Memorandum

To: City of Newton

Date: June 22, 2022

Project #: 15548.00

From: Randall C. Hart, Principal

Matthew Duranleau, PE

Re: Response to Comments
Transportation Engineering Peer Review, BETA Group (June 2022)
Crafts Street Elderly Housing Redevelopment Project
Newton, Massachusetts

VHB has received and reviewed the Transportation Engineering Peer Review submitted to the City of Newton by the City's traffic review firm, BETA Group, Inc. dated June 2, 2022, for the proposed Crafts Street Elderly Housing project in Newton, Massachusetts. This memorandum summarizes VHB's responses to the comments. Each comment raised by the reviewer is listed below followed by the response by VHB. The comments follow the format and structure outlined in the Transportation Engineering Peer Review.

Traffic Impact and Access Study

The proposed development project consists of 129 independent units, 52 assisted living facility, and 28 memory care type units totaling 209. The project is located at 36-48 Crafts Street on an approximately 2.7-acre site. The existing two commercial buildings and a school bus parking lot on Crafts Street and two residential properties on Court Street will be demolished. Included within the building is a proposed underground parking garage with 137 spaces. An additional seven parking spaces will be provided near the main entrance. Vehicle access to the site will be provided primarily by two driveways along Crafts Street, one on the north side of the proposed building and one on the south side. A third driveway access will be provided at Court Street and will be gated and limited to emergency access only. The Craft Street south driveway will be the primary driveway and will provide access to pick-up/drop-off, surface parking, and the garage. The north driveway will be used for loading and emergency vehicle access and will loop around to Court Street which will be gated. Pedestrian and bicycle access will be provided via Crafts Street and Court Street. A path on the southern edge of the site will connect Court Street and Crafts Street and the main entrance. The project will include bicycle racks within the garage for residents and employees and outdoor racks for visitors.

The study area includes the following 10 intersections.

- Crafts Steet at Ashmont Street (unsignalized)
- Crafts Street at Clinton Street/Maguire Court (unsignalized)
- Crafts Street at Lincoln Road/48 Crafts Street (bus lot) driveway (unsignalized)
- Crafts Street at 29 Crafts Street/38 Crafts Street parking lot driveway (unsignalized)
- Crafts Street at 36 Crafts Steet parking lot driveway (unsignalized)
- Crafts Street at Lenglen Road/Whole Foods driveway(unsignalized)
- Washington Street at Harvard Street (signalized)
- Washington Street at Crafts Street/Bank driveway (signalized)
- Washington Street at Adams Street/Lewis Terrace (signalized)
- Washington Street at Jackson Road (signalized)

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Comment 1: **The study area was found to be adequate.**

Response: No response necessary.

Traffic Volumes

Existing daily traffic volumes were collected using an automatic traffic recorder on Crafts Street south of Lincoln Street for 24 hours when schools were in session on Thursday, February 10, 2022. Turning Movement Counts (TMC) were also collected at the study intersections in February 2022 from 7:00AM to 9:00AM and 4:00PM to 6:00PM.

Comment 2*:* Traffic volume counts conducted in 2022 are considered to represent a post-pandemic condition by MassDOT and do not necessarily need to be adjusted. In the TIAS, the traffic volumes were adjusted upward based on 2019 traffic volumes at the intersection of Washington Street and Harvard Street, and therefore provide conservatively high traffic volumes for analysis purposes. This approach is acceptable.

Response: No Response necessary.

Comment 3: **Automatic Traffic Recorder roadway traffic volume counts on Crafts Street for a Saturday were provided in the Appendix, but not in the TIAS. Please provide a summary of the Saturday volumes.**

Response: Saturday daily traffic volumes were collected on Crafts and Washington Street over a 24-hour period on Saturday, February 12, 2022, using an automatic traffic recorder (ATR). This date represents a typical Saturday for traffic count purposes. The volumes are summarized in Table 1 below.

Table 1 Existing Traffic Volume Summary

		Saturday Midday Peak Hour		
Location	ADT [a]	Volume	K Factor [b]	Dir. Dist. [c]
Crafts Street, south of Lincoln Street	8,500	725	8.5%	50% NB/SB

Source: VHB based on automatic traffic recorder counts conducted on February 12th, 2022.
Note: Peak hours do not necessarily coincide with the peak hours of turning movement counts.
a Average Daily Traffic (ADT) volume expressed in vehicles per day.
b Represents the percent of daily traffic that occurs during the peak hour.
c Directional distribution of peak hour traffic.

As shown in Table 1, Crafts Street, south of Lincoln Street carries approximately 8,500 vehicles on a typical Saturday with the peak hour accounting for 8.5-percent of the Saturday daily traffic flow. Traffic flow along Crafts Street is evenly split in the northbound and southbound directions during the Saturday midday peak hour.

Public Transportation

Comment 4: **Figure 5 shows the closest bus stop to the Site on the westbound side of Washington Street near the Whole Foods Market. A similar bus stop for the eastbound direction should be shown as well, near the Santander Bank.**

Response: Figure 5 has been updated to include the eastbound bus stop on Washington Street and is included in the Attachments to this memorandum. The figure numbering has not been changed to remain consistent with the TIA.

Crash History

Crash data were obtained from the MassDOT database for the most recent five-year period available from 2015 to 2019. The highest crash rate, quantified as crashes per million entering vehicles, occurred at the intersection of Washington Street and Adams Street/Lewis Terrace with 0.82 which is higher than the 0.71 MassDOT average crash rate for signalized intersections.

The intersection of Washington Street and Adams Street/Lewis Terrace was identified as a MassDOT Highway Safety Improvement Program (HSIP) crash cluster between 2017 and 2019.

Comment 5: **The crash summary calculations and results are accurate.**

Response: No response necessary.

Future Conditions

The TIAS evaluated impacts over a seven-year period to 2029 from the initial traffic data collection in 2022, for both the No-Build and Build conditions.

An annual growth rate of 0.5% was applied to the raw volumes at study intersections based on the growth rate used in other studies within the City.

Comment 6: **BETA finds this growth rate to be reasonable.**

Response: No response necessary.

In addition to utilizing a historical growth rate, traffic generated by other planned developments near the site was considered in developing the 2029 No-Build traffic volumes. The TIAS identified five other developments that were considered to add traffic to the project study roadways and intersections. The developments are located at 967 Washington Street, 386 Watertown Street, 60, 66-68 Austin Street, 15 Riverside Avenue, and 1149 Washington Street.

Comment 7: The other developments assumed for the 2029 No-Build scenario are reasonable.

Response: No response necessary.

Build Conditions

The TIAS indicates that the existing site uses would generate approximately 28 vehicle trips during the weekday morning peak hour and 20 vehicle trips during the weekday evening peak hour.

Comment 8: **The existing vehicle trips at the site are reasonable. The word "evening" for 28 vehicle trips should be changed to "morning" in the first paragraph of the Existing Site-Generated Traffic section on page 25.**

Response: This comment has been noted. The revised paragraph is included below with the requested revision included:

"The planned development parcels are currently occupied by two commercial office buildings and a school bus parking lot on Crafts Street and two residential properties on Court Street. Traffic volumes generated by the Crafts Street parcels under Existing conditions were captured in the turning movement counts conducted at the study area intersections in February 2022. Based on those counts, the existing uses on the Site collectively currently generate approximately 28 vehicle trips (19 entering / 9 exiting) during the weekday morning peak hour and 20 vehicle trips (6 entering / 14 exiting) during the weekday evening peak hour."

Trip generation for the project was estimated using the Institute of Transportation Engineers, Trip Generation, 11th Edition Land Use Code 255 (Continuing Care Retirement Community). Subtracting the vehicle trips generated by the existing site uses, the project would generate 21 net new vehicle trips in the morning (49 total) and 62 net new vehicle trips in the evening (82 total). To present a conservatively high trip generation estimate, the TIAS assumed all project-generated trips were made by private vehicles with no mode shared credits for walk, bike, and transit.

Comment 9: **The project trip generation estimates are reasonable. Please provide information on the number of trips that would be made by the project's shuttle van and sedan, and the number of trips typically made by ambulances/emergency vehicles.**

Response: It is anticipated that the bus and sedan will make 2-3 trips per day. The bus will run on a schedule that is developed around the customer needs/desires. Based on SRG's experience with other facilities, they expect 3-5 emergency /911 calls per week with 15-20 visits by emergency vehicles per month. This represents the typical volume we see nationally, which may vary from community to community.

Trip distribution of traffic was based U.S. Census Bureau Journey-to-Work data for the City of Newton 2012-2016.This seems appropriate for employees and visitors.

Comment 10: **Since most of the residents of the project are not expected to be working, is Journey-to-Work data appropriate as the basis for resident trips?**

Response: The proposed elderly living facility will consist of a mix of unit types with three distinct elderly living options, including independent living, assisted living, and memory care units. Of these options, the independent living units will make up more than 50-percent of all units. Some residents of the independent living units will lhave access to private vehicles and some residents may still be in the workforce commuting on a regular schedule. Therefore, the journey to work data is likely to be appropriate for the residents of the independent living units. The residents of the

other living units are less likely to have a vehicle and therefore are less likely to add trips to the roadway network. Additionally, VHB reviewed the existing travel patterns within the study area and found that existing traffic patterns closely resemble the proposed trip distribution. Based on these findings, the Journey-to-Work data is appropriate.

***Comment 11*: The westbound right turn volume from Washington Street to Crafts Street should be changed from 15 to 335 on Figure 12 – 2029 Build Conditions Weekday Peak Hour.**

Response: Figure 12 has been updated and is included in the Attachments to this memorandum. The figure numbering has not been changed to remain consistent with the TIA.

Traffic Operations

Capacity analyses were performed for the study intersections using the Synchro software, based on the 2010 Highway Capacity Manual methodologies for the 2022 Existing, 2029 No-Build, and 2029 Build traffic volumes, during the weekday AM and weekday PM peak periods. The signalized intersection of Washington Street and Adams Street/Lewis Terrace operates at Level of Service (LOS) E during Existing, No-Build, and Build conditions during the morning peak hour, and LOS E during the No-Build and Build conditions during the evening peak hour. All other study area intersections are expected to operate with LOS D or better.

Comment 12: **Please check the following capacity analysis issues:**

a. **Washington Street and Harvard Street does not allow for Right-Turn-on-Red**
b. **Washington Street and Crafts Street/Bank driveway has a phase conflict**
c. **Synchro has assigned the eastbound approach at Washington Street and Adams Streets/Lewis Terrace as a Defacto Left lane and one through lane**

Response: VHB has incorporated the changes, as recommended in Comments 12a and 12c, into a revised capacity analysis for the intersections of Washington Street at Harvard Street and Washington Street at Adams Street/Lewis Terrace. The results of the analysis are presented in Table 2.

Regarding Comment 12b, the northbound Bank driveway approach at the intersection of Washington Street at Crafts Street is expected to see between 4 and 15 vehicles exiting during the weekday morning and weekday evening peak periods, respectively. Synchro analysis software uses conservative analysis parameters when determining approach delays for movements with an opposing left-turn conflict. In this case, the Crafts Street southbound left-turn, which carries between 290 and 300 vehicles under Existing Conditions and an anticipated 305 to 330 vehicles under Build Conditions, would have large overestimates in delay and a corresponding poor level of service related to the minimal number of vehicles exiting the Bank driveway. In real time, these vehicles will accept shorter gaps in traffic than those used in the analysis procedures and therefore experience less delay than reported by the analysis software. Further, based on field observations, the Crafts Street southbound left-turn is rarely inhibited by vehicles exiting the Bank driveway and it is not anticipated to be under future conditions, with or without the Project in place. Therefore, analyzing the intersection of Washington Street at Crafts Street/Bank driveway with the southbound approach as a protected phase in conflict with the northbound phase is more representative of real-world conditions than analyzing the southbound phase as permitted.

