



## Memorandum

To: Theonie J. Alicandro, Esq.  
COO & General Counsel  
Drew Company, Inc.

Date: July 31, 2018  
Revised January 16, 2019

Project #: 14287.00

From: Kathleen Keen, PE  
David Black

Re: Mixed-Use Development  
Scituate, Massachusetts

On behalf of the Drew Company (the "Client"), VHB has conducted a traffic impact and access study for a proposed mixed-use development (the "Project") located on a portion of the existing Massachusetts Bay Transportation Authority (MBTA) Greenbush Station parking lot east of Old Driftway and north of New Driftway in Scituate, Massachusetts (the "Site"). The location of the Project Site is shown in Figure 1. The new development will comprise approximately 10,580 square feet (sf) of retail/commercial uses and 78 residential units, all supported by approximately 157 parking spaces. In addition, a total of 240 parking spaces will be maintained for use by the MBTA, of which 196 parking spaces will be on the development Site and 44 parking spaces will be on Town-owned land. The existing MBTA parking lot to the west of New Driftway will remain unchanged. This study examines existing and future traffic conditions, both with and without the Project.

### Summary of Findings

The proposed Project is expected to result in a total of 144 new vehicle trips (84 entering/ 60 exiting) during the weekday morning peak hour and a total of 80 new vehicle trips (40 entering/40 exiting) during the weekday evening peak hour. The proposed Project is expected to result in a total of 92 new vehicle trips (52 entering/40 exiting) trips during the Saturday midday peak hour.

The Project is anticipated to have minimal impacts on roadways and intersections within the study area. However, the Proponent has proposed the implementation of the TDM program to further minimize the generation of new vehicle trips. Finally, sightlines at all site driveways satisfy appropriate design guidelines.

### 1.0 Study Methodology

The traffic assessment includes the following components:

- **Existing Conditions** – Assessment of existing traffic conditions within the project area including an inventory of existing roadway geometry; observations of traffic flow, including daily and peak period traffic counts; a review of vehicular crash data; and a review of existing public transportation.
- **Future Conditions** – Development of a framework for evaluating the transportation impacts of the proposed project. Specific travel demand forecasts for the Project were assessed along with future traffic demands on the study area roadways that will occur independent of the proposed development. The year 2025, a seven-year time horizon, was adopted as the design year for analysis for comparing future No-Build conditions (without the Project) and Build conditions (with the Project).
- **Traffic Analysis** – Traffic level-of-service (LOS) analyses based on roadway demands and capacities to quantify traffic operations under Existing, No-Build, and Build conditions. This analysis was the basis for determining potential project impacts.

- **Sight Distance Analysis** – Evaluation of sight distances at Project driveways to confirm their compliance with American Association of State Highway and Transportation Officials (AASHTO) guidelines.
- **Mitigation** – Identification of improvements and/or mitigation necessary to address potential adverse impacts of the Project identified in the study.

## 2.0 Site Location and Proposed Development

The Site is located on the northeast corner of the intersection of New Driftway and Old Driftway in Scituate Massachusetts. Currently, the Site is an underutilized parking lot for the MBTA Greenbush Station. The existing site plan is presented in Figure 2. As shown in Figure 2, access to the Site is currently provided by two full-access driveways along Old Driftway and an entrance-only driveway along New Driftway. In addition, full access is available through a privately-owned parcel occupied by Celtic Paws.

The proposed site plan and parking plan for the Project are presented in Figures 3a and 3b, respectively. As shown in the proposed site plan, the two full-access driveways along Old Driftway will remain and a third exit-only driveway from the residential parking will be added approximately mid-way between the two existing driveways. The entrance-only driveway along New Driftway will also remain, but access between the Site and the privately-owned parcel occupied by Celtic Paws will be closed. A new exit-only driveway will be added along New Driftway to the west of the existing entrance-only driveway.

The new development will comprise approximately 10,580 square feet (sf) of retail/commercial uses and 78 residential units, all supported by approximately 157 parking spaces. The Project program and allocation of parking spaces by use is summarized in Table 1. A total of 240 parking spaces will be maintained for use by the MBTA, of which 196 parking spaces will be on the development Site and 44 parking spaces will be on Town owned land. The existing MBTA parking lot to the west of New Driftway will also remain unchanged.

**Table 1 Project Program Summary**

Use	Size	Parking Spaces
Residential	78 units	106
Retail	6,571 sf	34
Commercial	2,012 sf	7
Coffee Shop	2,010 sf	10
Sub Total		157
MBTA <sup>1</sup>		240
<b>Total</b>		<b>397</b>

<sup>1</sup> 196 parking spaces on the development Site and 44 parking spaces on Town-owned land.

The proposed site plan Under the proposed development, the two full-access driveways along Old Driftway will remain and a third exit-only driveway from the residential parking will be added approximately mid-way between the two existing driveways. The entrance-only driveway along New Driftway will also remain, but access between the Site and the privately-owned parcel occupied by Celtic Paws will be closed. A new exit-only driveway will be added along New Driftway to the west of the existing entrance-only driveway.

