TO:	Brian Brewer, Kimley-Horn and Associates	DATE:	October 14, 2020
FROM:	Keri Pyke, P.E., PTOE Vannesa Methoxha	HSH PROJECT NO.:	2020124.00
SUBJECT:	194 Lowland Street, Holliston, MA Responses to Peer Review Traffic Comments		

Overview

This memorandum, prepared by ***Howard Stein Hudson (HSH),*** responds to comments provided in the peer review letter from Pare Corporation. The peer review was in response to the Traffic Impact Assessment Technical Memorandum completed for the Holliston Planning Board regarding the 194 Lowland Street development in Holliston, MA. The comments are summarized as follows:

1) Overview. Add roadway and intersection descriptions. What are the facility operations?
2) Trip Generation. How were truck trips calculated for LUC 110? Clarify trip generation for car storage facility and trip distribution.
3) Truck Access. What roads will drivers use to/from the Project Site?
4) Truck Turning Movements. What are the operation and safety impacts of turning trucks encroaching on opposing lanes? Show turning movements in/out of Project Site.
5) Additional Comments. Summarize crash data and show site distances at proposed driveway.

Responses

1. Overview

Roadway and intersection descriptions, along the truck route within the Town of Holliston, are summarized in **Table 1** and **Table 2**.

Table 1. Study Area Roadway Descriptions

Roadway Name	Functional Classification	Lane Width	Shoulder Width	Posted Speed Limit
Lowland Street	Local road	Approx. 25-foot two-way lane – no centerline	No shoulder lines	No Posted Signs
Jeffrey Avenue	Local road	Approx. 30-foot two-way lane – no centerline	No shoulder lines	No Posted Signs
Whitney Street	Local road	Approx. 30-foot two-way lane – no centerline	No shoulder lines	25 mph (WB) None (EB)
Washington Street (Route 16)	Rural minor arterial	one 11-foot lane in each direction	2 – 8 ft (both sides, varies)	35 mph (both directions)
Concord Street (Route 126)	Rural minor arterial	one 11.5-foot lane in each direction	2 ft (both sides)	40 mph (NB) 35 mph (SB)
Summer Street (Route 126)	Rural minor arterial	one 12-foot lane in each direction	2 – 5 ft (both sides, varies)	35 mph (SB) 40 mph (NB)

Table 2. Study Area Intersection Descriptions

Roadway Name	Traffic Controls	Approach Lanes	Crosswalks
Jeffrey Avenue at Lowland Street	Unsignalized T intersection Jefferey St approach is stop controlled.	Each approach has one lane.	None
Washington Street at Whitney Street	Unsignalized T intersection Whitney St approach is stop controlled.	Each approach has one lane.	None
Washington Street at Concord Street	Signalized T intersection	*Washington EB* – left-turn only and through lanes *Washington WB* – shared through/right lane *Concord SB* – left-turn only lane and right-turn only lane	On all approaches
Washington Street at Summer Street	Unsignalized T intersection Summer St approach is stop controlled.	Each approach has one lane.	None

Information regarding facility operations was provided by the attorney, Peter Barbieri of Fletcher Tilton, on August 28, 2020, in a letter to the Town of Holliston Planner. Weekday operations will be between 8 a.m. and 5 p.m., while on Saturdays they will operate between 8 a.m. and 12 p.m. The 8-

10 larger nine-car carrier trucks that will deliver vehicles to the site, the two-car carriers, and staff removing vehicles from the Site will all be spread out approximately throughout the nine-hour period. Vans that deliver staff to the Site to pick up vehicles can carry up to eight employees.

2. Trip Generation

Truck trips for Land Use Code 110 were calculated using the Institute of Transportation Engineers (ITE's) *Trip Generation,* 10th Edition. Similar to how ITE produces vehicle trip rates, they also produce truck trip rates for select land uses. Truck trips were based on trip rates measured per 1,000 square feet (sf) of proposed development.

The car storage facility trips were analyzed once more and with new information, have been updated since the submission of the memo. The following assumptions were used. There would be 8-10 of the nine-car carriers, on average, delivering cars to be stored on the site per day. This results in 16-20 trips per day. Cars will be removed from the site with two-car carriers and ADESA personnel. Approximately two of the two-car carriers would operate per hour for a total of 18 carriers a day, resulting in 36 trips a day. These carriers would remove 36 of the 75 cars a day from the Site. The remaining 39 cars would be removed from the Site by ADESA employees. Those trips would entail vans going to and from the site and employees only leaving the site with the cars being transported to the main facility. It is estimated that vans can carry up to 10 employees; however, currently vans are operating with four people on average. Using an estimate of four employees per van, there would be 20 van trips (10 entering, 10 exiting), and 39 employee trips exiting only. With operations only occurring from 8 a.m. – 5 p.m., the peak hour trips were determined by splitting the daily trips across nine hours. A detailed summary of the car storage facility trips is shown in **Table 3**.