Table 2 Signalized Intersection Capacity Analysis Summary

Location / Movement	2022 Existing Conditions					2029 No Build Conditions					2029 Build Conditions				
	v/c [a]	Del [b]	LOS [c]	50 Q [d]	95 Q [e]	v/c	Del	LOS	50 Q	95 Q	v/c	Del	LOS	50 Q	95 Q
Washington Street at Harvard Street															
Weekday Morning															
EB T/R	0.50	11	B	67	226	0.47	11	B	70	239	0.47	11	B	70	239
WB L/T	0.57	13	B	56	205	0.58	13	B	66	239	0.58	13	B	66	239
NB L/R	0.55	35	D	31	#147	0.51	36	D	31	#151	0.51	36	D	31	#151
Overall		**14**	**B**				**13**	**B**				**13**	**B**		
Weekday Evening															
EB T/R	0.34	9	A	47	166	0.35	9	A	53	185	0.35	9	A	54	187
WB L/T	0.65	14	B	89	310	0.67	14	B	97	#379	0.67	14	B	100	#389
NB L/R	0.60	41	D	38	#173	0.66	47	D	45	#178	0.68	49	D	47	#178
Overall		**14**	**B**				**15**	**B**				**15**	**B**		
Washington Street at Adams Street / Lewis Terrace															
Weekday Morning															
EB L*	0.72	68	E	38	#124	0.98	>120	F	46	#143	1.00	>120	F	47	#144
EB T/R	1.13	104	F	~865	#1120	1.19	>120	F	~942	#1199	1.19	>120	F	~952	#1208
WB L	0.43	32	C	18	m59	0.47	36	D	22	m60	0.47	36	D	22	m59
WB T/R	0.63	6	A	31	49	0.70	6	A	26	42	0.71	6	A	26	42
NB L/T/R	1.00	>120	F	163	#320	0.99	>120	F	161	#336	0.99	>120	F	161	#336
SB L/T	1.03	109	F	~244	#385	1.00	100	F	222	#402	1.00	100	F	222	#402
SB R [f]	0.20	7	A	0	34	0.20	7	A	0	38	0.20	7	A	0	38
Overall		**70**	**E**				**77**	**E**				**78**	**E**		
Weekday Evening															
EB L*	>1.20	>120	F	~76	#132	>1.20	>120	F	~83	#142	>1.20	>120	F	~83	#142
EB T/R	1.01	80	E	~719	#968	1.06	93	F	~792	#1052	1.09	93	F	~826	#1086
WB L	0.40	24	C	11	m27	0.43	27	C	14	m23	0.43	27	C	14	m22
WB T/R	0.76	5	A	26	41	0.83	6	A	28	43	0.84	7	A	28	48
NB L/T/R	0.82	>120	F	115	#201	0.80	>120	F	107	#204	0.80	>120	F	107	#204
SB L/T	0.93	84	F	218	#383	0.95	88	F	223	#400	0.95	88	F	223	#400
SB R [f]	0.21	8	A	4	43	0.21	9	A	5	46	0.21	9	A	5	46
Overall		**53**	**D**				**59**	**E**				**59**	**E**		

Note: Improvements from Existing Conditions to No Build Conditions due to peak hour factor of 0.92 used for all future analyses, as specified in MassDOT TIA guidelines.

* This lane is designated as a left-turn/through lane in the field, however, it is operating as a defacto exclusive left-turn lane and is analyzed as such.

a Volume to capacity ratio.

b Average total delay, in seconds per vehicle.

c Level-of-service.

d 50th percentile queue, in feet.

e 95th percentile queue, in feet.

~ Volume exceeds capacity, queue is theoretically infinite.

95th percentile volume exceeds capacity, queue may be longer.

As shown in Table 2, the signalized intersection of Washington Street and Adams Street/Lewis Terrace operates at Level of Service (LOS) E during Existing, No-Build, and Build conditions during the morning peak hour, and LOS E during the No-Build and Build conditions during the evening peak hour. Washington Street at Harvard Street operates at LOS B under all conditions. The results of this analysis are in line with those presented in the April 2022 TIA and the

impacts of the additional Site-generated trips between the No Build and Build Conditions is still expected to be negligible at these two intersections. The detailed Synchro capacity worksheets are included in the Attachments.

Sight Distance

Sight distance analyses were performed at the proposed site driveway which will be located in the vicinity of the existing driveway at the 38 Crafts Street parking lot along Crafts Street. Both Stopping Sight Distance (SSD) and Intersection Sight Distance (ISD) were evaluated. The observed 85th percentile weekday speeds on Crafts Street are 33 miles per hour (mph) northbound and 31 mph southbound.

The results show that required SSD and ISD lengths are exceeded in both directions at the proposed site driveway.

Comment 13: **Confirm that Stopping Sight Distance (SSD) and Intersection Sight Distance (ISD) is adequate at the northern curb cut on Crafts Street.**

Response: Sight distance has been conducted at the proposed northern curb cut on Crafts Street. Refer to Table 3 under the response to Comment 14 for the sight distance analysis summary.

Comment 14: Note that the Saturday 85th percentile speeds on Crafts Street are 34 mph northbound and 32 mph southbound. Confirm that the SSD and ISD are adequate for these speeds at both project driveways.

Response: A sight distance analysis, in conformance with guidelines of the American Association of State Highway and Transportation Officials (AASHTO)[1] was performed at the proposed Site driveway, which is located in the general vicinity of the existing 38 Crafts Street parking lot driveway on Crafts Street across from the 29 Crafts Street, and the proposed loading/emergency access driveway located in the general vicinity opposite Lincoln Road. The Saturday 85th percentile speeds of 34 mph northbound and 32 mph southbound were used in this analysis.

Table 3 summarizes the sight distance analysis based on field measurements conducted by VHB. The sight distance worksheets are included in the attachments to this document.

[1] A Policy on the Geometric Design of Highways and Streets, American Association of State Highway and Transportation Officials (AASHTO), 2013.

Table 3 Sight Distance Summary

		Stopping Sight Distance (feet)			Intersection Sight Distance (feet)	
Location	Traveling	Required [a]	Measured [b]	Looking	Desirable [a]	Measured [b]
Crafts Street at proposed Site driveway	NB	240	485	Left	375	>500
	SB	220	>500	Right	375	485
Crafts Street at proposed loading driveway	NB	240	>500	Left	375	>500
	SB	220	>500	Right	375	350

a Based on standards established in A Policy on the Geometric Design of Highways and Streets, American Association of State Highway and Transportation Officials, 2013. Based on 85th percentile speed of 34 mph northbound and 32 mph southbound. Measurements for Crafts Street at the proposed Site driveway and at the proposed loading driveway were taken in February and June 2022, respectively.

b Based on field measurements taken by VHB.

As shown in Table 3, the required SSD and desirable ISD are exceeded in both directions at Crafts Street at the proposed Site driveway. There are clear sight lines to the signalized intersection of Washington Street at Crafts Street to the south, and vehicles exiting the Site driveway will be able to see a vehicle traveling northbound as soon as they turn onto Crafts Street. The required SSD is met at the intersection of Crafts Street at the proposed loading driveway. The desirable ISD is met looking left at this intersection, however, it is just shy of meeting the desirable ISD looking right. It should be noted that there was a telephone pole and vegetation obstructing sight lines looking right at this location. As the SSD in the northbound direction is greater than 500 feet, it is likely the ISD looking right would exceed the desirable distance if the vegetation is removed and the telephone pole relocated. The Proponent is committed to ensuring adequate sight lines at both driveway locations.

The sight distance worksheets are included in the Attachments.

Mitigation

The Proponent proposes to implement several Transportation Demand Management (TDM) measures on site in an effort to minimize the project's impact on the surrounding roadways. The measures include:

- Provide a small-scale shuttle, van, and comfortable sedan on-site for residents to appointments and service needs, and retail, and restaurants as needed;
- Display transit maps on site in a central location;
- Provide map for transit users that shows Newtonville Station, MBTA bus stops, sidewalks, and crosswalks and post in common area;
- Provide 50 secure bicycle storage space on-site within the parking garage; and
- Implement a car-pool rideshare program with guaranteed ride home.

Comment 15: **BETA agrees that these measures should be implemented, and also recommends the following:**

- **Consider preferential parking for car-pools;**
- **Make 10% of the parking stalls electric vehicle (EV) spaces, and 50% EV ready;**

- **Provide additional weatherproof and secure bike parking in front of the building for visitors;**
- **The applicant should provide a subsidy to their employees for alternate modes of transportation, such as transit and bike share programs, for at least the first year of employment; and**
- **Incorporate electric vehicles for the multimodal transportation service for residents.**

Response: The client is committed to a robust transportation demand management (TDM) plan, as outlined in the April 2022 TIA. T

- While the Proponent sees car-pooling as a desirable result, we do not believe preferential parking is a viable approach in a residential setting and we will not provide it in this project. Typically, people may carpool to work when there is enough critical mass in an office building that there are enough people with similar commutes to justify coordinating for a carpool. In those scenarios with large parking lots and structures, the additional incentive of a front-row parking space may entice commuters to consider carpooling when they otherwise may not have. In a residential setting most parking spaces are dedicated to residents who remain on premises and there are a meaningful but relatively limited number of employee parking spaces. The preferred spaces are dedicated to residents, who would not carpool. The incentive of parking in a preferred location for the employees will not encourage carpooling especially in the case of the Crafts Street project as the employees will likely desire to park adjacent to the service elevator to access the back of house areas. The ineffectiveness of preferred parking has been demonstrated already at the TRIO project. There is a preferred carpool that was mandated and remains unoccupied daily while there are two employees who carpool daily but park in the rear of the garage adjacent to the maintenance shop.
- Although it is not a TDM measure, EV charging stations will be installed for 10% of the total parking spaces with conduit installed to expand to a total of 20% in line with our other projects in Newton. We will be sure that the overall infrastructure is in place to expand to meet the needs and future power loads for 100% of the spaces when warranted.
- Secure bike parking will be provided adjacent to the front of the building for short-term visitors for four bicycles. Visitors requiring longer-term weather protected parking can use the internal secure bike parking as there will be very little demand for it by residents who are mostly at an age where they do not ride bicycles.
- The proponent will consider a partial subsidy of for employees who provide receipts and invoices for use of alternate transportation.
- While not a TDM measure, the proponent will consider EVs as part of the transportation service program if it is economically feasible.

Comment 16: **Provide information on the operating hours of the shuttle, van, and sedan, where these vehicles will be parked, and how many vehicles there will be for this service.**

Response: Hours of shuttle van and sedan will generally be 8AM-6PM 7 days a week. Those hours are extended for special events (concerts, community events, and so forth). For special events they will extend hour until 10 PM. The sedan will be stored in the parking garage and the bus will be parked at the shipping/receiving are at the end of the day. A total of 2 vehicles (bus/sedan) is appropriate for a community this size based on SRG's experience.

The project will consolidate the number of curb cuts along Crafts Street from five to two. The main access will be on the south portion of the site and a second curb cut will be on the northern edge for loading and emergency access only.

The project proposes the following pedestrian and bicycle amenities:

- A path along the southern edge of the site will connect Court Street and Crafts Street with the main entrance of the building and;
- Reconstruct the sidewalk on the west side of Crafts Street along the site frontage.

Site Plans

The applicant proposes to construct 144 parking spaces on-site, with 137 in the proposed underground garage, and 7 surface stalls. Bike racks are proposed in the garage along the south wall.

Comment 17: **The Newton Zoning Ordinance, section 5.1.8.C.1 requires a 24-foot-wide parking aisle. All aisles in the garage meet this requirement except the aisle in the northwest corner of the garage which is 22-feet-wide and will require a waiver. If the 22-foot-wide aisle width is maintained, striping the adjacent spaces for compact cars or electric vehicle parking should be considered.**

Response: Noted, a waiver is being requested as stated for the parking aisle. The adjacent spaces may be striped as compact.

Comment 18: **The typical parking space width in the garage shown on the site plan is 8'-6" wide which will require a waiver per the Newton Zoning Ordinance, section 5.1.8.B.1. The City requires a 9'-0" wide parking space.**

Response: Noted, a waiver is being requested as stated.

Comment 19: **The site plan shows typical parking spaces in the garage are 18-feet-long. Per the Newton Zoning Ordinance, section 5.1.8.B.2, angled spaces shall be 19 feet long.**

Response: Noted, a waiver is being requested as stated.

Comment 20: **It appears not all of the four proposed handicap parking spaces in the garage meet the minimum dimension requirements in the Newton Zoning Ordinance, section 5.1.8.B.4.**

Response: Noted, a waiver is being requested as stated, however all spaces meet requirements of the American with Disabilities Act (ADA) and the Massachusetts Architectural Access Board (MAAB).

Comment 21: **Will parking spaces in the garage be designated for resident, employees, and visitors? If so, how many spaces will be provided for each?**

Response: The parking will not be designated to optimize the sharing of spaces.

Comment 22: **If the proposed 7 surface spaces on-site are intended for visitor parking, will these spaces be available for small delivery drop-offs by UPS and Amazon vans? If the spaces are occupied where will the delivery vans park?**

Response: Smaller delivery drop-offs are intended to utilize the rear loading area via the northern driveway access off Crafts Street. In the event those vehicles enter the front entry loop, it has been confirmed that they are able to maneuver within the turnaround area provided.