### 3.0 Existing Conditions

The following sections provide a description of the existing transportation conditions within the study area including roadway geometry, traffic volumes, crash history, and public transportation.

#### 3.1 Study Area

Based on an understanding of the area roadway network, existing traffic operations, and the expected transportation characteristics of the Project, the study area was defined to include the following intersections and their approach roadways, as shown in Figure 4:

1. Scituate Rotary, with approaches from Chief Justice Cushing Highway (Route 3A), Country Way, New Driftway, and Cornet Stenson Road (Route 123)
2. Cornet Stenson Road (Route 123) at Old Oaken Bucket Road/Chief Justice Cushing Highway (Route 3A)
3. New Driftway at Old Driftway
4. New Driftway at Site driveway west/commercial driveway
5. New Driftway at Site driveway east
6. Old Driftway at MBTA driveway south/Site driveway south
7. Old Driftway at MBTA driveway north/Site driveway north
8. Old Driftway at Stockbridge Road
9. Country Way at Stockbridge Road
10. Old Driftway at Site driveway center (*future intersection*)
11. New Driftway at Site driveway west (*future intersection*)

A figure presenting the study area intersection lane geometry and traffic control is included in the Attachments to this memorandum.

#### 3.2 Roadway Geometry

Descriptions of the study area roadways are provided below, including descriptions of the existing lane configurations, the roadway jurisdictions in this area, and existing pedestrian and bicycle infrastructure.

New Driftway is classified as an urban collector and is under the jurisdiction of the Town of Scituate. New Driftway runs in the east-west direction and provides one travel lane in each direction in the vicinity of the Site. Sidewalks are provided along the northerly side of the road and along portions of the southerly side of the road. On-street parking is prohibited in the vicinity of the Site. The posted speed limit is 45 miles-per-hour (mph) in the vicinity of the Site. Land use along New Driftway consists primarily of retail and commercial uses.

Old Driftway is classified as an urban collector from New Driftway to the MBTA driveway south/Site driveway south and as a local roadway from the MBTA driveway south/Site driveway south to Stockbridge Road and is under the jurisdiction of the Town of Scituate. Old Driftway runs in the north-south direction and provides one travel lane in each direction. Sidewalks are provided on both sides of the street, and parking is prohibited. There is no posted speed limit. Land use consists primarily of parking for the MBTA Greenbush Station and industrial uses.

### 3.3 Traffic Volumes

To assess the existing operational conditions at the study area, a review of existing traffic volumes in the immediate vicinity of the Site was gathered. VHB conducted 24-hour roadway counts using automatic traffic recorders (ATR) in June 2018, while schools were still in session, along New Driftway and Old Driftway. Table 2 summarizes the existing traffic volumes and the count data is included in the Attachments to this memorandum.

**Table 2 Existing Traffic Volume Summary**

Location	Weekday Daily	Weekday Morning Peak Hour			Weekday Evening Peak Hour			Saturday Daily	Saturday Midday Peak Hour		
	Vol (vpd) <sup>1</sup>	Vol (vph) <sup>2</sup>	K Factor <sup>3</sup>	Dir. Dist. <sup>4</sup>	Vol (vph)	K Factor	Dir. Dist.	Vol (vpd)	Vol (vph)	K Factor	Dir. Dist.
New Driftway east of Site driveway east	11,400	725	6.4%	54% EB	875	7.7%	58% EB	13,500	1,145	8.5%	53% EB
Old Driftway between Site driveway north and Site driveway south	2,300	175	7.7%	51% SB	200	8.9%	65% SB	2,100	220	10.5%	53% SB

Source: Automatic Traffic Recorder (ATR) counts conducted by VHB in June 2018.

- <sup>1</sup> Daily traffic expressed in vehicles per day.
- <sup>2</sup> Peak hour volumes expressed in vehicles per hour.
- <sup>3</sup> Percent of daily traffic, which occurs during the peak hour.
- <sup>4</sup> Directional distribution of peak period traffic.

As shown in Table 2, during a typical weekday, New Driftway carries approximately 11,400 vehicles per day with 725 vehicles during the weekday morning peak hour and 875 vehicles during the weekday evening peak hour. During a typical Saturday, New Driftway carries approximately 13,500 vehicles per day with 1,145 vehicles during the Saturday midday peak hour. New Driftway traffic is heavier in the eastbound direction during all peak hours. During a typical weekday, Old Driftway carries approximately 2,300 vehicles per day with 175 vehicles during the weekday morning peak hour and 200 vehicles during the weekday evening peak hour. During a typical Saturday, Old Driftway carries approximately 2,100 vehicles per day with 220 vehicles during the Saturday midday peak hour. Old Driftway traffic is heavier in the southbound direction during all peak hours.