Table 3. Trip Generation

Time Period/ Direction		Car Storage Facility[2]			
		Vehicles	2-Car Carriers	9-Car Carriers	Total Trips
Daily	In	10	18	10	38
	Out	49	18	10	77
	Total	59	36	20	115
a.m. Peak Hour	In	1	2	1	4
	Out	5	2	1	8
	Total	6	4	2	12
p.m. Peak Hour	In	1	2	1	4
	Out	5	2	1	8
	Total	6	4	2	12

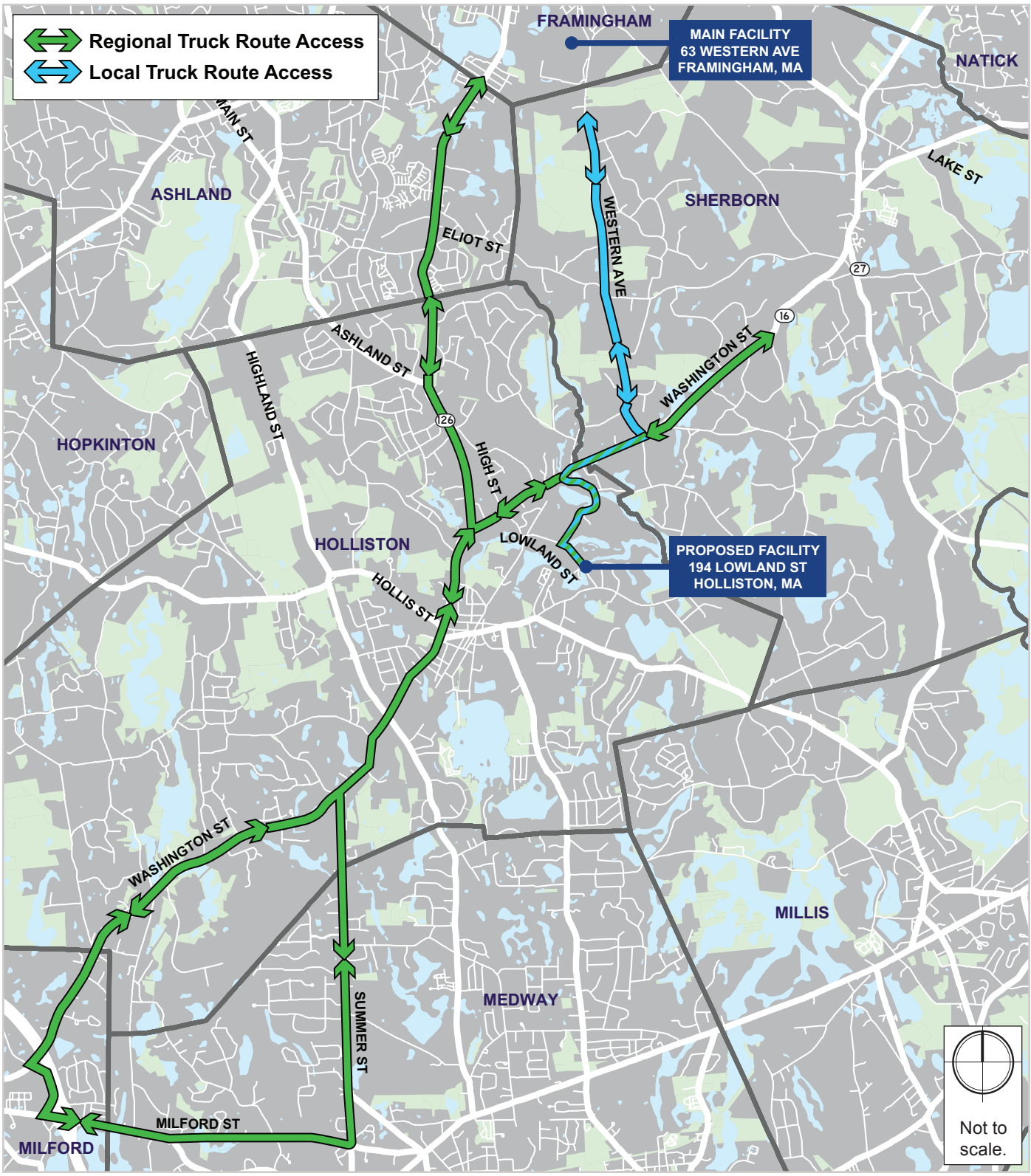
Trip distribution was not mentioned in the original memo because it was not requested by the Town of Holliston Planning Board. However, based on information provided by the Proponent, it is expected that approximately 25% of truck trips will come from Route 16 east of the Project Site and the remaining 75% of truck trips will come from either I-495 east on Route 16 or I-90 south on Route 126 to the Site.