Comment 23: **Where will the small-scale shuttle, van, and comfortable sedan vehicles be parked?**

Response: The sedan will be stored in the parking garage and the bus will be parked at the shipping/receiving are at the end of the day.

Comment 24: **Confirm that larger vehicles such as the shuttle van can maneuver within the entry court without having to back up.**

Response: Please refer to Attachment 05 for turning movement for small shuttle vans (23-ft length) within the entry court, which may maneuver the court without having to back up.

Comment 25: **Figure 2: Turning Analysis – SU 30 Box Truck shows turning radius is adequate in and out of the north driveway. Are larger trucks expected to serve the site?**

Response: Larger trailers are not anticipated to serve the site, the rear loading area shall accommodate SU 30 Box Trucks and Trash Removal. Emergency vehicles only are intended to utilize the limited access path in a clockwise movement around the site, entering at Court Street and existing onto Crafts Street.

Comment 26: **Three on-street parking spaces are proposed in front of the site on Crafts Street. On the west side of Crafts Street (project side) on-street parking is prohibited. Will the Applicant request the City to make this change?**

Response: Yes, the Applicant proposes to work with the City to provide on-street parking at the location shown. Note that a widening of the paved roadway is proposed to accommodate these spaces and an easement into the property for the benefit to the city will be provide to accommodate this change

Comment 27: **The existing concrete sidewalk fronting the project is approximately 8-feet wide. Can this sidewalk width be maintained with the proposed 3 on-street parking spaces? Can street trees be provided along the project frontage on Crafts Street?**

Response: The existing sidewalk is approximately 6-feet wide. The project proposes to maintaint a minimum 6-foot sidewalk along the Crafts Street frontage, in order to help allow for a landscape buffer between the proposed building and right-of-way, and additionally for street trees to be proposed in the "furnishing zones" immediately north and south

of the three (3) parking spaces as shown on sheet L-01. As noted above an easement into the project property is proposed to maintain the sidewalk width.

Comment 28: **Clarify the usage of the Court Street driveway, TIAS states it will be for emergency and loading, however petitioner's presentation at the May 17th hearing indicated it would be for emergency vehicles only.**

Response: Since the issuance of the original TIAS, it has been coordinated further with the City that the Court Street driveway shall be used for emergency vehicles only, and larger trailers will not serve the site for loading.

Comment 29: **Clarify how visitor vehicles will be prevented from looping around and accessing the Court Street driveway.**

Response: A limited-access gate shall be provided at both connection points to the emergency access path around the rear of the building, limiting access to the Newton Fire Department.

Comment 30: **The TIAS states that 50 secure bike parking spaces will be provided in the garage. Please clarify how bicyclists will access the garage. Will the access be secure, and do you need a card key to gain entrance into the garage?**

Response: As noted above, although a quantity of 50 bicycle spaces was represented in the TIAS, this quantity is excessive for the use. Based on the utilization of bicycles in the SRG portfolio, our properties have less than 10 bike parking spaces and they see little use. Our population tends to be risk-averse and the dangers of cycling at an advanced age results in little to no cycling in our population. With space in the below-grade level at a premium for utility rooms and other necessary elements, we are proposing to provide 20 bike parking spaces, which would double what we provide elsewhere. We understand that Newton is a community committed to promoting bicycle use and are willing to go far beyond what we typically provide for that reason.

Resident and staff cyclists will be able to access the garage either by the garage access ramp or by the service elevator. Access to the garage will be secure and the garage ramp will be activated by a key card. The service elevator is convenient to both the staff and independent living areas of the building. We do not anticipate any Assisted Living or Memory Care resident cyclists.

Comment 31: **Clarify whether vehicular access to the garage will be secure. If so, what is the proposed method to provide access: card, keypad?**

Response: Both vehicular and cyclist access to the garage will be secure. The overhead door will be activated by either a key card or a vehicle mounted transponder.

Comment 32: **Where will the trash dumpster be located?**

Response: Please refer to Attachment 06, showing the location of proposed exterior trash enclosure and associated garbage truck turning movement, added to the rear loading area.

Comment 33: **Are there areas on-site for snow storage?**

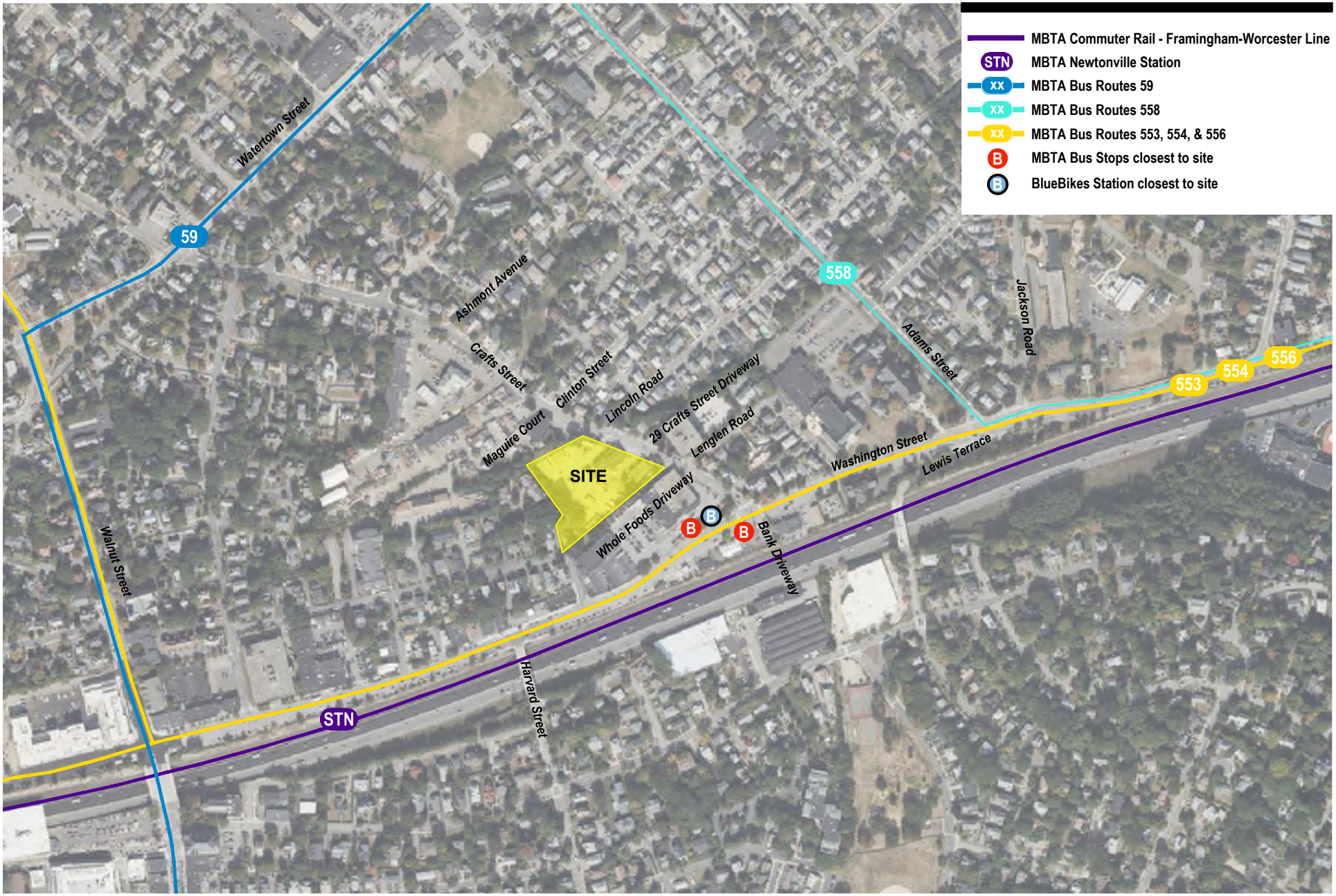
Response: Please refer to attached Attachment 07, delineating areas to be plowed and proposed anticipated snow storage locations.

Comment 34: **Coordinate with the Newton Fire Department regarding access and circulation of firetrucks at this site.**

Response: Please refer to Attachment 08, for Figure 1 – Crafts Street Senior Housing Fire Access Plan which has been reviewed and signed off on by the Newton Fire Department. The plan identifies emergency vehicle access at the front entry which may turn and exit the same southern drive, as well as the limited-access off of Court Street going clock-wise around the proposed building.

Attachments

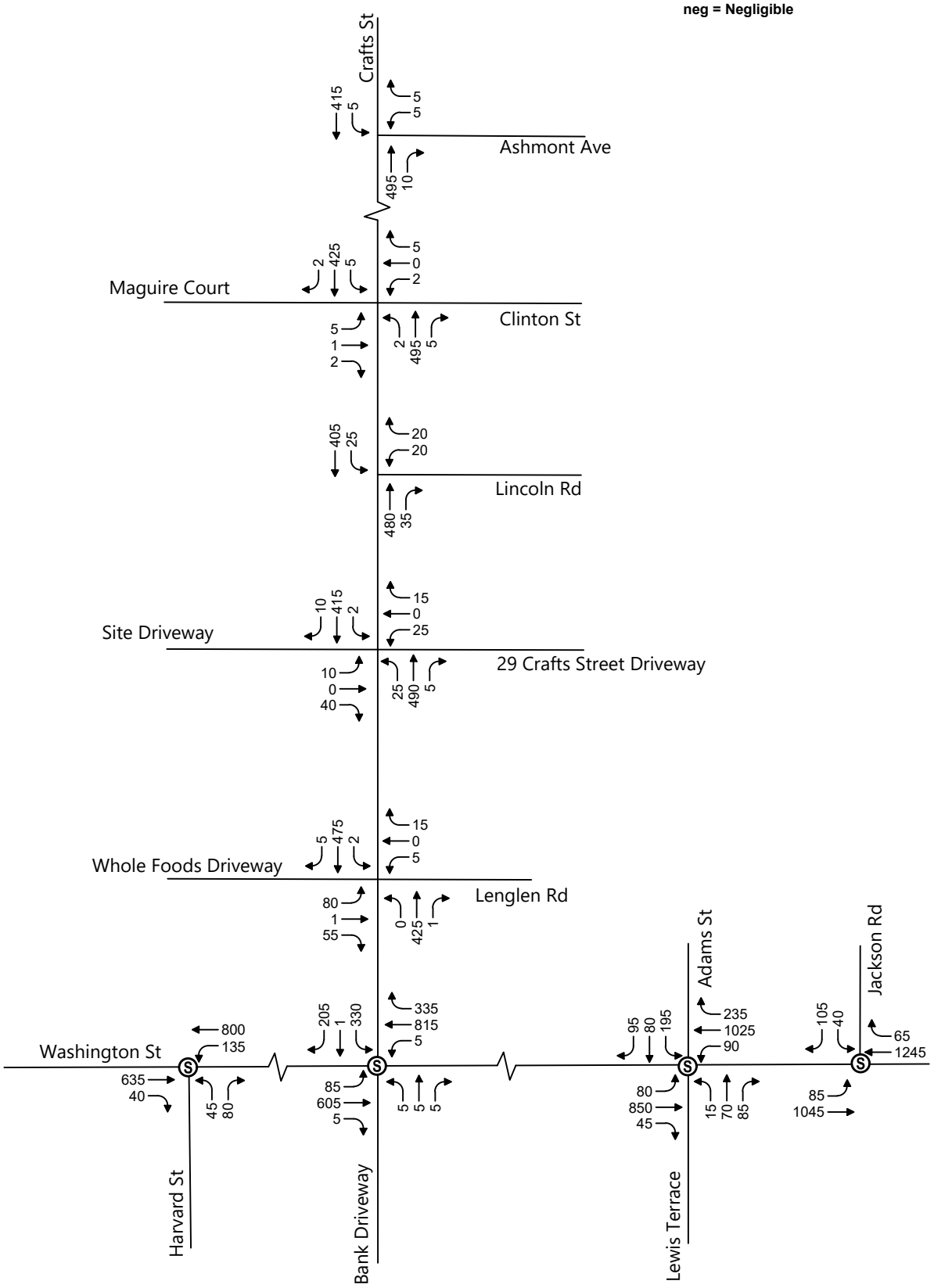
- 01: Figure – Public Transit Routes
- 02: Figure – 2029 Build Weekday Evening Traffic Volume Networks
- 03: Synchro Capacity Analysis
- 04: Sight Distance Worksheets
- 05: Small Shuttle Turning Movement at Entry Court
- 06: Trash Enclosure and Turning Diagram
- 07: Snow Storage Diagram
- 08: Fire Access Plan



