



September 7, 2016

Margaret Hoffman, AICP  
Planning Coordinator  
Town of Wenham  
138 Main Street  
Wenham, MA 01984

Reference: Wenham Pines, LLC – Wenham Pines  
Peer Review of Transportation Impact & Access Study

Dear Ms. Hoffman:

On behalf of the Town of Wenham, we have reviewed the above referenced Traffic Impact and Access Study (TIAS) and related documents dated July 19, 2016, prepared by Bayside Engineering in support of the application for the proposed Wenham Pines condominiums by Wenham Pines, LLC (“the Applicant”).

Our review focused on the adequacy of the study with regard to industry best practices for analyzing traffic operations, estimating project generated trips and related potential impacts, and providing safe and efficient site circulation.

## **SECTION 1: EXECUTIVE SUMMARY**

### **Project Description**

As indicated in the TIAS, the proposed development consists of 25 condominium units in 12 buildings: 11 new townhouse-style buildings will house 23 market units and one existing building that will house two newly renovated affordable units. The existing north driveway will be closed and a new driveway opposite Fiske Road will be constructed to serve the new condominium units. The existing south driveway will be maintained and continue to serve the single-family home that will house the two affordable units. The description should be updated to include a future layout of the site showing the two separate driveways.

## Existing Conditions

### **Existing Traffic Volumes**

Table 1 should be updated to reflect ATR data that is averaged over the three days. ATR data was recorded for three days (not two days as stated in the TIAS) from May 3<sup>rd</sup> to May 5<sup>th</sup>. The TIAS indicates that the daily volume is 17,950 vehicles per day while the calculated average is 17,963 vehicles per day. The report also indicates that the morning peak is approximated at 1,360 vehicles per hour and the evening peak is approximated at 1,474 vehicles per hour, however, the calculated average in the morning peak hour is 1,359 vehicles and the calculated average in the evening peak hour is 1,473 vehicles. These figures were obtained from the ATR data.

## Probable Impacts of the Project

### **No-Build Traffic Volumes**

The Executive Summary indicates that a one-half (0.5) percent compounded annual growth rate was used to develop future No-Build volumes. This is inconsistent with later narrative and the project volumes in the report. This section should be updated to read “1.0 percent compounded growth rate”.

The study also indicates that the Town of Wenham was contacted and it was indicated that there is one other potential project that has been identified that would need to be included in the No-Build projections (The Maples, a senior living housing project on Main Street). This is inconsistent with later narrative in Section 3, and there is no indication of trips from other developments being added to the No-Build volumes. This section should be updated to give a reason why the use of expected trips from outside developments were not included.

### **Build Traffic Volumes**

The study indicates that the project is expected to generate 192 daily trips, 17 vehicles trips in the morning peak hour, and 19 trips in the evening peak hour. It is recommended to separate the trip generation calculations into two separate uses (23 units and 2 units), as they will be using different access points. See “Site Traffic Generation” section.

## **SECTION 2: EXISTING TRAFFIC CONDITIONS**

### Study Area

The study area in the TIAS dated July 19, 2016 includes the following intersections:

- Main Street and Fiske Road
- Main Street and Existing Site Driveways

Based on the anticipated trip distribution and area travel patterns, as well the low number of expected project trips, the size of the study area as analyzed is adequate.

### Geometrics

The description of the study area roadways and intersections are adequate.

### **Traffic Volumes**

#### Existing Traffic Volumes

The TIAS indicates that the peak hours occur between 7:30 and 8:30 in the morning and 5:00 and 6:00 in the evening. The morning peak hour, according to the ATR data, is 7:45 to 8:45 in the morning, and the evening peak hour is accurate as stated in the report. The TMC data did find the peak hour to be between 7:30 and 8:30 in the morning. The TIAS should simply state the source of the data.