3. Truck Access

At the regional level, trucks delivering vehicles from the west will come from I-495 and will exit onto Medway Road West (Route 109), turning right onto Beaver Street and then right onto East Main Street (Route 109) eastbound in Milford, continuing to Whitney Street. On Whitney Street, they will continue onto Jeffrey Street turning left on Lowland Street to the Site. Trucks could follow the same route in reverse to get back to I-495. Trucks coming from the east of the Project will remain on Route 16. **Figure 1** shows the route map. Note that the route map shows the regional route that large trucks delivering cars to the Site would take (green), as well as the route that ADESA employees and small two-car carrier trucks would take (blue) to go between the Project Site and the main Framingham facility. When coming from I-495, trucks delivering vehicles from the west could also come from I-495 and exit onto Medway Road (Route 109). Traveling east on Milford Street (Route 109), they could reach the intersection with Summer Street (Route 126) where they will turn left. Trucks could then continue north and turn right at the intersection with Washington Street. They would then continue east and turn right at the intersection with Whitney Street. From Whitney Street they would continue onto Jeffery Avenue and turn left at Lowland Street. Trucks will follow the same route in reverse to get back to I-495.

All drivers will be given route maps to follow that show the regional roadway access. Trucks will be directed not to use Fiske Street south of the Project Site, which has nighttime weight limit restrictions.

Figure 1. ***Truck Routes***



4. Truck Turning Movements

Larger nine-car carrier trucks will not be traveling between the Project Site and the Framingham site, they will only be traveling to and from the interstate. ADESA employees and small car carriers will move cars between the Project Site and the Framingham Site.

The truck movements in the downtown area, on Washington Street near Central Street, do not need to be further studied as the lane widths are similar in that area to what is along the rest of Washington Street.

Additional AutoTURN movement diagrams were completed for larger trucks (nine-car carriers) and smaller trucks (two-car carriers) entering and exiting the Proposed Site driveway. There turning movements are shown in **Figure 2** and **Figure 3**.

In regards to truck encroachment, the streets studied within the Town of Holliston are classified by the Massachusetts Department of Transportation (MassDOT) as shown in **Table 4.** MassDOT guidance as to when encroachment by a vehicle is allowed is based on the functional classification of the roadway**.** MassDOT's *Project Development and Design Guide (PDDG)* provides the information shown in **Figure 4** as to when encroachment is allowed based on the classification of the roadways to and from which the vehicle is turning.

