Split (s)	23.0		23.0		23.0	23.0
Total Split (s)	25.0		35.0		35.0	35.0
Total Split (%)	41.7%		58.3%		58.3%	58.3%
Maximum Green (s)	20.0		30.0		30.0	30.0
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
Total Lost Time (s)	5.0		5.0			5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Recall Mode	None		Max		Max	Max
Walk Time (s)	7.0		7.0		7.0	7.0
Flash Dont Walk (s)	11.0		11.0		11.0	11.0
Pedestrian Calls (#/hr)	0		0		0	0
Act Effect Green (s)	16.5		30.2			30.2
Actuated g/C Ratio	0.29		0.53			0.53
v/c Ratio	0.77		1.11			0.51
Control Delay	29.6		80.2			13.7
Queue Delay	0.0		0.0			0.0
Total Delay	29.6		80.2			13.7

Lanes, Volumes, Timings
 4: Union Street/Waverly Street & East Union Street

Ashland Public Safety Complex
 No-Build AM Peak Hour



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
LOS	C		F			B
Approach Delay	29.6		80.2			13.7
Approach LOS	C		F			B
Queue Length 50th (ft)	115		~425			57
Queue Length 95th (ft)	200		#671			127
Internal Link Dist (ft)	491		317			361
Turn Bay Length (ft)						
Base Capacity (vph)	604		961			543
Starvation Cap Reductn	0		0			0
Spillback Cap Reductn	0		0			0
Storage Cap Reductn	0		0			0
Reduced v/c Ratio	0.63		1.11			0.51

Intersection Summary

Area Type: Other
 Cycle Length: 60
 Actuated Cycle Length: 56.7
 Natural Cycle: 90
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 1.11
 Intersection Signal Delay: 58.3
 Intersection LOS: E
 Intersection Capacity Utilization 83.4%
 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: 4: Union Street/Waverly Street & East Union Street



Lanes, Volumes, Timings
4: Union Street/Waverly Street & East Union Street

Ashland Public Safety Complex
No-Build PM Peak Hour



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	285	10	350	237	7	563
Future Volume (vph)	285	10	350	237	7	563
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00					
Frt	0.995		0.945			
Flt Protected	0.954					0.999
Satd. Flow (prot)	1804	0	1767	0	0	1898
Flt Permitted	0.954					0.992
Satd. Flow (perm)	1795	0	1767	0	0	1885
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	3		81			
Link Speed (mph)	30		30			30
Link Distance (ft)	571		397			441
Travel Time (s)	13.0		9.0			10.0
Confl. Peds. (#/hr)	3					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	2%	1%	0%	0%
Adj. Flow (vph)	310	11	380	258	8	612
Shared Lane Traffic (%)						
Lane Group Flow (vph)	321	0	638	0	0	620
Turn Type	Prot		NA		Perm	NA
Protected Phases	8		2			6
Permitted Phases					6	
Detector Phase	8		2		6	6
Switch Phase						
Minimum Initial (s)	5.0		5.0		5.0	5.0
Minimum Split (s)	23.0		24.0		23.0	23.0
Total Split (s)	25.0		35.0		35.0	35.0
Total Split (%)	41.7%		58.3%		58.3%	58.3%
Maximum Green (s)	20.0		30.0		30.0	30.0
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
Total Lost Time (s)	5.0		5.0			5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Recall Mode	None		Max		Max	Max
Walk Time (s)	7.0		7.0		7.0	7.0
Flash Dont Walk (s)	11.0		11.0		11.0	11.0
Pedestrian Calls (#/hr)	0		0		0	0
Act Effect Green (s)	14.5		31.0			31.0
Actuated g/C Ratio	0.26		0.56			0.56
v/c Ratio	0.68		0.62			0.59
Control Delay	25.6		11.5			12.0
Queue Delay	0.0		0.0			0.0
Total Delay	25.6		11.5			12.0