#### Seasonal Adjustment

The report indicates that a seasonal adjustment calculated from MassDOT indicated that volumes in May are slightly higher than average month conditions. Therefore, this report used unadjusted traffic volumes in order to provide a more conservative report, which is acceptable.

#### Table 1

The current table reads that the weekday traffic volume is 17,950 vehicles, with the morning peak hour volume being 1,360 vehicles and the evening peak hour volume being 1,474 vehicles. The table should be updated to be 17,963 vehicles as the weekday traffic volume, 1,359 vehicles during the morning peak hour, and 1,473 vehicles during the evening peak hour, as shown in the ATR data. Additionally, the morning peak hour has a directional distribution of 57.2% NB and the evening peak hour has a directional distribution of 58.2% SB. ATR data should be used for these calculations.

#### Vehicle Speeds

The study should be updated to reflect the current ATR data on Main Street. The narrative currently refers to South Street and Fuller Street, with their respective average and 85<sup>th</sup> percentile speeds. The speeds shown in Table 2 are accurate and reflect the ATR data collected on Main Street.

#### Motor Vehicle Crash Data

The study reviewed crash data from the MassDOT database from the years 2009-2013 and determined that there were zero crashes at any of the study intersections during this time. It also states that the most recent crash at the intersection of Main Street and Fiske Road occurred in April 2007. This data is accurate.

### Public Transportation

The study states that there are no public transportation options that service Main Street in Wenham. This is accurate and this section is sufficient.

### Planned Roadway Improvements

This section accurately states that there are no planned roadway improvements from MassDOT or the Town of Wenham that would impact this project.

## **SECTION 3: 2023 NO-BUILD AND BUILD TRAFFIC CONDITIONS**

### 2023 No-Build Traffic Volumes

The study refers to two methods for predicting No-Build volumes: background growth rate and use of background trips from other developments. The narrative states that both procedures were used, however only the background growth rate was used, as explained below.

#### **Background Traffic Growth**

The study references that the Metropolitan Area Planning Council (MAPC) was contacted and provided a growth rate of 0.30 percent per year. To be conservative, the study uses a 1.0% per year growth rate, which is acceptable. This is inconsistent with the narrative in the Executive Summary, which states that a 0.5% growth rate was used to find No-Build volumes. If a 1.0% growth rate is used, the 0.5% growth rate should be omitted.

#### **Specific Development by Others**

This section should be updated to reflect the second paragraph in the “No-Build Traffic Volumes” section in the Executive Summary, as explained in earlier comments.

#### **No-Build Condition Traffic Volumes**

In Figure 3, it appears that the southbound-through volume in the morning peak hour use a 0.45% growth rate instead of a 1.0% growth rate. The volume should be 851 vehicles at the Main Street/North Driveway intersection, 852 vehicles at the Main Street/Fiske Road intersection, and 855 vehicles at the Main Street/South Driveway intersection. The no-build condition traffic volumes should be reviewed for consistency with the growth rate and corrected.

Also in Figure 3, the northbound-through movement at the Main Street/South Driveway intersection should read “894” instead of “984”.

## Future 2023 Build Conditions

### **Site Traffic Generation**

The study references the fact that there will be two driveways for the project: one that will serve the 11 new townhouse-style buildings and one that will serve the existing building that will house two affordable units. The trip generation calculations assume that all trips will be entering and exiting the same location. The calculations should be updated to include two separate trip generations: one for the new driveway that will serve 23 units and one for the driveway that will serve two units.

Based on guidelines published by the Institute of Transportation Engineers (ITE) in the *Trip Generation Manual, 9<sup>th</sup> Edition*, the proposed project would then be estimated to generate an additional 200 vehicle trips on an average weekday, including 18 trips during the morning peak hour and 20 trips during the evening peak hour when separating the trip generation into two driveways.

Additionally, a mode split section should be included. Mode split from Census Tract 2161 in Essex County should be shown and provided in the Appendix. The Census Tract data has been attached to this report. The preliminary trip generation calculations should then be updated to reflect this mode split. For the purpose of this study, the only reduction in vehicle trips should be from the “Work at Home” percentage.