Figure 2. ***Lowland Street at Proposed Site - Large Auto Carrier***

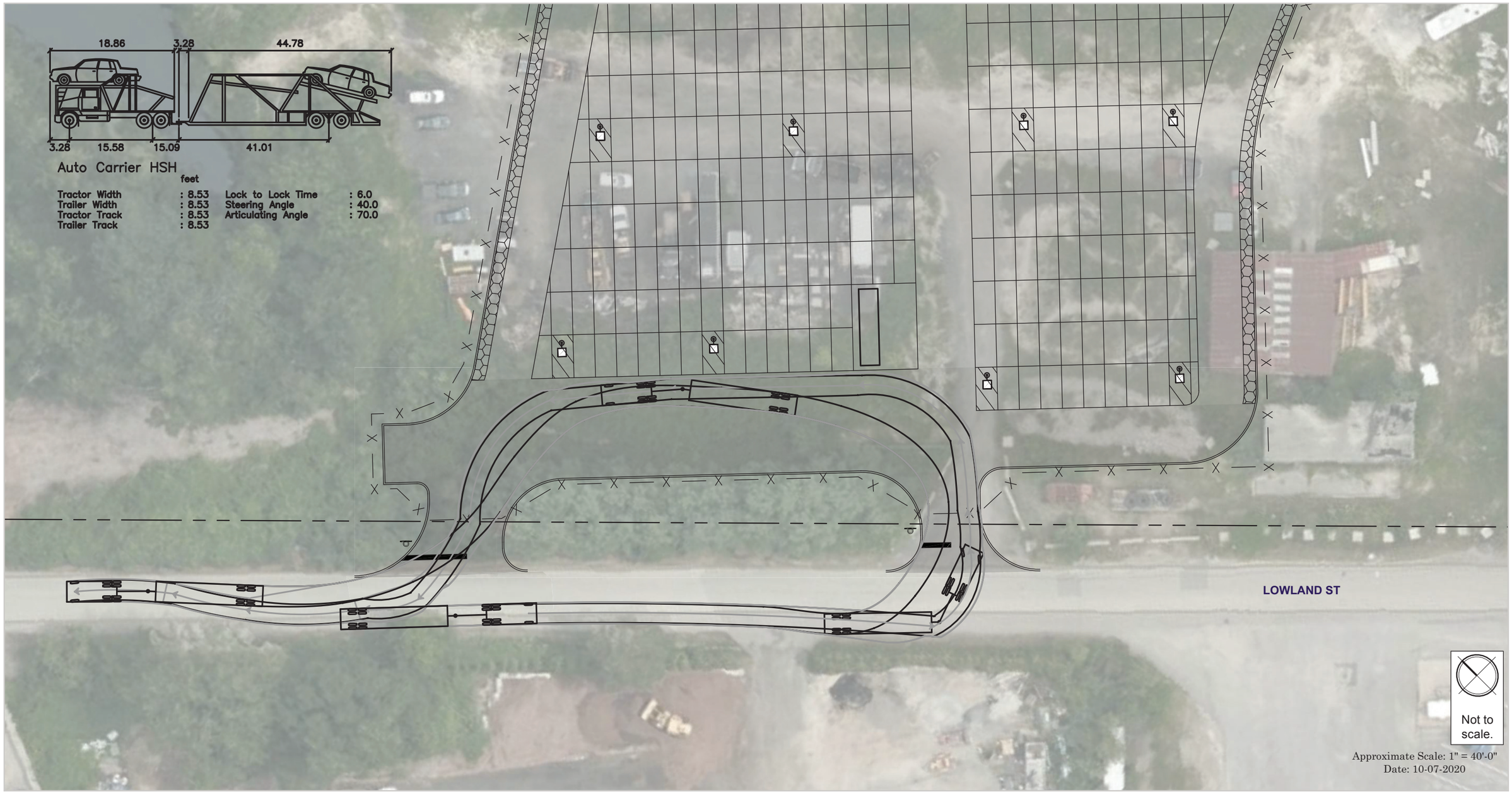


Figure 3. ***Lowland Street at Proposed Site - Small Auto Carrier***

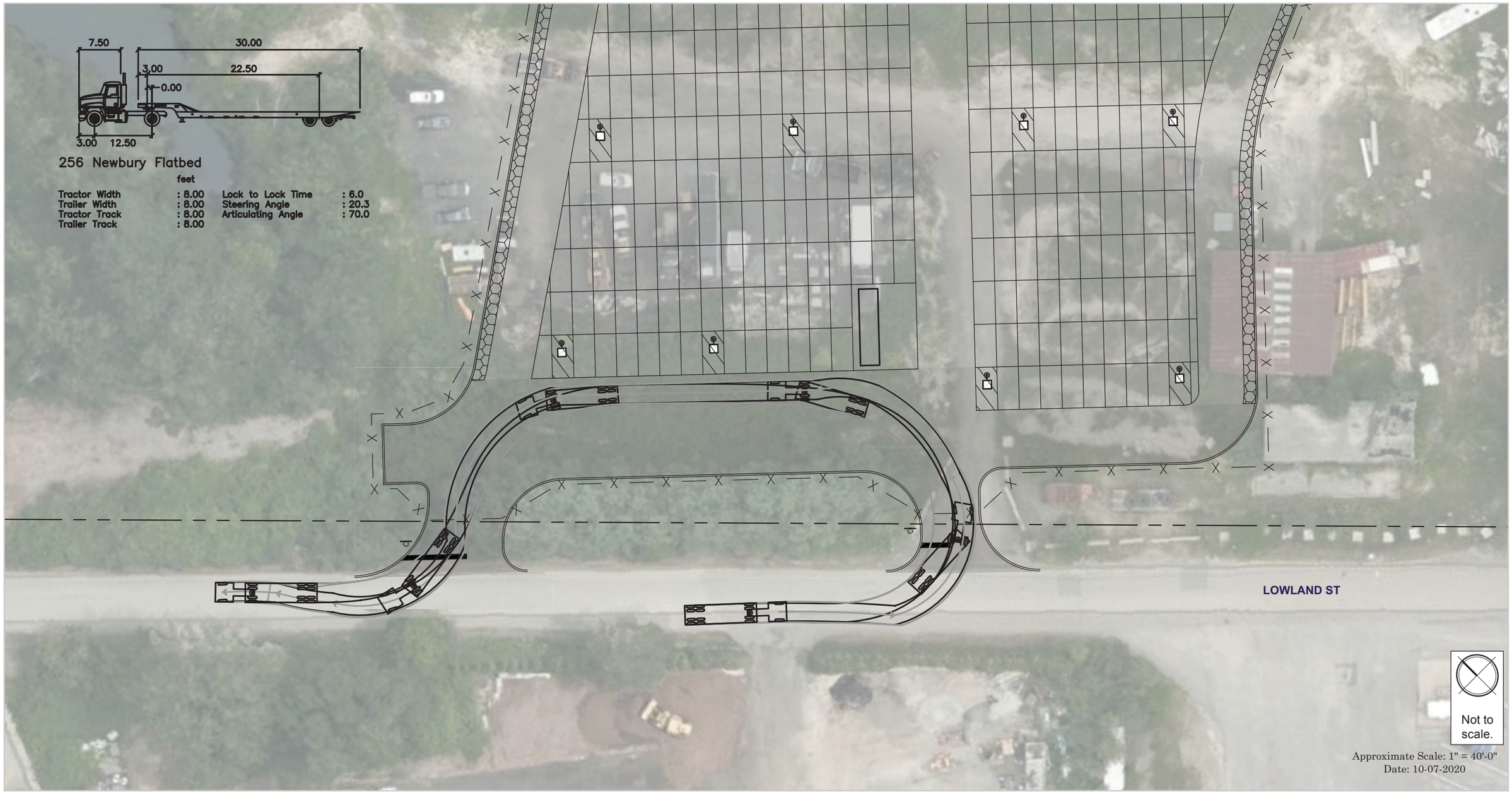
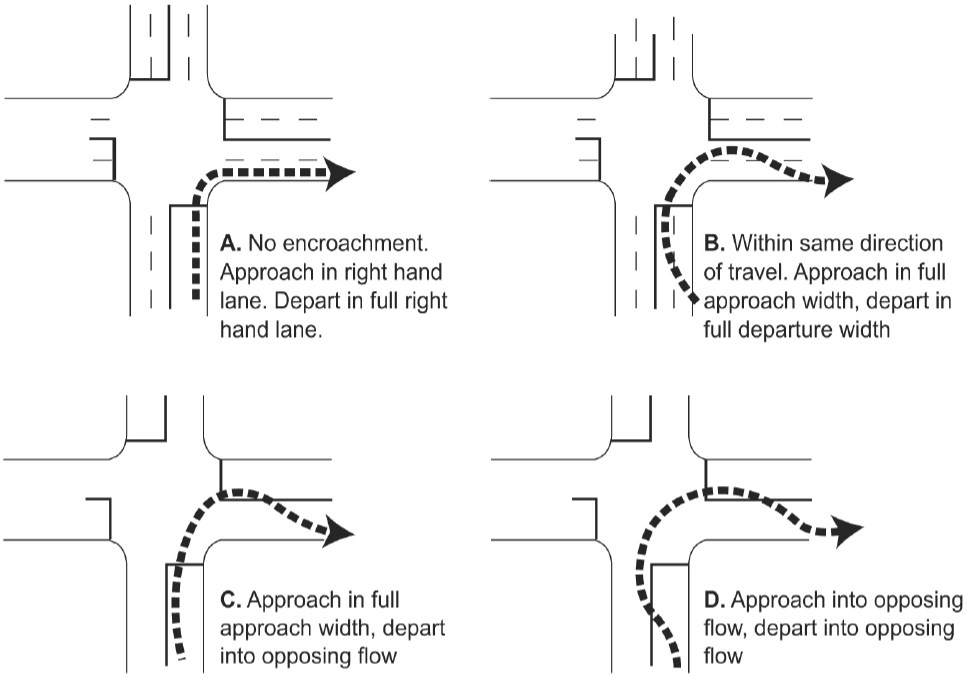


Figure 4. MassDOT PDDG Design Vehicle Encroachment Guidance

Exhibit 6-15
Typical Encroachment by Design Vehicle



From (Approach Street)	To (Departure Street)								
	For Tractor/Trailer (WB 50)			For Single-Unit Truck (SU)			For Passenger Car (P)		
	Arterial	Collector	Local	Arterial	Collector	Local	Arterial	Collector	Local
Arterial (Art)	A	B	C	A	B	C	A	A	A
Collector (Col)	B	B	C	B	B	C	A	A	A
Local (Loc)	B	D	D	C	C	D	A	B	B

A, B, C, D defined in above diagrams.
Note: Cases C and D are generally not desirable at signal controlled intersections because traffic on stopped street has nowhere to go.
Source: Adapted from ITE Arterial Street Design Guidelines.

Table 4. Study Area Roadway Functional Classifications

Roadway Name	Functional Classification
Lowland Street	Local road
Jeffrey Avenue	Local road
Whitney Street	Local road
Washington Street (Route 16)	Rural minor arterial
Concord Street (Route 126)	Rural minor arterial
Summer Street (Route 126)	Rural minor arterial

Based on the projected truck movements and routing for the nine-car carrier, the conditions shown in **Table 5** apply.