Lanes, Volumes, Timings
 4: Union Street/Waverly Street & East Union Street

Ashland Public Safety Complex
 No-Build PM Peak Hour

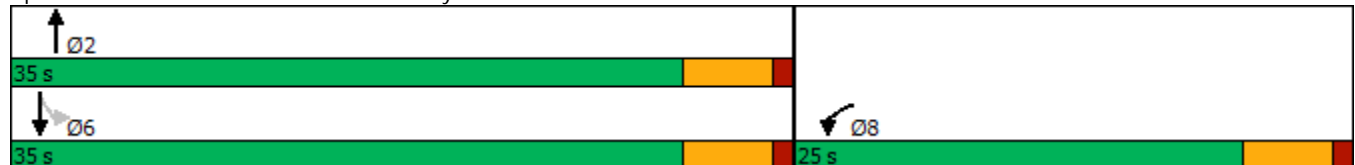


Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
LOS	C		B			B
Approach Delay	25.6		11.5			12.0
Approach LOS	C		B			B
Queue Length 50th (ft)	91		107			120
Queue Length 95th (ft)	160		249			254
Internal Link Dist (ft)	491		317			361
Turn Bay Length (ft)						
Base Capacity (vph)	652		1022			1052
Starvation Cap Reductn	0		0			0
Spillback Cap Reductn	0		0			0
Storage Cap Reductn	0		0			0
Reduced v/c Ratio	0.49		0.62			0.59

Intersection Summary

Area Type: Other
 Cycle Length: 60
 Actuated Cycle Length: 55.6
 Natural Cycle: 55
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.68
 Intersection Signal Delay: 14.6
 Intersection LOS: B
 Intersection Capacity Utilization 60.0%
 ICU Level of Service B
 Analysis Period (min) 15

Splits and Phases: 4: Union Street/Waverly Street & East Union Street



Lanes, Volumes, Timings
4: Union Street/Waverly Street & East Union Street

Ashland Public Safety Complex
Build AM Peak Hour



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	341	16	519	463	13	242
Future Volume (vph)	341	16	519	463	13	242
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00		0.99			
Frt	0.994		0.936			
Flt Protected	0.954					0.997
Satd. Flow (prot)	1702	0	1710	0	0	1842
Flt Permitted	0.954					0.551
Satd. Flow (perm)	1702	0	1710	0	0	1018
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	4		107			
Link Speed (mph)	30		30			30
Link Distance (ft)	571		229			441
Travel Time (s)	13.0		5.2			10.0
Confl. Peds. (#/hr)		2		1	1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	6%	0%	2%	4%	0%	3%
Adj. Flow (vph)	371	17	564	503	14	263
Shared Lane Traffic (%)						
Lane Group Flow (vph)	388	0	1067	0	0	277
Turn Type	Prot		NA		Perm	NA
Protected Phases	8		2			6
Permitted Phases					6	
Detector Phase	8		2		6	6
Switch Phase						
Minimum Initial (s)	5.0		5.0		5.0	5.0
Minimum Split (s)	23.0		23.0		23.0	23.0
Total Split (s)	25.0		35.0		35.0	35.0
Total Split (%)	41.7%		58.3%		58.3%	58.3%
Maximum Green (s)	20.0		30.0		30.0	30.0
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
Total Lost Time (s)	5.0		5.0			5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Recall Mode	None		Max		Max	Max
Walk Time (s)	7.0		7.0		7.0	7.0
Flash Dont Walk (s)	11.0		11.0		11.0	11.0
Pedestrian Calls (#/hr)	0		0		0	0
Act Effect Green (s)	16.6		30.2			30.2
Actuated g/C Ratio	0.29		0.53			0.53
v/c Ratio	0.78		1.11			0.51
Control Delay	29.9		83.1			13.9
Queue Delay	0.0		0.0			0.0
Total Delay	29.9		83.1			13.9