Public Transportation Routes

Figure 5

Crafts Street Elderly Housing
Newton, Massachusetts



Not to Scale

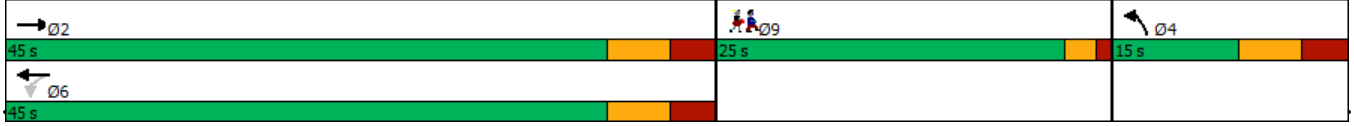
Figure 12

2029 Build Conditions
Weekday Evening Peak Hour Traffic Volumes
Crafts Street Elderly Housing with Services
Newton, Massachusetts

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø9
Lane Configurations							
Traffic Volume (vph)	740	30	95	565	50	60	
Future Volume (vph)	740	30	95	565	50	60	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Satd. Flow (prot)	3452	0	0	3519	1647	0	
Flt Permitted				0.691	0.978		
Satd. Flow (perm)	3452	0	0	2449	1635	0	
Right Turn on Red		No				No	
Satd. Flow (RTOR)							
Link Speed (mph)	30			30	30		
Link Distance (ft)	330			999	440		
Travel Time (s)	7.5			22.7	10.0		
Confl. Peds. (#/hr)		3	3		5	9	
Confl. Bikes (#/hr)		1					
Peak Hour Factor	0.89	0.89	0.95	0.95	0.76	0.76	
Heavy Vehicles (%)	4%	0%	1%	2%	0%	4%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	865	0	0	695	145	0	
Turn Type	NA		Perm	NA	Prot		
Protected Phases	2			6	4		9
Permitted Phases			6				
Detector Phase	2		6	6	4		
Switch Phase							
Minimum Initial (s)	8.0		8.0	8.0	6.0		6.0
Minimum Split (s)	15.0		15.0	15.0	13.0		25.0
Total Split (s)	45.0		45.0	45.0	15.0		25.0
Total Split (%)	52.9%		52.9%	52.9%	17.6%		29%
Yellow Time (s)	4.0		4.0	4.0	4.0		2.0
All-Red Time (s)	3.0		3.0	3.0	3.0		1.0
Lost Time Adjust (s)	0.0			0.0	0.0		
Total Lost Time (s)	7.0			7.0	7.0		
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	Min		Min	Min	None		None
Act Effct Green (s)	26.9			26.9	8.5		
Actuated g/C Ratio	0.50			0.50	0.16		
v/c Ratio	0.50			0.57	0.55		
Control Delay	11.3			12.9	35.0		
Queue Delay	0.0			0.0	0.0		
Total Delay	11.3			12.9	35.0		
LOS	B			B	D		
Approach Delay	11.3			12.9	35.0		
Approach LOS	B			B	D		
Queue Length 50th (ft)	67			56	31		
Queue Length 95th (ft)	226			205	#147		
Internal Link Dist (ft)	250			919	360		
Turn Bay Length (ft)							
Base Capacity (vph)	2618			1857	263		
Starvation Cap Reductn	0			0	0		
Spillback Cap Reductn	0			0	0		
Storage Cap Reductn	0			0	0		
Reduced v/c Ratio	0.33			0.37	0.55		

Intersection Summary			
Area Type:	Other		
Cycle Length: 85			
Actuated Cycle Length: 53.5			
Natural Cycle: 75			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.57			
Intersection Signal Delay: 14.0		Intersection LOS: B	
Intersection Capacity Utilization 64.3%		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: 7: Harvard Street & Washington Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2	Ø3
Lane Configurations														
Traffic Volume (vph)	60	880	25	90	760	200	15	75	145	195	65	80		
Future Volume (vph)	60	880	25	90	760	200	15	75	145	195	65	80		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Length (ft)	0		0	0		0	0		0	0		75		
Storage Lanes	1		0	1		0	0		0	0		1		
Taper Length (ft)	25			25			25			25				
Satd. Flow (prot)	1770	1853	0	1787	3347	0	0	1708	0	0	1716	1553		
Flt Permitted	0.105			0.100				0.997			0.964			
Satd. Flow (perm)	196	1853	0	188	3347	0	0	1707	0	0	1716	1502		
Right Turn on Red			Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)		2			38			58				94		
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		929			123			248			747			
Travel Time (s)		21.1			2.8			5.6			17.0			
Confl. Peds. (#/hr)	17		13	13		17	12					12		
Confl. Bikes (#/hr)						1								
Peak Hour Factor	0.91	0.91	0.91	0.96	0.96	0.96	0.87	0.87	0.87	0.85	0.85	0.85		
Heavy Vehicles (%)	2%	2%	4%	1%	3%	3%	0%	3%	1%	8%	3%	4%		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	66	994	0	94	1000	0	0	270	0	0	305	94		
Turn Type	Perm	NA		custom	NA		Split	NA		Split	NA	custom		
Protected Phases		2 3		4	3 4		8	8		1	1	1	2	3
Permitted Phases	2 3			3								2		
Detector Phase	2 3	2 3		4	3 4		8	8		1	1	1		
Switch Phase														
Minimum Initial (s)				6.0			8.0	8.0		8.0	8.0	8.0	6.0	8.0
Minimum Split (s)				10.0			19.0	19.0		24.0	24.0	24.0	10.0	25.0
Total Split (s)				14.0			19.0	19.0		24.0	24.0	24.0	14.0	45.0
Total Split (%)				12.1%			16.4%	16.4%		20.7%	20.7%	20.7%	12%	39%
Yellow Time (s)				3.0			3.0	3.0		3.0	3.0	3.0	3.0	4.0
All-Red Time (s)				1.0			1.0	1.0		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)				4.0				4.0			4.0	4.0		
Lead/Lag				Lag						Lead	Lead	Lead	Lag	Lead
Lead-Lag Optimize?														
Recall Mode				None			None	None		None	None	None	Min	None
Act Effct Green (s)	55.0	55.0		51.0	54.0			15.0			20.0	30.0		
Actuated g/C Ratio	0.47	0.47		0.44	0.47			0.13			0.17	0.26		
v/c Ratio	0.72	1.13		0.43	0.63			1.00			1.03	0.20		
Control Delay	68.3	103.2		19.7	5.5			94.0			108.8	7.2		
Queue Delay	0.0	1.0		11.9	0.1			82.5			0.0	0.0		
Total Delay	68.3	104.2		31.6	5.7			176.5			108.8	7.2		
LOS	E	F		C	A			F			F	A		
Approach Delay		101.9			7.9			176.5			84.9			
Approach LOS		F			A			F			F			
Queue Length 50th (ft)	38	~865		18	31			163			~244	0		
Queue Length 95th (ft)	#124	#1120		m59	49			#320			#385	34		
Internal Link Dist (ft)		849			43			168			667			
Turn Bay Length (ft)												75		
Base Capacity (vph)	92	879		220	1578			271			295	466		
Starvation Cap Reductn	0	0		99	83			0			0	0		
Spillback Cap Reductn	0	139		0	0			235			0	0		
Storage Cap Reductn	0	0		0	0			0			0	0		
Reduced v/c Ratio	0.72	1.34		0.78	0.67			7.50			1.03	0.20		

Intersection Summary			
Area Type:	Other		
Cycle Length: 116			
Actuated Cycle Length: 116			
Natural Cycle: 100			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.13			
Intersection Signal Delay: 70.2		Intersection LOS: E	
Intersection Capacity Utilization 94.9%		ICU Level of Service F	
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.

m Volume for 95th percentile queue is metered by upstream signal.

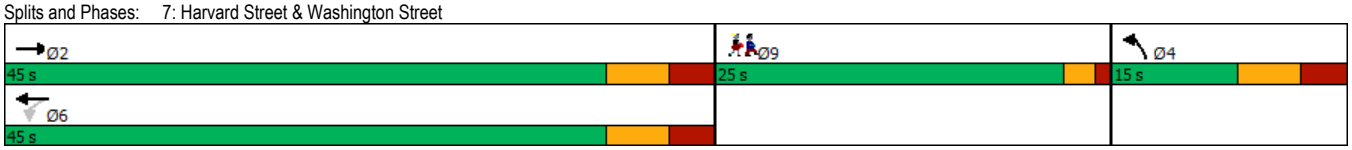
Splits and Phases: 9: Lewis Terrace Rd/Adams Street & Washington Street

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø9
Lane Configurations							
Traffic Volume (vph)	580	40	125	735	45	75	
Future Volume (vph)	580	40	125	735	45	75	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Satd. Flow (prot)	3503	0	0	3554	1638	0	
Flt Permitted				0.734	0.981		
Satd. Flow (perm)	3503	0	0	2627	1624	0	
Right Turn on Red		No				No	
Satd. Flow (RTOR)							
Link Speed (mph)	30			30	30		
Link Distance (ft)	330			999	440		
Travel Time (s)	7.5			22.7	10.0		
Confl. Peds. (#/hr)		1	1		7	17	
Peak Hour Factor	0.94	0.94	0.89	0.89	0.89	0.89	
Heavy Vehicles (%)	2%	0%	0%	1%	0%	0%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	660	0	0	966	135	0	
Turn Type	NA		Perm	NA	Prot		
Protected Phases	2			6	4		9
Permitted Phases			6				
Detector Phase	2		6	6	4		
Switch Phase							
Minimum Initial (s)	8.0		8.0	8.0	6.0		6.0
Minimum Split (s)	15.0		15.0	15.0	13.0		25.0
Total Split (s)	45.0		45.0	45.0	15.0		25.0
Total Split (%)	52.9%		52.9%	52.9%	17.6%		29%
Yellow Time (s)	4.0		4.0	4.0	4.0		2.0
All-Red Time (s)	3.0		3.0	3.0	3.0		1.0
Lost Time Adjust (s)	0.0			0.0	0.0		
Total Lost Time (s)	7.0			7.0	7.0		
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	Min		Min	Min	None		None
Act Effct Green (s)	33.8			33.8	8.3		
Actuated g/C Ratio	0.56			0.56	0.14		
v/c Ratio	0.34			0.65	0.60		
Control Delay	9.2			13.9	41.0		
Queue Delay	0.0			0.0	0.0		
Total Delay	9.2			13.9	41.0		
LOS	A			B	D		
Approach Delay	9.2			13.9	41.0		
Approach LOS	A			B	D		
Queue Length 50th (ft)	47			89	38		
Queue Length 95th (ft)	166			310	#173		
Internal Link Dist (ft)	250			919	360		
Turn Bay Length (ft)							
Base Capacity (vph)	2292			1718	225		
Starvation Cap Reductn	0			0	0		
Spillback Cap Reductn	0			0	0		
Storage Cap Reductn	0			0	0		
Reduced v/c Ratio	0.29			0.56	0.60		