Table 5. Turning Encroachment Conditions on Study Area Roadways

From Street (Classification)	To Street (Classification)	Encroachment Condition	Meets Standard?
Washington St EB (rural minor arterial)	Whitney Street SEB (local road)	C	Yes
Whitney St NWB (local road)	Washington St WB (rural minor arterial)	B	Yes
Washington St WB (rural minor arterial)	Whitney St SEB (local road)	C	Yes
Whitney St NWB (local road)	Washington St EB (rural minor arterial)	B	No
Jeffrey Ave SB (local road)	Lowland St EB (local road)	D	Yes
Lowland St WB (local road)	Jeffrey Ave NB (local Road)	D	Yes
Washington St WB (rural minor arterial)	Summer St SB (rural minor arterial)	A	Yes
Summer St NB (rural minor arterial)	Washington St EB (rural minor arterial)	A	No

There are two locations within the Town of Holliston where a heavy vehicle would be required to encroach upon opposing lanes to complete turns: Washington Street at Summer Street and Washington Street at Whitney Street. These are existing conditions; other large trucks, which are not prohibited from using these streets, must make similar maneuvers to complete turns at these intersections. The number of trucks related to the development will not substantially impair this condition, and it should make no impact on the Town's Complete Streets policy.

Large trucks turning across travel lanes at intersections is a usual condition in Massachusetts, where many roadways were former paths that were paved prior to the need to accommodate larger vehicles. These types of movements are likely to occur more frequently if the as-of-right industrial use is developed on the Site because it would generate more trucks than the proposed use.

6. Additional Comments

CRASH DATA SUMMARY

Crash data was collected from the MassDOT IMPACT Crash Portal for the most recent three-year period (2015-2017) for all study area intersections and segments along the truck route within the Town of Holliston. Intersections are summarized in **Table 6** and segments are in **Table 7.**

There were 123 intersection crashes and 165 segment crashes identified along the truck route. Segment crashes may include crashes located at driveways and minor unsignalized intersections. Overall, there were five intersection crashes (4%) and 12 segment related crashes (7%) identified that involved heavy trucks or trailers. Segments experienced many rear-end crashes while intersections primarily experienced angle and rear-end crashes.

Table 6. Crash Data Summary of Intersections

Description/Scenario		Washington Street at							
		Summer St (Rte 126)	Highland St	Green St/ Exchange St/ Central St	Hollis St/ Charles St	Cole Court	Concord St (Rte 126)	High St/ Woodland St	Whitney St
Total Crashes		21	24	24	19	9	16	8	2
Year	2015	6	9	12	6	3	4	1	0
	2016	9	5	8	7	3	3	2	1
	2017	6	10	4	6	3	9	5	1
Severity	Property Damage Only	15	18	22	15	8	13	6	1
	Injury	6	6	2	4	1	3	2	1
	Fatality	0	0	0	0	0	0	0	0
Collision Type	Angle	9	3	12	16	2	10	5	1
	Head-on	0	1	0	0	0	0	0	0
	Rear-to-rear	0	0	0	0	0	0	0	0
	Rear-end	10	18	10	3	6	4	3	0
	Sideswipe, same direction	1	0	0	0	0	0	0	0
	Sideswipe, opposite direction	1	0	0	0	0	0	0	0
	Single vehicle crash	0	2	2	0	1	1	0	1
	Unknown	0	0	0	0	0	1	0	0
Time of Day	Weekday a.m. Peak (7 – 9 a.m.)	5	6	2	2	4	0	0	0
	Weekday p.m. Peak (4 – 6 p.m.)	1	2	6	4	0	3	5	2
	Weekday Off-Peak	11	9	10	8	5	11	2	0
	Saturday (11 a.m. – 2 p.m.)	0	0	4	2	0	1	0	0
	Weekend Off-Peak	4	7	2	3	0	1	1	0
Roadway Surface	Dry	12	21	20	17	6	14	6	2
	Wet	7	3	2	1	2	2	2	0
	Snow	2	0	2	1	1	0	0	0
	Ice	0	0	0	0	0	0	0	0
Light Condition	Daylight	16	20	18	17	9	12	7	2
	Dusk	0	0	0	0	0	1	0	0
	Dark - lighted roadway	5	4	6	2	0	3	1	0
	Dark - roadway not lighted	0	0	0	0	0	0	0	0
Involving Heavy Truck/Trailer		1	2	1	0	1	0	0	0

Table 7. Crash Data Summary of Segments[1]