Lanes, Volumes, Timings
 4: Union Street/Waverly Street & East Union Street



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
LOS	C		F			B
Approach Delay	29.9		83.1			13.9
Approach LOS	C		F			B
Queue Length 50th (ft)	117		~432			58
Queue Length 95th (ft)	#207		#675			129
Internal Link Dist (ft)	491		149			361
Turn Bay Length (ft)						
Base Capacity (vph)	603		958			541
Starvation Cap Reductn	0		0			0
Spillback Cap Reductn	0		0			0
Storage Cap Reductn	0		0			0
Reduced v/c Ratio	0.64		1.11			0.51

Intersection Summary

Area Type: Other
 Cycle Length: 60
 Actuated Cycle Length: 56.8
 Natural Cycle: 90
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 1.11
 Intersection Signal Delay: 60.1
 Intersection LOS: E
 Intersection Capacity Utilization 83.9%
 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: 4: Union Street/Waverly Street & East Union Street



Intersection						
Int Delay, s/veh	0.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		T			T
Traffic Vol, veh/h	2	4	901	8	6	509
Future Vol, veh/h	2	4	901	8	6	509
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	4	979	9	7	553

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1551	984	0	0	988
Stage 1	984	-	-	-	-
Stage 2	567	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218
Pot Cap-1 Maneuver	125	301	-	-	699
Stage 1	362	-	-	-	-
Stage 2	568	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	123	301	-	-	699
Mov Cap-2 Maneuver	123	-	-	-	-
Stage 1	357	-	-	-	-
Stage 2	568	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	23.3	0	0.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	203	699
HCM Lane V/C Ratio	-	-	0.032	0.009
HCM Control Delay (s)	-	-	23.3	10.2
HCM Lane LOS	-	-	C	B
HCM 95th %tile Q(veh)	-	-	0.1	0

Lanes, Volumes, Timings
4: Union Street/Waverly Street & East Union Street

Ashland Public Safety Complex
Build PM Peak Hour



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	287	10	354	239	7	565
Future Volume (vph)	287	10	354	239	7	565
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00					
Frt	0.995		0.946			
Flt Protected	0.954					0.999
Satd. Flow (prot)	1804	0	1769	0	0	1898
Flt Permitted	0.954					0.992
Satd. Flow (perm)	1795	0	1769	0	0	1885
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	3		81			
Link Speed (mph)	30		30			30
Link Distance (ft)	571		220			441
Travel Time (s)	13.0		5.0			10.0
Confl. Peds. (#/hr)	3					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	2%	1%	0%	0%
Adj. Flow (vph)	312	11	385	260	8	614
Shared Lane Traffic (%)						
Lane Group Flow (vph)	323	0	645	0	0	622
Turn Type	Prot		NA		Perm	NA
Protected Phases	8		2			6
Permitted Phases					6	
Detector Phase	8		2		6	6
Switch Phase						
Minimum Initial (s)	5.0		5.0		5.0	5.0
Minimum Split (s)	23.0		24.0		23.0	23.0
Total Split (s)	25.0		35.0		35.0	35.0
Total Split (%)	41.7%		58.3%		58.3%	58.3%
Maximum Green (s)	20.0		30.0		30.0	30.0
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
Total Lost Time (s)	5.0		5.0			5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Recall Mode	None		Max		Max	Max
Walk Time (s)	7.0		7.0		7.0	7.0
Flash Dont Walk (s)	11.0		11.0		11.0	11.0
Pedestrian Calls (#/hr)	0		0		0	0
Act Effect Green (s)	14.6		31.0			31.0
Actuated g/C Ratio	0.26		0.56			0.56
v/c Ratio	0.68		0.63			0.59
Control Delay	25.6		11.7			12.1
Queue Delay	0.0		0.0			0.0
Total Delay	25.6		11.7			12.1