Intersection Summary			
Area Type:	Other		
Cycle Length: 85			
Actuated Cycle Length: 60.1			
Natural Cycle: 80			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.65			
Intersection Signal Delay: 14.2		Intersection LOS: B	
Intersection Capacity Utilization 66.9%		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: 7: Harvard Street & Washington Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2	Ø3
Lane Configurations														
Traffic Volume (vph)	75	775	45	85	940	225	15	70	80	185	75	90		
Future Volume (vph)	75	775	45	85	940	225	15	70	80	185	75	90		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Length (ft)	0		0	0		0	0		0	0		75		
Storage Lanes	1		0	1		0	0		0	0		1		
Taper Length (ft)	25			25			25			25				
Satd. Flow (prot)	1805	1847	0	1805	3406	0	0	1768	0	0	1787	1615		
Flt Permitted	0.074			0.100				0.996			0.966			
Satd. Flow (perm)	141	1847	0	190	3406	0	0	1767	0	0	1787	1582		
Right Turn on Red			Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)		3			34			34				94		
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		929			123			248			747			
Travel Time (s)		21.1			2.8			5.6			17.0			
Confl. Peds. (#/hr)	9		5	5		9	5					5		
Peak Hour Factor	0.91	0.91	0.91	0.94	0.94	0.94	0.86	0.86	0.86	0.89	0.89	0.89		
Heavy Vehicles (%)	0%	2%	0%	0%	2%	2%	0%	0%	0%	3%	2%	0%		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	82	901	0	90	1239	0	0	191	0	0	292	101		
Turn Type	Perm	NA		custom	NA		Split	NA		Split	NA	custom		
Protected Phases		2 3		4	3 4		8	8		1	1	1	2	3
Permitted Phases	2 3			3								2		
Detector Phase	2 3	2 3		4	3 4		8	8		1	1	1		
Switch Phase														
Minimum Initial (s)				6.0			8.0	8.0		8.0	8.0	8.0	6.0	8.0
Minimum Split (s)				10.0			19.0	19.0		24.0	24.0	24.0	10.0	25.0
Total Split (s)				14.0			19.0	19.0		24.0	24.0	24.0	14.0	45.0
Total Split (%)				12.1%			16.4%	16.4%		20.7%	20.7%	20.7%	12%	39%
Yellow Time (s)				3.0			3.0	3.0		3.0	3.0	3.0	3.0	4.0
All-Red Time (s)				1.0			1.0	1.0		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)				4.0				4.0			4.0	4.0		
Lead/Lag				Lag						Lead	Lead	Lead	Lag	Lead
Lead-Lag Optimize?														
Recall Mode				None			None	None		None	None	None	Min	None
Act Effct Green (s)	55.0	55.0		51.0	54.0			13.2			20.0	30.0		
Actuated g/C Ratio	0.48	0.48		0.45	0.47			0.12			0.18	0.26		
v/c Ratio	1.22	1.01		0.40	0.76			0.82			0.93	0.21		
Control Delay	212.6	63.4		13.7	5.1			67.0			84.0	8.3		
Queue Delay	0.0	16.2		10.2	0.3			91.7			0.0	0.0		
Total Delay	212.6	79.6		23.9	5.4			158.7			84.0	8.3		
LOS	F	E		C	A			F			F	A		
Approach Delay		90.7			6.7			158.7			64.5			
Approach LOS		F			A			F			E			
Queue Length 50th (ft)	~76	~719		11	26			115			218	4		
Queue Length 95th (ft)	#132	#968		m27	41			#201			#383	43		
Internal Link Dist (ft)		849			43			168			667			
Turn Bay Length (ft)												75		
Base Capacity (vph)	67	891		226	1628			262			313	490		
Starvation Cap Reductn	0	0		105	65			0			0	0		
Spillback Cap Reductn	0	41		0	0			209			0	0		
Storage Cap Reductn	0	0		0	0			0			0	0		
Reduced v/c Ratio	1.22	1.06		0.74	0.79			3.60			0.93	0.21		

Intersection Summary			
Area Type:	Other		
Cycle Length: 116			
Actuated Cycle Length: 114.2			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.22			
Intersection Signal Delay: 53.1		Intersection LOS: D	
Intersection Capacity Utilization 85.9%		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.

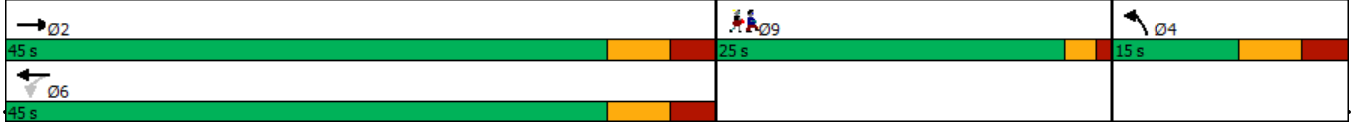
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: Lewis Terrace Rd/Adams Street & Washington Street

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø9
Lane Configurations							
Traffic Volume (vph)	790	30	100	610	50	60	
Future Volume (vph)	790	30	100	610	50	60	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Satd. Flow (prot)	3452	0	0	3519	1647	0	
Flt Permitted				0.682	0.978		
Satd. Flow (perm)	3452	0	0	2417	1635	0	
Right Turn on Red		No				No	
Satd. Flow (RTOR)							
Link Speed (mph)	30			30	30		
Link Distance (ft)	330			999	440		
Travel Time (s)	7.5			22.7	10.0		
Confl. Peds. (#/hr)		3	3		5	9	
Confl. Bikes (#/hr)		1					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	4%	0%	1%	2%	0%	4%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	892	0	0	772	119	0	
Turn Type	NA		Perm	NA	Prot		
Protected Phases	2			6	4		9
Permitted Phases			6				
Detector Phase	2		6	6	4		
Switch Phase							
Minimum Initial (s)	8.0		8.0	8.0	6.0		6.0
Minimum Split (s)	15.0		15.0	15.0	13.0		25.0
Total Split (s)	45.0		45.0	45.0	15.0		25.0
Total Split (%)	52.9%		52.9%	52.9%	17.6%		29%
Yellow Time (s)	4.0		4.0	4.0	4.0		2.0
All-Red Time (s)	3.0		3.0	3.0	3.0		1.0
Lost Time Adjust (s)	0.0			0.0	0.0		
Total Lost Time (s)	7.0			7.0	7.0		
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	Min		Min	Min	None		None
Act Effct Green (s)	31.7			31.7	8.2		
Actuated g/C Ratio	0.55			0.55	0.14		
v/c Ratio	0.47			0.58	0.51		
Control Delay	10.6			12.8	36.1		
Queue Delay	0.0			0.0	0.0		
Total Delay	10.6			12.8	36.1		
LOS	B			B	D		
Approach Delay	10.6			12.8	36.1		
Approach LOS	B			B	D		
Queue Length 50th (ft)	70			66	31		
Queue Length 95th (ft)	239			239	#151		
Internal Link Dist (ft)	250			919	360		
Turn Bay Length (ft)							
Base Capacity (vph)	2365			1656	237		
Starvation Cap Reductn	0			0	0		
Spillback Cap Reductn	0			0	0		
Storage Cap Reductn	0			0	0		
Reduced v/c Ratio	0.38			0.47	0.50		

Intersection Summary			
Area Type:	Other		
Cycle Length: 85			
Actuated Cycle Length: 58			
Natural Cycle: 80			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.58			
Intersection Signal Delay: 13.2		Intersection LOS: B	
Intersection Capacity Utilization 67.0%		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: 7: Harvard Street & Washington Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2	Ø3
Lane Configurations														
Traffic Volume (vph)	60	935	25	95	810	210	15	80	150	205	65	85		
Future Volume (vph)	60	935	25	95	810	210	15	80	150	205	65	85		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Length (ft)	0		0	0		0	0		0	0		75		
Storage Lanes	1		0	1		0	0		0	0		1		
Taper Length (ft)	25			25			25			25				
Satd. Flow (prot)	1770	1853	0	1787	3348	0	0	1710	0	0	1713	1553		
Flt Permitted	0.075			0.100				0.997			0.963			
Satd. Flow (perm)	140	1853	0	188	3348	0	0	1708	0	0	1713	1502		
Right Turn on Red			Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)		2			37			56				94		
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		929			123			248			747			
Travel Time (s)		21.1			2.8			5.6			17.0			
Confl. Peds. (#/hr)	17		13	13		17	12					12		
Confl. Bikes (#/hr)						1								
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92		
Heavy Vehicles (%)	2%	2%	4%	1%	3%	3%	0%	3%	1%	8%	3%	4%		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	65	1043	0	103	1108	0	0	266	0	0	294	92		
Turn Type	Perm	NA		custom	NA		Split	NA		Split	NA	custom		
Protected Phases		2 3		4	3 4		8	8		1	1	1	2	3
Permitted Phases	2 3			3								2		
Detector Phase	2 3	2 3		4	3 4		8	8		1	1	1		
Switch Phase														
Minimum Initial (s)				6.0			8.0	8.0		8.0	8.0	8.0	6.0	8.0
Minimum Split (s)				10.0			19.0	19.0		24.0	24.0	24.0	10.0	25.0
Total Split (s)				14.0			19.0	19.0		24.0	24.0	24.0	14.0	45.0
Total Split (%)				12.1%			16.4%	16.4%		20.7%	20.7%	20.7%	12%	39%
Yellow Time (s)				3.0			3.0	3.0		3.0	3.0	3.0	3.0	4.0
All-Red Time (s)				1.0			1.0	1.0		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)				4.0				4.0			4.0	4.0		
Lead/Lag				Lag						Lead	Lead	Lead	Lag	Lead
Lead-Lag Optimize?														
Recall Mode				None			None	None		None	None	None	Min	None
Act Effct Green (s)	55.0	55.0		51.0	54.0			15.0			20.0	30.0		
Actuated g/C Ratio	0.47	0.47		0.44	0.47			0.13			0.17	0.26		
v/c Ratio	0.98	1.19		0.47	0.70			0.99			1.00	0.20		
Control Delay	142.9	125.0		19.7	5.5			92.6			100.2	7.0		
Queue Delay	0.0	1.4		16.8	0.0			87.8			0.0	0.0		
Total Delay	142.9	126.4		36.4	5.6			180.4			100.2	7.0		
LOS	F	F		D	A			F			F	A		
Approach Delay		127.4			8.2			180.4			78.0			
Approach LOS		F			A			F			E			
Queue Length 50th (ft)	46	~942		22	26			161			222	0		
Queue Length 95th (ft)	#143	#1199		m60	42			#336			#402	38		
Internal Link Dist (ft)		849			43			168			667			
Turn Bay Length (ft)												75		
Base Capacity (vph)	66	879		220	1578			269			295	466		
Starvation Cap Reductn	0	0		98	17			0			0	0		
Spillback Cap Reductn	0	188		0	0			236			0	0		
Storage Cap Reductn	0	0		0	0			0			0	0		
Reduced v/c Ratio	0.98	1.51		0.84	0.71			8.06			1.00	0.20		

Intersection Summary			
Area Type:	Other		
Cycle Length: 116			
Actuated Cycle Length: 116			
Natural Cycle: 120			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.19			
Intersection Signal Delay: 77.1		Intersection LOS: E	
Intersection Capacity Utilization 99.0%		ICU Level of Service F	
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.

m Volume for 95th percentile queue is metered by upstream signal.

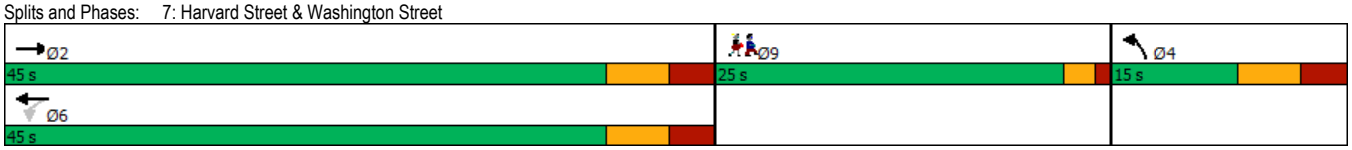
Splits and Phases: 9: Lewis Terrace Rd/Adams Street & Washington Street

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø9
Lane Configurations							
Traffic Volume (vph)	630	40	130	795	45	80	
Future Volume (vph)	630	40	130	795	45	80	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Satd. Flow (prot)	3507	0	0	3554	1634	0	
Flt Permitted				0.712	0.982		
Satd. Flow (perm)	3507	0	0	2548	1621	0	
Right Turn on Red		No				No	
Satd. Flow (RTOR)							
Link Speed (mph)	30			30	30		
Link Distance (ft)	330			999	440		
Travel Time (s)	7.5			22.7	10.0		
Confl. Peds. (#/hr)		1	1		7	17	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	2%	0%	0%	1%	0%	0%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	728	0	0	1005	136	0	
Turn Type	NA		Perm	NA	Prot		
Protected Phases	2			6	4		9
Permitted Phases			6				
Detector Phase	2		6	6	4		
Switch Phase							
Minimum Initial (s)	8.0		8.0	8.0	6.0		6.0
Minimum Split (s)	15.0		15.0	15.0	13.0		25.0
Total Split (s)	45.0		45.0	45.0	15.0		25.0
Total Split (%)	52.9%		52.9%	52.9%	17.6%		29%
Yellow Time (s)	4.0		4.0	4.0	4.0		2.0
All-Red Time (s)	3.0		3.0	3.0	3.0		1.0
Lost Time Adjust (s)	0.0			0.0	0.0		
Total Lost Time (s)	7.0			7.0	7.0		
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	Min		Min	Min	None		None
Act Effct Green (s)	38.0			38.0	8.2		
Actuated g/C Ratio	0.59			0.59	0.13		
v/c Ratio	0.35			0.67	0.66		
Control Delay	9.0			14.2	46.8		
Queue Delay	0.0			0.0	0.0		
Total Delay	9.0			14.2	46.8		
LOS	A			B	D		
Approach Delay	9.0			14.2	46.8		
Approach LOS	A			B	D		
Queue Length 50th (ft)	53			97	45		
Queue Length 95th (ft)	185			#379	#178		
Internal Link Dist (ft)	250			919	360		
Turn Bay Length (ft)							
Base Capacity (vph)	2130			1548	207		
Starvation Cap Reductn	0			0	0		
Spillback Cap Reductn	0			0	0		
Storage Cap Reductn	0			0	0		
Reduced v/c Ratio	0.34			0.65	0.66		