Description/Scenario		Washington Street between							Whitney St/ Jeffrey Ave
		Summer St to Highland St	Highland St to Central St	Central St to Hollis St	Hollis St to Cole Court	Cole Court to Concord St	Concord St to High St	High St to Whitney St	Washington St to Lowland St
Total Crashes		39	42	10	32	16	13	11	2
Year	2015	17	16	4	8	8	7	2	1
	2016	12	15	3	13	2	3	7	1
	2017	10	11	3	11	6	3	2	0
Severity	Property Damage Only	31	27	7	22	12	10	8	2
	Injury	8	13	1	9	3	3	3	0
	Fatality	0	0	1	0	0	0	0	0
	Not Reported/Unknown	0	2	1	1	1	0	0	0
Collision Type	Angle	5	8	2	5	6	5	2	1
	Head-on	1	0	0	0	0	1	1	0
	Rear-to-rear	1	0	0	1	0	0	0	0
	Rear-end	22	25	5	19	6	5	7	0
	Sideswipe, same direction	2	3	1	2	0	2	0	0
	Sideswipe, opposite direction	1	1	0	0	1	0	0	0
	Single vehicle crash	7	5	2	4	3	0	1	1
	Unknown	0	0	0	1	0	0	0	0
Time of Day	Weekday a.m. Peak (7 – 9 a.m.)	8	4	1	2	0	2	0	1
	Weekday p.m. Peak (4 – 6 p.m.)	7	11	5	8	4	4	2	0
	Weekday Off-Peak	20	25	3	15	9	7	6	1
	Saturday (11 a.m. – 2 p.m.)	0	1	0	0	0	0	1	0
	Weekend Off-Peak	4	1	1	7	3	0	2	0
Roadway Surface	Dry	31	32	8	26	11	12	9	1
	Wet	5	9	2	5	4	1	1	0
	Snow	3	0	0	1	0	0	1	1
	Ice	0	1	0	0	0	0	0	0
	Other	0	0	0	0	1	0	0	0
Light Condition	Daylight	26	32	6	27	12	9	9	2
	Dawn/Dusk	2	2	2	0	2	0	0	0
	Dark - lighted roadway	11	7	2	5	2	4	1	0
	Dark - roadway not lighted	0	0	0	0	0	0	1	0
	Dark – unknown roadway lighting	0	1	0	0	0	0	0	0
Involving Heavy Truck/Trailer		1	3	1	3	0	2	1	1

SIGHT DISTANCE

Sight distances at the proposed driveways were measured using AutoCAD and provided by Kimley-Horn as shown in the **Figure 5**. To the southeast on Lowland Street, the sight distance is at least 700 feet. To the northwest on Lowland Street, the sight distance is approximately 360 feet. The stopping sight distance (SSD) required for a road that is 45 mph is at least 360 feet based on the *Policy on Geometric Design of Highways and Streets* (AASHTO Green Book). There were no posted speed limit signs identified on Lowland Street; however, based on the classification of this road, it is likely not greater than 45 mph. Therefore, the sight distances meet the Green Book requirements.

TRAFFIC CAPACITY

In response to the request for existing traffic capacity analysis, traffic counts were collected at the unsignalized intersection of Washington Street and Whitney Street on Thursday, October 8, 2020, between 7:00 – 9:00 a.m. and 4:00 – 6:00 p.m. Counts were not collected at any other adjacent intersections as a full traffic study was not requested by the Holliston Planning Board.