### **Trip Distribution**

The TIAS should describe how the trip distribution was calculated, as well as provide the raw data to determine the trip distribution. The report should be updated to include a figure of expected project trips and their distribution onto the traffic network.

### **Future Traffic Volumes – Build Condition**

The future traffic volumes for the Build Condition should be updated to reflect the changes to No-Build Volumes, the Site Traffic Generation, and Mode Split.

## **SECTION 4: CAPACITY ANALYSIS**

### Analysis Results

All analysis results should be updated based on the updates to volumes and Peak Hour Factors (PHF) mentioned for Existing, No-Build, and Build volumes. Additionally, the PHF for the Existing Conditions should be updated to reflect those found by PDI in the field. For both future No-Build and Build conditions, the PHF should be 0.92.

## **Main Street and Fiske Road**

The first paragraph reads that this section is signalized, but it should read that it is unsignalized. The summary should also be updated to combine both paragraphs that discuss this intersection. The overall intersection delay should be shown in the summary table.

Additionally, the summary in the second paragraph discusses a projected volume to capacity (v/c) ratio as an indicator of there being adequate capacity to accommodate the anticipated traffic volumes. This should be updated to say that the delay indicates a satisfactory level of service and the delay is based on the size of the headways on Main Street and the left turn gaps available for vehicles exiting Fiske Road.

### Sight Distance

Sight distance measurements were carried out at the intersection of the proposed Pine Hill Road and Main Street. This includes stopping sight distance (SSD) as well as intersection sight distance (ISD). The calculated measured stopping sight distance in both the northbound and southbound directions on Main Street meet the AASHTO requirements. The intersection sight distance for vehicles making a left-turn movement onto Main Street meets the AASHTO requirements, but the sight distance for vehicles making a right-turn do not. However, according to the AASHTO manual, as long as the ISD is greater than the SSD, then there is enough room for an oncoming vehicle on the major street to stop safely for a vehicle turning off of the minor street. In this case, the measured ISD of 315 feet for right-turning vehicles is greater than the required minimum SSD. Therefore, both the ISD and the SSD are acceptable at the proposed intersection of Pine Hill Road and Main Street.

The report should be updated to include sight distance at the intersection of the South Driveway and Main Street due to the fact that it will be used to serve the two affordable units within the existing building.

## **SECTION 5: RECOMMENDATIONS AND CONCLUSIONS**

### Recommendations

The recommendations should be updated to reflect the findings of gap acceptance as a factor instead of volume-to-capacity (v/c).

As mentioned above, the recommendations section should reiterate that for the left-turns coming out of the minor roads, the delay indicates a satisfactory level of service and the delay is based on the size of the headways on Main Street and the left turn gaps available for vehicles exiting Fiske Road rather than using the volume to capacity (v/c) ratio as an indicator of there being adequate capacity.

### Conclusion

The conclusion should be updated to reflect all changes made throughout the report.

# APPENDIX



S0801

COMMUTING CHARACTERISTICS BY SEX

2010-2014 American Community Survey 5-Year Estimates

Supporting documentation on code lists, subject definitions, data accuracy, and statistical testing can be found on the American Community Survey website in the Data and Documentation section.

Sample size and data quality measures (including coverage rates, allocation rates, and response rates) can be found on the American Community Survey website in the Methodology section.

Although the American Community Survey (ACS) produces population, demographic and housing unit estimates, it is the Census Bureau's Population Estimates Program that produces and disseminates the official estimates of the population for the nation, states, counties, cities and towns and estimates of housing units for states and counties.