Intersection Summary

Area Type: Other
Cycle Length: 85
Actuated Cycle Length: 64.3
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.67
Intersection Signal Delay: 14.5 Intersection LOS: B
Intersection Capacity Utilization 70.4% 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: 7: Harvard Street & Washington Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2	Ø3
Lane Configurations														
Traffic Volume (vph)	80	830	45	90	1010	235	15	70	85	195	80	95		
Future Volume (vph)	80	830	45	90	1010	235	15	70	85	195	80	95		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Length (ft)	0		0	0		0	0		0	0		75		
Storage Lanes	1		0	1		0	0		0	0		1		
Taper Length (ft)	25			25			25			25				
Satd. Flow (prot)	1805	1847	0	1805	3411	0	0	1764	0	0	1787	1615		
Flt Permitted	0.074			0.100				0.996			0.966			
Satd. Flow (perm)	141	1847	0	190	3411	0	0	1763	0	0	1787	1582		
Right Turn on Red			Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)		3			32			36				94		
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		929			123			248			747			
Travel Time (s)		21.1			2.8			5.6			17.0			
Confl. Peds. (#/hr)	9		5	5		9	5					5		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92		
Heavy Vehicles (%)	0%	2%	0%	0%	2%	2%	0%	0%	0%	3%	2%	0%		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	87	951	0	98	1353	0	0	184	0	0	299	103		
Turn Type	Perm	NA		custom	NA		Split	NA		Split	NA	custom		
Protected Phases		2 3		4	3 4		8	8		1	1	1	2	3
Permitted Phases	2 3			3								2		
Detector Phase	2 3	2 3		4	3 4		8	8		1	1	1		
Switch Phase														
Minimum Initial (s)				6.0			8.0	8.0		8.0	8.0	8.0	6.0	8.0
Minimum Split (s)				10.0			19.0	19.0		24.0	24.0	24.0	10.0	25.0
Total Split (s)				14.0			19.0	19.0		24.0	24.0	24.0	14.0	45.0
Total Split (%)				12.1%			16.4%	16.4%		20.7%	20.7%	20.7%	12%	39%
Yellow Time (s)				3.0			3.0	3.0		3.0	3.0	3.0	3.0	4.0
All-Red Time (s)				1.0			1.0	1.0		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)				4.0				4.0			4.0	4.0		
Lead/Lag				Lag						Lead	Lead	Lead	Lag	Lead
Lead-Lag Optimize?														
Recall Mode				None			None	None		None	None	None	Min	None
Act Effct Green (s)	55.0	55.0		51.0	54.0			12.8			20.0	30.0		
Actuated g/C Ratio	0.48	0.48		0.45	0.47			0.11			0.18	0.26		
v/c Ratio	1.28	1.06		0.43	0.83			0.80			0.95	0.21		
Control Delay	235.3	78.4		13.4	6.1			64.7			87.7	8.6		
Queue Delay	0.0	14.7		13.6	0.3			113.4			0.0	0.0		
Total Delay	235.3	93.1		27.0	6.4			178.1			87.7	8.6		
LOS	F	F		C	A			F			F	A		
Approach Delay		105.1			7.8			178.1			67.4			
Approach LOS		F			A			F			E			
Queue Length 50th (ft)	~83	~792		14	28			107			223	5		
Queue Length 95th (ft)	#142	#1052		m23	43			#204			#400	46		
Internal Link Dist (ft)		849			43			168			667			
Turn Bay Length (ft)												75		
Base Capacity (vph)	68	894		227	1635			263			314	492		
Starvation Cap Reductn	0	0		105	38			0			0	0		
Spillback Cap Reductn	0	68		0	0			232			0	0		
Storage Cap Reductn	0	0		0	0			0			0	0		
Reduced v/c Ratio	1.28	1.15		0.80	0.85			5.94			0.95	0.21		

Intersection Summary			
Area Type:	Other		
Cycle Length: 116			
Actuated Cycle Length: 113.8			
Natural Cycle: 110			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.28			
Intersection Signal Delay: 58.6		Intersection LOS: E	
Intersection Capacity Utilization 89.7%		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.

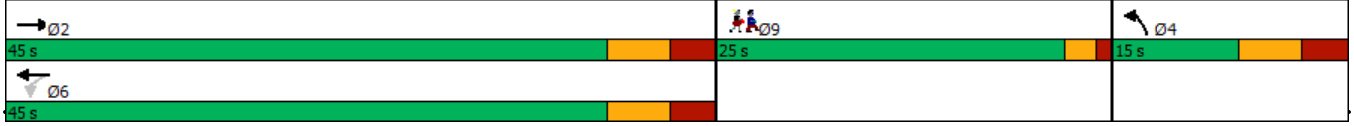
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: Lewis Terrace Rd/Adams Street & Washington Street

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø9
Lane Configurations							
Traffic Volume (vph)	790	30	100	610	50	60	
Future Volume (vph)	790	30	100	610	50	60	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Satd. Flow (prot)	3452	0	0	3519	1647	0	
Flt Permitted				0.682	0.978		
Satd. Flow (perm)	3452	0	0	2417	1635	0	
Right Turn on Red		No				No	
Satd. Flow (RTOR)							
Link Speed (mph)	30			30	30		
Link Distance (ft)	330			999	440		
Travel Time (s)	7.5			22.7	10.0		
Confl. Peds. (#/hr)		3	3		5	9	
Confl. Bikes (#/hr)		1					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	4%	0%	1%	2%	0%	4%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	892	0	0	772	119	0	
Turn Type	NA		Perm	NA	Prot		
Protected Phases	2			6	4		9
Permitted Phases			6				
Detector Phase	2		6	6	4		
Switch Phase							
Minimum Initial (s)	8.0		8.0	8.0	6.0		6.0
Minimum Split (s)	15.0		15.0	15.0	13.0		25.0
Total Split (s)	45.0		45.0	45.0	15.0		25.0
Total Split (%)	52.9%		52.9%	52.9%	17.6%		29%
Yellow Time (s)	4.0		4.0	4.0	4.0		2.0
All-Red Time (s)	3.0		3.0	3.0	3.0		1.0
Lost Time Adjust (s)	0.0			0.0	0.0		
Total Lost Time (s)	7.0			7.0	7.0		
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	Min		Min	Min	None		None
Act Effct Green (s)	31.7			31.7	8.2		
Actuated g/C Ratio	0.55			0.55	0.14		
v/c Ratio	0.47			0.58	0.51		
Control Delay	10.6			12.8	36.1		
Queue Delay	0.0			0.0	0.0		
Total Delay	10.6			12.8	36.1		
LOS	B			B	D		
Approach Delay	10.6			12.8	36.1		
Approach LOS	B			B	D		
Queue Length 50th (ft)	70			66	31		
Queue Length 95th (ft)	239			239	#151		
Internal Link Dist (ft)	250			919	360		
Turn Bay Length (ft)							
Base Capacity (vph)	2365			1656	237		
Starvation Cap Reductn	0			0	0		
Spillback Cap Reductn	0			0	0		
Storage Cap Reductn	0			0	0		
Reduced v/c Ratio	0.38			0.47	0.50		

Intersection Summary			
Area Type:	Other		
Cycle Length: 85			
Actuated Cycle Length: 58			
Natural Cycle: 80			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.58			
Intersection Signal Delay: 13.2		Intersection LOS: B	
Intersection Capacity Utilization 67.0%		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: 7: Harvard Street & Washington Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2	Ø3
Lane Configurations														
Traffic Volume (vph)	60	940	25	95	815	210	15	80	150	205	65	85		
Future Volume (vph)	60	940	25	95	815	210	15	80	150	205	65	85		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Length (ft)	0		0	0		0	0		0	0		75		
Storage Lanes	1		0	1		0	0		0	0		1		
Taper Length (ft)	25			25			25			25				
Satd. Flow (prot)	1770	1853	0	1787	3348	0	0	1710	0	0	1713	1553		
Flt Permitted	0.074			0.100				0.997			0.963			
Satd. Flow (perm)	138	1853	0	188	3348	0	0	1708	0	0	1713	1502		
Right Turn on Red			Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)		2			37			56				94		
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		929			123			248			747			
Travel Time (s)		21.1			2.8			5.6			17.0			
Confl. Peds. (#/hr)	17		13	13		17	12					12		
Confl. Bikes (#/hr)						1								
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92		
Heavy Vehicles (%)	2%	2%	4%	1%	3%	3%	0%	3%	1%	8%	3%	4%		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	65	1049	0	103	1114	0	0	266	0	0	294	92		
Turn Type	Perm	NA		custom	NA		Split	NA		Split	NA	custom		
Protected Phases		2 3		4	3 4		8	8		1	1	1	2	3
Permitted Phases	2 3			3								2		
Detector Phase	2 3	2 3		4	3 4		8	8		1	1	1		
Switch Phase														
Minimum Initial (s)				6.0			8.0	8.0		8.0	8.0	8.0	6.0	8.0
Minimum Split (s)				10.0			19.0	19.0		24.0	24.0	24.0	10.0	25.0
Total Split (s)				14.0			19.0	19.0		24.0	24.0	24.0	14.0	45.0
Total Split (%)				12.1%			16.4%	16.4%		20.7%	20.7%	20.7%	12%	39%
Yellow Time (s)				3.0			3.0	3.0		3.0	3.0	3.0	3.0	4.0
All-Red Time (s)				1.0			1.0	1.0		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)				4.0				4.0			4.0	4.0		
Lead/Lag				Lag						Lead	Lead	Lead	Lag	Lead
Lead-Lag Optimize?														
Recall Mode				None			None	None		None	None	None	Min	None
Act Effct Green (s)	55.0	55.0		51.0	54.0			15.0			20.0	30.0		
Actuated g/C Ratio	0.47	0.47		0.44	0.47			0.13			0.17	0.26		
v/c Ratio	1.00	1.19		0.47	0.71			0.99			1.00	0.20		
Control Delay	148.2	127.8		19.5	5.6			92.6			100.2	7.0		
Queue Delay	0.0	1.5		16.8	0.0			89.1			0.0	0.0		
Total Delay	148.2	129.2		36.3	5.6			181.7			100.2	7.0		
LOS	F	F		D	A			F			F	A		
Approach Delay		130.3			8.2			181.7			78.0			
Approach LOS		F			A			F			E			
Queue Length 50th (ft)	47	~952		22	26			161			222	0		
Queue Length 95th (ft)	#144	#1208		m59	42			#336			#402	38		
Internal Link Dist (ft)		849			43			168			667			
Turn Bay Length (ft)												75		
Base Capacity (vph)	65	879		220	1578			269			295	466		
Starvation Cap Reductn	0	0		98	17			0			0	0		
Spillback Cap Reductn	0	192		0	0			237			0	0		
Storage Cap Reductn	0	0		0	0			0			0	0		
Reduced v/c Ratio	1.00	1.53		0.84	0.71			8.31			1.00	0.20		

Intersection Summary			
Area Type:	Other		
Cycle Length: 116			
Actuated Cycle Length: 116			
Natural Cycle: 100			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.19			
Intersection Signal Delay: 78.3		Intersection LOS: E	
Intersection Capacity Utilization 99.3%		ICU Level of Service F	
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.

m Volume for 95th percentile queue is metered by upstream signal.