Lanes, Volumes, Timings
 4: Union Street/Waverly Street & East Union Street



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
LOS	C		B			B
Approach Delay	25.6		11.7			12.1
Approach LOS	C		B			B
Queue Length 50th (ft)	92		110			120
Queue Length 95th (ft)	161		254			256
Internal Link Dist (ft)	491		140			361
Turn Bay Length (ft)						
Base Capacity (vph)	651		1022			1050
Starvation Cap Reductn	0		0			0
Spillback Cap Reductn	0		0			0
Storage Cap Reductn	0		0			0
Reduced v/c Ratio	0.50		0.63			0.59

Intersection Summary

Area Type: Other
 Cycle Length: 60
 Actuated Cycle Length: 55.6
 Natural Cycle: 55
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.68
 Intersection Signal Delay: 14.7
 Intersection Capacity Utilization 60.2%
 Analysis Period (min) 15

Intersection LOS: B
 ICU Level of Service B

Splits and Phases: 4: Union Street/Waverly Street & East Union Street



Intersection						
Int Delay, s/veh	0.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		T			T
Traffic Vol, veh/h	8	6	578	2	4	766
Future Vol, veh/h	8	6	578	2	4	766
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	9	7	628	2	4	833











Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1470	629	0	0	630
Stage 1	629	-	-	-	-
Stage 2	841	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218
Pot Cap-1 Maneuver	140	482	-	-	952
Stage 1	531	-	-	-	-
Stage 2	423	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	139	482	-	-	952
Mov Cap-2 Maneuver	139	-	-	-	-
Stage 1	527	-	-	-	-
Stage 2	423	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	24.5	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	200	952
HCM Lane V/C Ratio	-	-	0.076	0.005
HCM Control Delay (s)	-	-	24.5	8.8
HCM Lane LOS	-	-	C	A
HCM 95th %tile Q(veh)	-	-	0.2	0

Lanes, Volumes, Timings
4: Union Street/Waverly Street & East Union Street

Ashland Public Safety Complex
Build AM Peak Hour

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	341	16	519	463	13	242
Future Volume (vph)	341	16	519	463	13	242
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00			0.98		1.00
Frt	0.994			0.850		
Flt Protected	0.954					0.997
Satd. Flow (prot)	1702	0	1863	1553	0	1842
Flt Permitted	0.954					0.965
Satd. Flow (perm)	1702	0	1863	1519	0	1783
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	4					
Link Speed (mph)	30		30			30
Link Distance (ft)	571		229			441
Travel Time (s)	13.0		5.2			10.0
Confl. Peds. (#/hr)		2		1	1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	6%	0%	2%	4%	0%	3%
Adj. Flow (vph)	371	17	564	503	14	263
Shared Lane Traffic (%)						
Lane Group Flow (vph)	388	0	564	503	0	277
Turn Type	Prot		NA	pm+ov	Perm	NA
Protected Phases	8		2	8		6
Permitted Phases				2	6	
Detector Phase	8		2	8	6	6
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	23.0		23.0	23.0	23.0	23.0
Total Split (s)	26.0		34.0	26.0	34.0	34.0
Total Split (%)	43.3%		56.7%	43.3%	56.7%	56.7%
Maximum Green (s)	21.0		29.0	21.0	29.0	29.0
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0
All-Red Time (s)	1.0		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						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		Min	None	Min	Min
Walk Time (s)	7.0		7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0		11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0		0	0	0	0
Act Effect Green (s)	15.7		19.5	35.2		19.5
Actuated g/C Ratio	0.34		0.42	0.77		0.42
v/c Ratio	0.67		0.71	0.43		0.37
Control Delay	20.4		17.0	1.9		10.9
Queue Delay	0.0		0.0	0.0		0.0
Total Delay	20.4		17.0	1.9		10.9