Subject	Census Tract 2161, Essex County, Massachusetts				
	Total		Male		Female
	Estimate	Margin of Error	Estimate	Margin of Error	Estimate
Workers 16 years and over	2,433	+/-155	1,155	+/-115	1,278
<b>MEANS OF TRANSPORTATION TO WORK</b>					
Car, truck, or van	63.7%	+/-6.1	62.7%	+/-8.3	64.6%
Drove alone	56.0%	+/-6.2	56.6%	+/-8.3	55.5%
Carpooled	7.7%	+/-2.9	6.1%	+/-3.3	9.2%
In 2-person carpool	5.1%	+/-2.7	4.7%	+/-3.3	5.5%
In 3-person carpool	0.3%	+/-0.5	0.7%	+/-1.0	0.0%
In 4-or-more person carpool	2.3%	+/-1.5	0.7%	+/-1.3	3.7%
Workers per car, truck, or van	1.08	+/-0.03	1.06	+/-0.03	1.09
Public transportation (excluding taxicab)	3.7%	+/-2.4	5.5%	+/-3.6	2.1%
Walked	19.9%	+/-5.9	17.9%	+/-7.2	21.6%
Bicycle	0.4%	+/-0.5	0.0%	+/-3.0	0.7%
Taxicab, motorcycle, or other means	0.8%	+/-0.9	1.6%	+/-1.9	0.0%
Worked at home	11.5%	+/-3.8	12.2%	+/-5.7	11.0%
<b>PLACE OF WORK</b>					
Worked in state of residence	99.0%	+/-1.0	99.0%	+/-1.4	98.9%
Worked in county of residence	71.8%	+/-4.5	65.3%	+/-6.7	77.7%
Worked outside county of residence	27.2%	+/-4.6	33.8%	+/-6.8	21.2%
Worked outside state of residence	1.0%	+/-1.0	1.0%	+/-1.4	1.1%
<b>Living in a place</b>					
Living in a place	0.0%	+/-1.4	0.0%	+/-3.0	0.0%
Worked in place of residence	0.0%	+/-1.4	0.0%	+/-3.0	0.0%
Worked outside place of residence	0.0%	+/-1.4	0.0%	+/-3.0	0.0%
Not living in a place	100.0%	+/-1.4	100.0%	+/-3.0	100.0%
<b>Living in 12 selected states</b>					
Living in 12 selected states	100.0%	+/-1.4	100.0%	+/-3.0	100.0%
Worked in minor civil division of residence	31.3%	+/-6.1	28.6%	+/-7.2	33.7%
Worked outside minor civil division of residence	68.7%	+/-6.1	71.4%	+/-7.2	66.3%
Not living in 12 selected states	0.0%	+/-1.4	0.0%	+/-3.0	0.0%
Workers 16 years and over who did not work at home	2,152	+/-166	1,014	+/-127	1,138
<b>TIME LEAVING HOME TO GO TO WORK</b>					
12:00 a.m. to 4:59 a.m.	1.2%	+/-1.1	2.6%	+/-2.4	0.0%
5:00 a.m. to 5:29 a.m.	2.4%	+/-2.4	1.6%	+/-1.8	3.1%