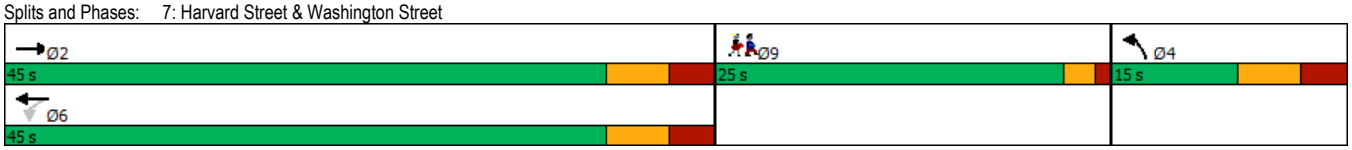
Splits and Phases: 9: Lewis Terrace Rd/Adams Street & Washington Street

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø9
Lane Configurations							
Traffic Volume (vph)	635	40	135	800	45	80	
Future Volume (vph)	635	40	135	800	45	80	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Satd. Flow (prot)	3507	0	0	3554	1634	0	
Flt Permitted				0.706	0.982		
Satd. Flow (perm)	3507	0	0	2527	1621	0	
Right Turn on Red		No				No	
Satd. Flow (RTOR)							
Link Speed (mph)	30			30	30		
Link Distance (ft)	330			999	440		
Travel Time (s)	7.5			22.7	10.0		
Confl. Peds. (#/hr)		1	1		7	17	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	2%	0%	0%	1%	0%	0%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	733	0	0	1017	136	0	
Turn Type	NA		Perm	NA	Prot		
Protected Phases	2			6	4		9
Permitted Phases			6				
Detector Phase	2		6	6	4		
Switch Phase							
Minimum Initial (s)	8.0		8.0	8.0	6.0		6.0
Minimum Split (s)	15.0		15.0	15.0	13.0		25.0
Total Split (s)	45.0		45.0	45.0	15.0		25.0
Total Split (%)	52.9%		52.9%	52.9%	17.6%		29%
Yellow Time (s)	4.0		4.0	4.0	4.0		2.0
All-Red Time (s)	3.0		3.0	3.0	3.0		1.0
Lost Time Adjust (s)	0.0			0.0	0.0		
Total Lost Time (s)	7.0			7.0	7.0		
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	Min		Min	Min	None		None
Act Effct Green (s)	39.6			39.6	8.1		
Actuated g/C Ratio	0.60			0.60	0.12		
v/c Ratio	0.35			0.67	0.68		
Control Delay	8.8			14.3	48.9		
Queue Delay	0.0			0.0	0.0		
Total Delay	8.8			14.3	48.9		
LOS	A			B	D		
Approach Delay	8.8			14.3	48.9		
Approach LOS	A			B	D		
Queue Length 50th (ft)	54			100	47		
Queue Length 95th (ft)	187			#389	#178		
Internal Link Dist (ft)	250			919	360		
Turn Bay Length (ft)							
Base Capacity (vph)	2123			1530	201		
Starvation Cap Reductn	0			0	0		
Spillback Cap Reductn	0			0	0		
Storage Cap Reductn	0			0	0		
Reduced v/c Ratio	0.35			0.66	0.68		

Intersection Summary			
Area Type:	Other		
Cycle Length: 85			
Actuated Cycle Length: 65.9			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.68			
Intersection Signal Delay: 14.7		Intersection LOS: B	
Intersection Capacity Utilization 70.8%		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: 7: Harvard Street & Washington Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø2	Ø3
Lane Configurations														
Traffic Volume (vph)	80	850	45	90	1025	235	15	70	85	195	80	95		
Future Volume (vph)	80	850	45	90	1025	235	15	70	85	195	80	95		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Length (ft)	0		0	0		0	0		0	0		75		
Storage Lanes	1		0	1		0	0		0	0		1		
Taper Length (ft)	25			25			25			25				
Satd. Flow (prot)	1805	1847	0	1805	3411	0	0	1764	0	0	1787	1615		
Flt Permitted	0.074			0.100				0.996			0.966			
Satd. Flow (perm)	141	1847	0	190	3411	0	0	1763	0	0	1787	1582		
Right Turn on Red			Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)		3			32			36				94		
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		929			123			248			747			
Travel Time (s)		21.1			2.8			5.6			17.0			
Confl. Peds. (#/hr)	9		5	5		9	5					5		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92		
Heavy Vehicles (%)	0%	2%	0%	0%	2%	2%	0%	0%	0%	3%	2%	0%		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	87	973	0	98	1369	0	0	184	0	0	299	103		
Turn Type	Perm	NA		custom	NA		Split	NA		Split	NA	custom		
Protected Phases		2 3		4	3 4		8	8		1	1	1	2	3
Permitted Phases	2 3			3								2		
Detector Phase	2 3	2 3		4	3 4		8	8		1	1	1		
Switch Phase														
Minimum Initial (s)				6.0			8.0	8.0		8.0	8.0	8.0	6.0	8.0
Minimum Split (s)				10.0			19.0	19.0		24.0	24.0	24.0	10.0	25.0
Total Split (s)				14.0			19.0	19.0		24.0	24.0	24.0	14.0	45.0
Total Split (%)				12.1%			16.4%	16.4%		20.7%	20.7%	20.7%	12%	39%
Yellow Time (s)				3.0			3.0	3.0		3.0	3.0	3.0	3.0	4.0
All-Red Time (s)				1.0			1.0	1.0		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)				4.0				4.0			4.0	4.0		
Lead/Lag				Lag						Lead	Lead	Lead	Lag	Lead
Lead-Lag Optimize?														
Recall Mode				None			None	None		None	None	None	Min	None
Act Effct Green (s)	55.0	55.0		51.0	54.0			12.8			20.0	30.0		
Actuated g/C Ratio	0.48	0.48		0.45	0.47			0.11			0.18	0.26		
v/c Ratio	1.28	1.09		0.43	0.84			0.80			0.95	0.21		
Control Delay	235.3	86.7		13.2	6.5			64.7			87.7	8.6		
Queue Delay	0.0	5.2		13.6	0.3			119.9			0.0	0.0		
Total Delay	235.3	92.0		26.8	6.8			184.6			87.7	8.6		
LOS	F	F		C	A			F			F	A		
Approach Delay		103.7			8.2			184.6			67.4			
Approach LOS		F			A			F			E			
Queue Length 50th (ft)	~83	~826		14	28			107			223	5		
Queue Length 95th (ft)	#142	#1086		m22	48			#204			#400	46		
Internal Link Dist (ft)		849			43			168			667			
Turn Bay Length (ft)												75		
Base Capacity (vph)	68	894		227	1635			263			314	492		
Starvation Cap Reductn	0	0		105	36			0			0	0		
Spillback Cap Reductn	0	83		0	0			236			0	0		
Storage Cap Reductn	0	0		0	0			0			0	0		
Reduced v/c Ratio	1.28	1.20		0.80	0.86			6.81			0.95	0.21		

Intersection Summary			
Area Type:	Other		
Cycle Length: 116			
Actuated Cycle Length: 113.8			
Natural Cycle: 110			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.28			
Intersection Signal Delay: 58.8		Intersection LOS: E	
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.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: Lewis Terrace Rd/Adams Street & Washington Street

Stopping Sight Distance and Intersection Sight Distance Calculator [v0.97]
Based on 'A Policy on Geometric Design of Highways and Streets', AASHTO, 2004

Section I

Project Information

Project Number:	15548.00	**Analyst:**	VHB
City/Town, State:	Newton, MA		
Location:	Crafts Street	**Client:**	
	Proposed Site Driveway		

Street Names and Directions

Major Street name:	Crafts Street	NB/SB
Minor Street name:	Site Driveway	EB/WB
Minor Street intersects *from* the:	west	
The minor street *predominantly* serves...	Passenger Cars	
Sight distance location intersection is...	Proposed	
Total number of lanes on Major Street is...	2	

Street Notes

85th percentile speed not obtained
Posted speed limit used

Grade Information [enter down slope as a negative number]

Major Street Approach Grade:	0.00%	NB
	0.00%	SB
Minor Street Approach Grade:	0.00%	NB
	0.00%	SB

Major Street Speed Information

	Posted		*Observed **
	n/a	NB	34
	n/a	SB	32

** note:* off-peak *85th percentile speeds*

Section II

ISD and SSD *Observations*

Instructions on how to observe and measure ISD and SSD are included on subsequent pages.

ISD - Intersection sight distance is the distance that is based on the time required for perception, reaction and completion of the desired critical exiting maneuver [typically, a left turn] once the driver on a minor street approach [or a site drive] decides to execute the maneuver. Calculation for the critical ISD includes the time to [1] turn left, and to clear the near half of the intersection without conflicting with the vehicles approaching from the left; and [2] upon turning left, to accelerate to the operating speed on the roadway without causing approaching vehicles on the main road to unduly reduce their speed. In this context, ISD can be considered as a *desirable* visibility criterion for the safe operation of an unsignalized intersection.

SSD - Stopping sight distance is the distance required for a vehicle approaching an intersection from either direction to perceive, react, and come to a complete stop before colliding with the exiting vehicle from a driveway. In this respect, SSD can be considered as the *minimum* visibility criterion for the safe operation of an unsignalized intersection.

			Limiting Factors:
***Observed* ISD:**	552	looking left [north]	horizontal curvature
(rounded to nearest 5 feet)	485	looking right [south]	to intersection with Washington St
***Observed* SSD:**	485	traveling NB	from intersection with Washington St
(rounded to nearest 5 feet)	567	traveling SB	horizontal curvature

Section III

ISD and SSD *Calculations* (rounded up to the next highest 5 feet) [sources: SSD - AASHTO, pp.110-117; ISD - AASHTO, pp. 650 - 664]

Cases are described in detail on subsequent pages. In summary...

B1: left turn from minor road, from stop control
B2: right turn from minor road, from stop control
B3: crossing maneuver from minor road, from stop control, assuming left- and right turns are not permitted *[otherwise, case B1 or B2 would supercede]*

***Desirable* Calculated...**		**Condition Met?**
... ISD, case B1:	375	**Yes**
... ISD, case B2:	310	**Yes**
... ISD, case B3:	325	**Yes**

[note: if number of lanes crossed exceeds 6, or if grades are steep, consult the manual]

***Minimum* Calculated ...**		**Condition Met?**
... ISD, case B1:	240	**Yes**
... ISD, case B2:	220	**Yes**
... ISD, case B3:	240	**Yes**

[note: minimum *ISD is equal to required SSD]*

Calculated ...			**Condition Met?**
... SSD:	240	traveling NB	**Yes**
	220	traveling SB	**Yes**

Section IV

AASHTO Guidance

Refer to AASHTO for specific guidance on SSD and ISD if presented with an unusual/atypical case.
Adequate ISD is not needed at signalized intersections, assuming traffic signal heads are visible on all approaches.
Any object that would obstruct the driver's view should be removed or lowered, if practical. Such objects include buildings, parked cars, highway structures, hedges/vegetation/trees/bushes/unmowed lawn, walls, fences, and terrain.
For ISD, an object should be considered an obstruction if it obstructs the vision of a driver whose eye height is 3.5 feet above the roadway surface and the object to be seen is 3.5 feet above the surface of the intersecting road.
Where horizontal sight restrictions occur on downgrades, particularly at the ends of long downgrades, it is desirable to provide SSD that exceeds those values indicated above (refer to page 114 of AASHTO).

Stopping Sight Distance and Intersection Sight Distance Calculator [v0.97]
Based on 'A Policy on Geometric Design of Highways and Streets', AASHTO, 2004

Section I

Project Information

Project Number:	15548.00	**Analyst:**	VHB
City/Town, State:	Newton, MA		
Location:	Crafts Street	**Client:**	
	Proposed Loading/ Emergency Access Driveway		

Street Names and Directions

Major Street name:	Crafts Street	NB/SB	
Minor Street name:	Loading Driveway	EB/WB	
Minor Street intersects *from* the:		west	
The minor street *predominantly* serves...		Passenger Cars	
Sight distance location intersection is...		Proposed	
Total number of lanes on Major Street is...		2	

Street Notes

85th percentile speed not obtained
Posted speed limit used

Grade Information [enter down slope as a negative number]

Major Street Approach Grade:	0.00%	NB
	0.00%	SB
Minor Street Approach Grade:	0.00%	NB
	0.00%	SB

Major Street Speed Information

Posted		*Observed **
n/a	NB	34
n/a	SB	32

** note:* off-peak *85th percentile speeds*

Section II

ISD and SSD *Observations*

Instructions on how to observe and measure ISD and SSD are included on subsequent pages.

ISD - Intersection sight distance is the distance that is based on the time required for perception, reaction and completion of the desired critical exiting maneuver [typically, a left turn] once the driver on a minor street approach [or a site drive] decides to execute the maneuver. Calculation for the critical ISD includes the time to [1] turn left, and to clear the near half of the intersection without conflicting with the vehicles approaching from the left; and [2] upon turning left, to accelerate to the operating speed on the roadway without causing approaching vehicles on the main road to unduly reduce their speed. In this context, ISD can be considered as a *desirable* visibility criterion for the safe operation of an unsignalized intersection.

SSD - Stopping sight distance is the distance required for a vehicle approaching an intersection from either direction to perceive, react, and come to a complete stop before colliding with the exiting vehicle from a driveway. In this respect, SSD can be considered as the *minimum* visibility criterion for the safe operation of an unsignalized intersection.