Lanes, Volumes, Timings
 4: Union Street/Waverly Street & East Union Street

Ashland Public Safety Complex
 Build AM Peak Hour



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
LOS	C		B	A		B
Approach Delay	20.4		9.9			10.9
Approach LOS	C		A			B
Queue Length 50th (ft)	83		113	0		46
Queue Length 95th (ft)	198		233	0		102
Internal Link Dist (ft)	491		149			361
Turn Bay Length (ft)						
Base Capacity (vph)	838		1263	1304		1209
Starvation Cap Reductn	0		0	0		0
Spillback Cap Reductn	0		0	0		0
Storage Cap Reductn	0		0	0		0
Reduced v/c Ratio	0.46		0.45	0.39		0.23

Intersection Summary











Area Type:	Other
Cycle Length:	60
Actuated Cycle Length:	45.9
Natural Cycle:	55
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.71
Intersection Signal Delay:	12.4
Intersection LOS:	B
Intersection Capacity Utilization:	55.5%
ICU Level of Service:	B
Analysis Period (min):	15

Splits and Phases: 4: Union Street/Waverly Street & East Union Street



Lanes, Volumes, Timings
4: Union Street/Waverly Street & East Union Street

Ashland Public Safety Complex
Build PM Peak Hour

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	287	10	354	239	7	565
Future Volume (vph)	287	10	354	239	7	565
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00					
Frt	0.995			0.850		
Flt Protected	0.954					0.999
Satd. Flow (prot)	1804	0	1863	1599	0	1898
Flt Permitted	0.954					0.995
Satd. Flow (perm)	1795	0	1863	1599	0	1890
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	3					
Link Speed (mph)	30		30			30
Link Distance (ft)	571		220			441
Travel Time (s)	13.0		5.0			10.0
Confl. Peds. (#/hr)	3					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	2%	1%	0%	0%
Adj. Flow (vph)	312	11	385	260	8	614
Shared Lane Traffic (%)						
Lane Group Flow (vph)	323	0	385	260	0	622
Turn Type	Prot		NA	pm+ov	Perm	NA
Protected Phases	8		2	8		6
Permitted Phases				2	6	
Detector Phase	8		2	8	6	6
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	23.0		24.0	23.0	23.0	23.0
Total Split (s)	26.0		34.0	26.0	34.0	34.0
Total Split (%)	43.3%		56.7%	43.3%	56.7%	56.7%
Maximum Green (s)	21.0		29.0	21.0	29.0	29.0
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0
All-Red Time (s)	1.0		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						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		Max	None	Max	Max
Walk Time (s)	7.0		7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0		11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0		0	0	0	0
Act Effect Green (s)	14.6		29.2	53.9		29.2
Actuated g/C Ratio	0.27		0.54	1.00		0.54
v/c Ratio	0.66		0.38	0.16		0.61
Control Delay	23.8		9.6	0.2		12.8
Queue Delay	0.0		0.0	0.0		0.0
Total Delay	23.8		9.6	0.2		12.8

Lanes, Volumes, Timings
 4: Union Street/Waverly Street & East Union Street



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
LOS	C		A	A		B
Approach Delay	23.8		5.8			12.8
Approach LOS	C		A			B
Queue Length 50th (ft)	89		62	0		119
Queue Length 95th (ft)	156		144	0		266
Internal Link Dist (ft)	491		140			361
Turn Bay Length (ft)						
Base Capacity (vph)	709		1008	1588		1023
Starvation Cap Reductn	0		0	0		0
Spillback Cap Reductn	0		0	0		0
Storage Cap Reductn	0		0	0		0
Reduced v/c Ratio	0.46		0.38	0.16		0.61

Intersection Summary

Area Type:	Other
Cycle Length:	60
Actuated Cycle Length:	53.9
Natural Cycle:	50
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.66
Intersection Signal Delay:	12.2
Intersection LOS:	B
Intersection Capacity Utilization:	60.2%
ICU Level of Service:	B
Analysis Period (min):	15

Splits and Phases: 4: Union Street/Waverly Street & East Union Street