Subject	Census Tract 2161, Essex County, Massachusetts				
	Total		Male		Female
	Estimate	Margin of Error	Estimate	Margin of Error	Estimate
5:30 a.m. to 5:59 a.m.	1.9%	+/-1.6	1.7%	+/-1.9	2.1%
6:00 a.m. to 6:29 a.m.	6.3%	+/-3.4	10.2%	+/-6.7	2.9%
6:30 a.m. to 6:59 a.m.	8.1%	+/-3.4	7.3%	+/-3.7	8.8%
7:00 a.m. to 7:29 a.m.	14.1%	+/-4.9	12.8%	+/-5.3	15.2%
7:30 a.m. to 7:59 a.m.	9.6%	+/-3.5	10.1%	+/-5.7	9.1%
8:00 a.m. to 8:29 a.m.	11.4%	+/-4.0	17.2%	+/-7.5	6.2%
8:30 a.m. to 8:59 a.m.	6.5%	+/-2.8	5.7%	+/-3.8	7.2%
9:00 a.m. to 11:59 p.m.	38.6%	+/-6.2	31.0%	+/-7.9	45.3%
<b>TRAVEL TIME TO WORK</b>					
Less than 10 minutes	27.8%	+/-5.5	24.2%	+/-6.7	31.0%
10 to 14 minutes	12.9%	+/-3.9	12.9%	+/-6.2	12.9%
15 to 19 minutes	11.7%	+/-3.9	6.1%	+/-4.0	16.6%
20 to 24 minutes	9.3%	+/-3.4	11.9%	+/-6.3	7.0%
25 to 29 minutes	2.5%	+/-1.5	2.4%	+/-2.2	2.5%
30 to 34 minutes	9.7%	+/-4.3	8.8%	+/-5.0	10.5%
35 to 44 minutes	4.3%	+/-2.5	6.1%	+/-4.5	2.6%
45 to 59 minutes	11.3%	+/-5.0	12.6%	+/-6.0	10.1%
60 or more minutes	10.5%	+/-3.9	15.0%	+/-6.3	6.6%
Mean travel time to work (minutes)	24.2	+/-2.9	28.2	+/-4.3	20.6
<b>VEHICLES AVAILABLE</b>					
Workers 16 years and over in households	1,630	+/-135	865	+/-87	765
No vehicle available	2.0%	+/-2.2	2.5%	+/-3.8	1.4%
1 vehicle available	10.7%	+/-4.4	3.9%	+/-4.0	18.4%
2 vehicles available	51.2%	+/-8.4	52.5%	+/-9.5	49.8%
3 or more vehicles available	36.0%	+/-8.6	41.0%	+/-9.7	30.3%
<b>PERCENT IMPUTED</b>					
Means of transportation to work	13.3%	(X)	(X)	(X)	(X)
Private vehicle occupancy	13.4%	(X)	(X)	(X)	(X)
Place of work	16.1%	(X)	(X)	(X)	(X)
Time leaving home to go to work	21.4%	(X)	(X)	(X)	(X)
Travel time to work	17.6%	(X)	(X)	(X)	(X)
Vehicles available	0.0%	(X)	(X)	(X)	(X)

Subject	Census Tract 2161, Essex County, Massachusetts
	Female
	Margin of Error
Workers 16 years and over	+/-151
<b>MEANS OF TRANSPORTATION TO WORK</b>	
Car, truck, or van	+/-7.2
Drove alone	+/-7.6
Carpooled	+/-3.9
In 2-person carpool	+/-3.7
In 3-person carpool	+/-2.7
In 4-or-more person carpool	+/-2.6
Workers per car, truck, or van	+/-0.04
Public transportation (excluding taxicab)	+/-2.0
Walked	+/-7.1
Bicycle	+/-1.0
Taxicab, motorcycle, or other means	+/-2.7
Worked at home	+/-4.2
<b>PLACE OF WORK</b>	
Worked in state of residence	+/-1.5
Worked in county of residence	+/-7.0
Worked outside county of residence	+/-7.1
Worked outside state of residence	+/-1.5
<b>Living in a place</b>	
Living in a place	+/-2.7
Worked in place of residence	+/-2.7
Worked outside place of residence	+/-2.7
Not living in a place	+/-2.7
<b>Living in 12 selected states</b>	
Living in 12 selected states	+/-2.7
Worked in minor civil division of residence	+/-7.2
Worked outside minor civil division of residence	+/-7.2
Not living in 12 selected states	+/-2.7
<b>Workers 16 years and over who did not work at home</b>	
Workers 16 years and over who did not work at home	+/-155
<b>TIME LEAVING HOME TO GO TO WORK</b>	
12:00 a.m. to 4:59 a.m.	+/-3.0
5:00 a.m. to 5:29 a.m.	+/-4.1
5:30 a.m. to 5:59 a.m.	+/-2.4
6:00 a.m. to 6:29 a.m.	+/-2.8
6:30 a.m. to 6:59 a.m.	+/-5.1
7:00 a.m. to 7:29 a.m.	+/-6.3
7:30 a.m. to 7:59 a.m.	+/-5.0
8:00 a.m. to 8:29 a.m.	+/-3.5
8:30 a.m. to 8:59 a.m.	+/-4.4
9:00 a.m. to 11:59 p.m.	+/-7.9
<b>TRAVEL TIME TO WORK</b>	
Less than 10 minutes	+/-8.4
10 to 14 minutes	+/-5.4
15 to 19 minutes	+/-6.3
20 to 24 minutes	+/-4.1
25 to 29 minutes	+/-2.4
30 to 34 minutes	+/-6.7
35 to 44 minutes	+/-2.3
45 to 59 minutes	+/-5.6
60 or more minutes	+/-3.5
Mean travel time to work (minutes)	+/-2.8