			Limiting Factors:
***Observed* ISD:**	>500	looking left [north]	horizontal curvature
(rounded to nearest 5 feet)	351	looking right [south]	vegetation
***Observed* SSD:**	>500	traveling NB	just before intersection with Washington St
(rounded to nearest 5 feet)	>500	traveling SB	horizontal curvature

Section III

ISD and SSD *Calculations* (rounded up to the next highest 5 feet) [sources: SSD - AASHTO, pp.110-117; ISD - AASHTO, pp. 650 - 664]

Cases are described in detail on subsequent pages. In summary...

B1: left turn from minor road, from stop control
B2: right turn from minor road, from stop control
B3: crossing maneuver from minor road, from stop control, assuming left- and right turns are not permitted *[otherwise, case B1 or B2 would supercede]*

***Desirable* Calculated...**		**Condition Met?**
... ISD, case B1:	375	**Yes**
... ISD, case B2:	310	**Yes**
... ISD, case B3:	325	**Yes**

[note: if number of lanes crossed exceeds 6, or if grades are steep, consult the manual]

***Minimum* Calculated ...**		**Condition Met?**
... ISD, case B1:	240	**Yes**
... ISD, case B2:	220	**Yes**
... ISD, case B3:	240	**Yes**

[note: minimum *ISD is equal to required SSD]*

Calculated ...			**Condition Met?**
... SSD:	240	traveling NB	**Yes**
	220	traveling SB	**Yes**

Section IV

AASHTO Guidance

Refer to AASHTO for specific guidance on SSD and ISD if presented with an unusual/atypical case.
Adequate ISD is not needed at signalized intersections, assuming traffic signal heads are visible on all approaches.
Any object that would obstruct the driver's view should be removed or lowered, if practical. Such objects include buildings, parked cars, highway structures, hedges/vegetation/trees/bushes/unmowed lawn, walls, fences, and terrain.
For ISD, an object should be considered an obstruction if it obstructs the vision of a driver whose eye height is 3.5 feet above the roadway surface and the object to be seen is 3.5 feet above the surface of the intersecting road.
Where horizontal sight restrictions occur on downgrades, particularly at the ends of long downgrades, it is desirable to provide SSD that exceeds those values indicated above (refer to page 114 of AASHTO).

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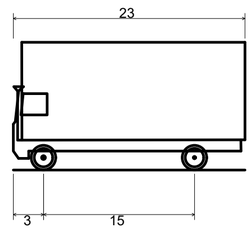

FedEx Truck
Overall Length
Overall Width
Overall Body Height
Min Body Ground Clearance
Track Width
Lock-to-lock time
Max Steering Angle (Virtual)

Attachment 05: Turning Analysis - Small Shuttle/Delivery Vehicle

Crafts Street Senior Housing

Newton, MA

Source: **VHB**
Prepared for: **Internal**
Date: **05/11/2022**

0 15 30 60 Feet

Garbage Truck	
Overall Length	34.900ft
Overall Width	8.000ft
Overall Body Height	10.481ft
Min Body Ground Clearance	1.311ft
Track Width	8.000ft
Lock-to-lock time	4.00s
Max Steering Angle (Virtual)	37.00°

Attachment 06 - Exterior Trash Enclosure and Turning Diagram

Crafts Street Senior Housing
Newton, MA

Source: VHB
Prepared for: Internal
Date: 06/13/2022

0 15 30 60 Feet

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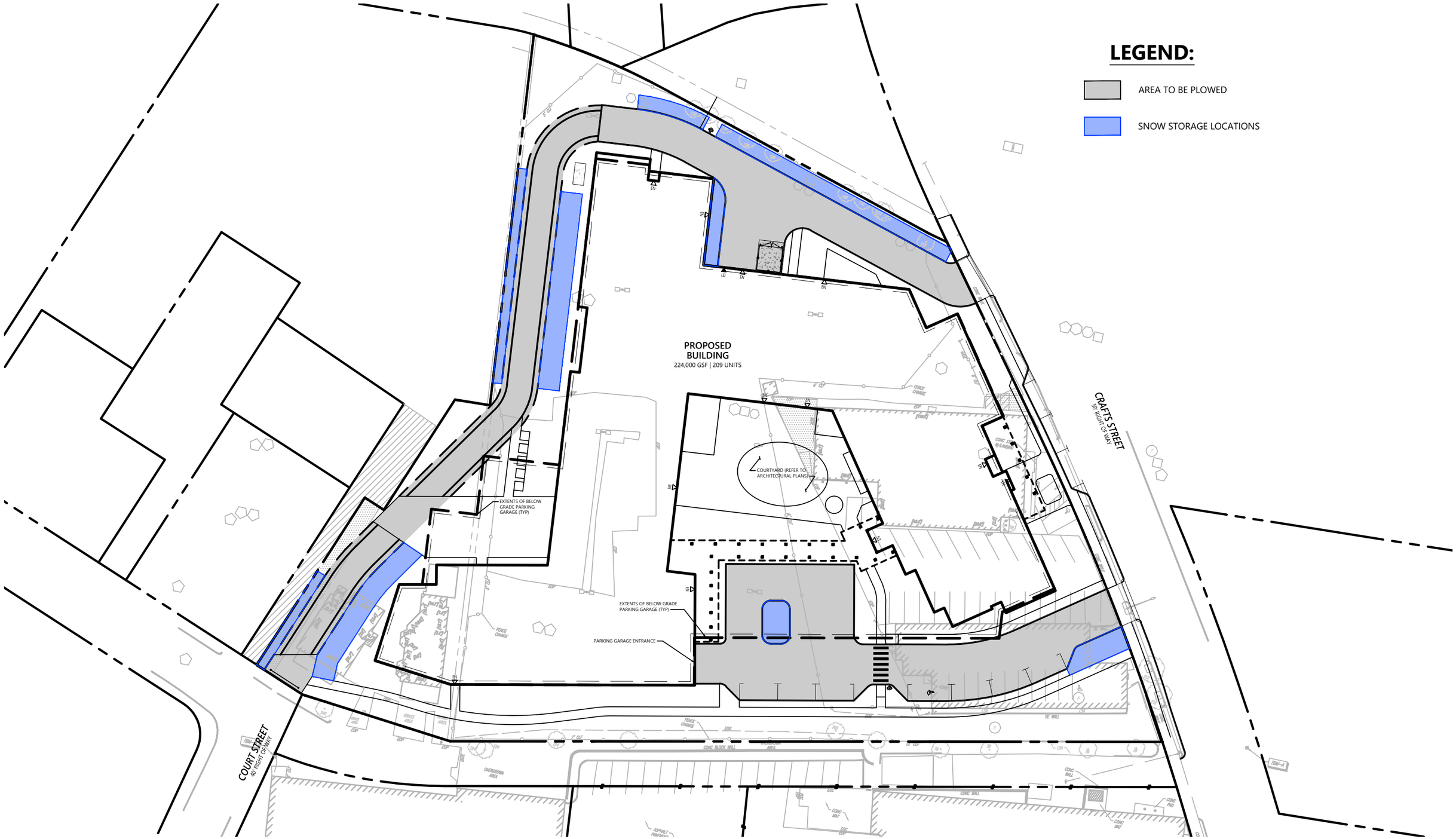


Snow Storage Diagram
Elderly Housing with Services
Crafts Street & Court Street
Newton, MA

Attachment 07

06/14/22

Snow Storage Calculations

Project	Elderly Housing w Services	**Project #**	15548.00
	Crafts St & Court St		
Calculated by	JWK	**Date**	6/14/2020
Checked by		**Date**	

SNOW STORAGE VOLUME SUMMARY

Area to be Plowed:	23,020	s.f.	** Assumes 12" snowfall with 40% compaction factor*
Storage Volume Required:	13,812	c.f.	
Storage Volume Provided:	14,891	c.f.	

SNOW STORAGE VOLUME PROVIDED

STORAGE AREA #1:

Storage Height:	4	ft.	
Storage Width:	8	ft.	
Cross Sectional Area:	16	s.f.	** Assumes 1:1 side slope*
Storage Length:	40	ft.	
Storage Volume 1 Provided:	640	c.f.	

STORAGE AREA #2:

Storage Height:	4	ft.	
Storage Width:	8	ft.	
Cross Sectional Area:	16	s.f.	** Assumes 1:1 side slope*
Storage Length:	190	ft.	
Storage Volume 2 Provided:	3,040	c.f.	

STORAGE AREA #3:

Storage Height:	8	ft.	
Storage Width:	15	ft.	
Cross Sectional Area:	56	s.f.	** Assumes 1:1 side slope*
Storage Length:	24	ft.	

Snow Storage Calculations

Project	Elderly Housing w Services	**Project #**	15548.00
	Crafts St & Court St		
Calculated by	JWK	**Date**	6/14/2020
Checked by		**Date**	

Storage Volume 3 Provided:	**1,350**	c.f.	

STORAGE AREA #4:

Storage Height:	3	ft.	
Storage Width:	5	ft.	
Cross Sectional Area:	**6**	s.f.	** Assumes 1:1 side slope*
Storage Length:	120	ft.	
Storage Volume 3 Provided:	**750**	c.f.	

STORAGE AREA #5:

Storage Height:	6	ft.	
Storage Width:	12	ft.	
Cross Sectional Area:	**36**	s.f.	** Assumes 1:1 side slope*
Storage Length:	110	ft.	
Storage Volume 3 Provided:	**3,960**	c.f.	

STORAGE AREA #6:

Storage Height:	6	ft.	
Storage Width:	12	ft.	
Cross Sectional Area:	**36**	s.f.	** Assumes 1:1 side slope*
Storage Length:	90	ft.	
Storage Volume 3 Provided:	**3,240**	c.f.	

STORAGE AREA #7:

Storage Height:	3	ft.	
Storage Width:	5	ft.	
Cross Sectional Area:	**6**	s.f.	** Assumes 1:1 side slope*

Snow Storage Calculations

Project	Elderly Housing w Services	**Project #**	15548.00
	Crafts St & Court St		
Calculated by	JWK	**Date**	6/14/2020
Checked by		**Date**	

Storage Length:	60	ft.	
Storage Volume 3 Provided:	375	c.f.	

STORAGE AREA #8:

Storage Height:	6	ft.	
Storage Width:	14	ft.	
Cross Sectional Area:	48	s.f.	** Assumes 1:1 side slope*
Storage Length:	32	ft.	
Storage Volume 3 Provided:	1,536	c.f.	

58 CRAFTS STREET

LINCOLN ROAD

CRAFTS STREET
50' RIGHT OF WAY

COURT STREET
40' RIGHT OF WAY

29 CRAFTS STREET

LENGLEN ROAD

MARTY'S FINE WINES
675 WASHINGTON STREET

WHOLE FOODS
647 WASHINGTON STREET

PROPOSED BUILDING
224,000 GSF | 209 UNITS

20' LOADING DOCK

COURTYARD (REFER TO ARCHITECTURAL PLANS)

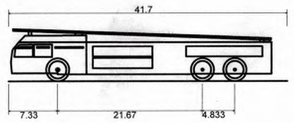
EXTENTS OF BELOW GRADE PARKING GARAGE (TYP)

PARKING GARAGE ENTRANCE

APPROXIMATE LOCATION OF LIMITED/EMERGENCY VEHICLE ACCESS GATE

AMBULANCE OR LARGE PASSENGER VEHICLE QUEUED AT ENTRY COURT

21' TYP



Newton Fire	
Overall Length	41.700ft
Overall Width	9.810ft
Overall Body Height	7.788ft
Min Body Ground Clearance	1.038ft
Track Width	9.810ft
Lock-to-lock time	6.00s
Curb to Curb Turning Radius	37.000ft

LEGEND

EXISTING HYDRANT

PROPOSED HYDRANT

NEWTON FIRE DEPARTMENT
FIRE PREVENTION
SIGNATURE
3/28/22
DATE

Plans have been reviewed and accepted
- ☐ For Building Permit Only
- ☐ For Demolition Only
- ☐ For Fire Alarm Approval Only
- ☑ For Site Review Only
- ☐ For Sprinkler Approval Only
- ☐ Fire Protection To be Designed&Submitted by Installer
- ☐ No Fire Protection Required-Based on Plans Submitted
- ☐ Other

0 15 30 60 Feet

Figure 1
Crafts Street Senior Housing
Newton, MA

Source: **VHB**
Prepared for: **Internal**
Date: **03/28/2022**

vhb