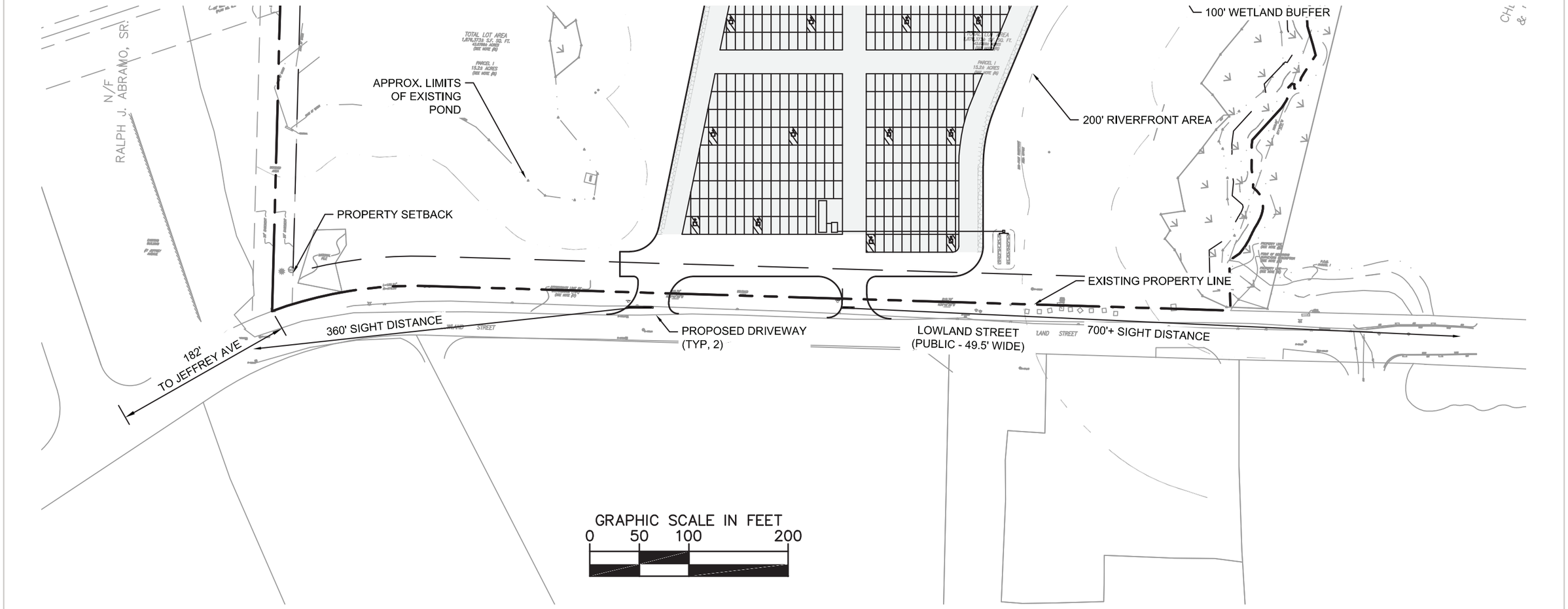
The peak hours at this intersection were identified as 7:00 – 8:00 a.m. and 4:30 – 5:30 p.m. The peak 15 minutes of data collected during the peak hour were isolated to calculate the peak-hour factors (PHFs) for each approach, and the percentage of heavy vehicles was noted for each movement.

Level of service (LOS) at the intersection was calculated using Synchro 11.0, which is based on the traffic operational analysis methodology of the *Highway Capacity Manual* (HCM) 6th Edition. **Table 8** is an excerpt from the HCM that provides LOS criteria for unsignalized intersections.

The volume-to-capacity (v/c) ratio is a measure of congestion at an intersection approach. A v/c ratio of one or greater indicates that the traffic volume on the intersection approach exceeds capacity. The 95th percentile queue length, measured in feet, represents the farthest extent of the vehicle queue (to the last stopped vehicle) upstream from the stop line during 5% of all signal cycles. The 95th percentile queue will not be seen during each cycle. The queue would be this long only 5% of the time and would typically occur during peak hours.

The existing traffic capacity and future capacity that considers the Project trips added to the existing volumes during the a.m. and p.m. peak hours are summarized in **Table 9.** The existing conditions operate LOS D or better during the a.m. and p.m. peak hours. When Project trips are added to the existing conditions, the future operations show no impact with all approaches still operating at LOS D or better. Similar negligible Project impacts are also expected at other intersections along Washington Street due to the small numbers of trips.

Figure 5. ***Proposed Driveway Sight Distance***



Graphic created by Kimley-Horn

Table 8. Level of Service Criteria – Unsignalized Intersections

Level of Service	Average Stopped Delay (seconds/vehicle)
A	≤10
B	>10 and ≤15
C	>15 and ≤25
D	>25 and ≤35
E	>35 and ≤50
F	>50

Table 9. Capacity Analysis Summary

	Existing				Future (w/ Project Trips)			
Approach	LOS	Delay (sec)	V/C ratio	95th % Queue (ft)	LOS	Delay (sec)	V/C ratio	95th % Queue (ft)
a.m. Peak Hour								
Washington Street at Whitney Street	--	--	--	--	--	--	--	--
Whitney St NW left/thru/right	C	21.9	0.35	38	C	22.7	0.38	43
Washington St EB left/thru/right	A	0	0	0	A	0	0	0
Washington St WB left/thru/right	A	9.3	0.04	3	A	9.3	0.05	3
Driveway SE left/thru/right	A	0	0	0	A	0	0	0
p.m. Peak Hour								
Washington Street at Whitney Street	--	--	--	--	--	--	--	--
Whitney St NW left/thru/right	D	25.1	0.33	35	D	25.0	0.36	40
Washington St EB left/thru/right	A	8.6	0	0	A	8.6	0	0
Washington St WB left/thru/right	A	8.4	0.10	8	A	8.4	0.10	8
Driveway SE left/thru/right	C	24.1	0.04	3	C	24.4	0.04	3

SPEED STUDY

HSH does not believe a speed study of Lowland Street is necessary. The crash data show a total of 2 crashes in three years (2015-2017) on Lowland Street.