Subject	Census Tract 2161, Essex County, Massachusetts
	Female
	Margin of Error
VEHICLES AVAILABLE	
Workers 16 years and over in households	+/-88
No vehicle available	+/-2.1
1 vehicle available	+/-8.0
2 vehicles available	+/-9.9
3 or more vehicles available	+/-8.8
PERCENT IMPUTED	
Means of transportation to work	(X)
Private vehicle occupancy	(X)
Place of work	(X)
Time leaving home to go to work	(X)
Travel time to work	(X)
Vehicles available	(X)

Data are based on a sample and are subject to sampling variability. The degree of uncertainty for an estimate arising from sampling variability is represented through the use of a margin of error. The value shown here is the 90 percent margin of error. The margin of error can be interpreted roughly as providing a 90 percent probability that the interval defined by the estimate minus the margin of error and the estimate plus the margin of error (the lower and upper confidence bounds) contains the true value. In addition to sampling variability, the ACS estimates are subject to nonsampling error (for a discussion of nonsampling variability, see Accuracy of the Data). The effect of nonsampling error is not represented in these tables.

The 12 selected states are Connecticut, Maine, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Wisconsin.

Workers include members of the Armed Forces and civilians who were at work last week.

While the 2010-2014 American Community Survey (ACS) data generally reflect the February 2013 Office of Management and Budget (OMB) definitions of metropolitan and micropolitan statistical areas; in certain instances the names, codes, and boundaries of the principal cities shown in ACS tables may differ from the OMB definitions due to differences in the effective dates of the geographic entities.

Estimates of urban and rural population, housing units, and characteristics reflect boundaries of urban areas defined based on Census 2010 data. As a result, data for urban and rural areas from the ACS do not necessarily reflect the results of ongoing urbanization.

Source: U.S. Census Bureau, 2010-2014 American Community Survey 5-Year Estimates

#### Explanation of Symbols:

1. An '\*\*\*' entry in the margin of error column indicates that either no sample observations or too few sample observations were available to compute a standard error and thus the margin of error. A statistical test is not appropriate.
2. An '-' entry in the estimate column indicates that either no sample observations or too few sample observations were available to compute an estimate, or a ratio of medians cannot be calculated because one or both of the median estimates falls in the lowest interval or upper interval of an open-ended distribution.
3. An '-' following a median estimate means the median falls in the lowest interval of an open-ended distribution.
4. An '+' following a median estimate means the median falls in the upper interval of an open-ended distribution.
5. An '\*\*\*\*' entry in the margin of error column indicates that the median falls in the lowest interval or upper interval of an open-ended distribution. A statistical test is not appropriate.
6. An '\*\*\*\*\*' entry in the margin of error column indicates that the estimate is controlled. A statistical test for sampling variability is not appropriate.
7. An 'N' entry in the estimate and margin of error columns indicates that data for this geographic area cannot be displayed because the number of sample cases is too small.
8. An '(X)' means that the estimate is not applicable or not available.