In addition, peak hour turning movement counts (TMCs) were conducted at the study area intersections in June 2018, concurrent with the ATR count, during the weekday morning peak period from 7:00 AM to 9:00AM, the evening peak period from 4:00 PM to 6:00 PM, and the Saturday midday peak period from 11:00 AM to 2:00 PM. Based on review of the count data, the weekday morning peak hour of vehicular activity was 7:45 AM to 8:45 AM, the weekday evening peak hour was 5:00 PM to 6:00 PM, and the Saturday midday peak hour was 11:30 AM to 12:30 PM. The 2018 Existing conditions peak hour traffic volumes are shown in Figures 5a, 5b, and 5c for the weekday morning, weekday evening and Saturday midday peak hours, respectively. The traffic count data are included in the Attachments to this memorandum.

### 3.4 Seasonal Variation

The peak hour traffic data collected for the Project was obtained during the month of June 2018. To quantify the seasonal variation of traffic volumes in the area, historic traffic data available from the Massachusetts Department of Transportation (MassDOT) at a permanent count station along Route 3 was reviewed. Based on the review, June traffic counts are generally higher than average month conditions by approximately 12-percent. Therefore, to provide a conservative assessment, no seasonal adjustment factor was applied to the June traffic counts. The seasonal adjustment data and 2018 Existing conditions peak hour traffic volume networks are provided in the Attachments to this memorandum.

### 3.5 Crash Summary

To identify potential vehicle crash trends in the study area, vehicular crash data for the study area intersections were obtained from MassDOT for the most recent five-year period (2011-2015) available. A summary of the MassDOT vehicle crash history is presented in Table 3 and the detailed crash data is provided in the Attachments to this memorandum.

Crash rates are calculated based on the number of crashes at an intersection and the volume of traffic traveling through that intersection on a daily basis. MassDOT average crash rates for District 5 (the MassDOT district designation for Scituate) are 0.75 and 0.57 for signalized and unsignalized intersections, respectively. In other words, on average, 0.75 crashes occurred per million vehicles entering signalized intersections, and 0.57 crashes occurred per million vehicles entering unsignalized intersections throughout District 5. The crash rate worksheets for the study area intersections are included in the Attachments to this memorandum.

As shown in Table 3, only one study area intersection, the Scituate Rotary (#1), has a calculated crash rate higher than MassDOT average crash rate for District 5. The crashes that occurred at the study area intersections were primarily single vehicle, angle, and rear-end collisions, resulting in property damage only. No crashes were reported which resulted in a fatality or involved a non-motorist (bike, pedestrian). None of the study area intersections are HSIP<sup>1</sup> clusters (2013 – 2015) or ranked as a Top 200 Intersection.

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<sup>1</sup> According to the MassDOT website, "an HSIP-eligible location is a crash cluster that ranks within the Top 5% of each Regional Planning Agency, based on a combination of factors including crash incidence and severity (Using the Equivalent Property Damage Only (EPDO) index where Property Damage Only crashes = 1 Point; Injury crashes = 5 Points; Fatal crashes = 10 points)."

**Table 3 Vehicular Crash Data (2011 – 2015)**

Intersection	1.	2.	3.	4.	5.	6.	7.	8.	9.
	Scituate Rotary	Cornet Stenson at Old Oaken Bucket	New Driftway at			Old Driftway at			Country Way at Stock-bridge
			Old Driftway	Site driveway west	Site driveway east	MBTA driveway south	MBTA driveway north	Stock-bridge Road	
Signalized?	No	No	Yes	No	No	No	No	No	No
MassDOT Average Crash Rate	0.57	0.57	0.75	0.57	0.57	0.57	0.57	0.57	0.57
Calculated Crash Rate	0.64	0.29	0.17	0.00	0.00	0.00	0.00	0.00	0.07
Exceeds Average?	Yes	No	No	No	No	No	No	No	No
<b>Year</b>									
2011	1	0	0	0	0	0	0	0	0
2012	7	0	3	0	0	0	0	0	1
2013	6	0	0	0	0	0	0	0	0
2014	12	4	1	0	0	0	0	0	0
<u>2015</u>	<u>4</u>	<u>2</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total	30	6	4	0	0	0	0	0	1
Average	6.0	1.2	0.8	0.0	0.0	0.0	0.0	0.0	0.2
<b>Collision Type</b>									
Angle	2	2	2	0	0	0	0	0	0
Head-on	1	0	0	0	0	0	0	0	0
Rear-end	11	1	0	0	0	0	0	0	0
Sideswipe, opposite direction	2	1	0	0	0	0	0	0	0
Sideswipe, same direction	3	0	1	0	0	0	0	0	0
Single Vehicle Crash	11	2	1	0	0	0	0	0	1
<b>Severity</b>									
Fatal Injury	0	0	0	0	0	0	0	0	0
Non-Fatal Injury	7	0	1	0	0	0	0	0	0
Property Damage Only	22	5	2	0	0	0	0	0	1
Unknown	1	1	1	0	0	0	0	0	0
<b>Time of day</b>									
Weekday ,7:00 AM - 9:00 AM	1	0	0	0	0	0	0	0	1
Weekday, 4:00 – 6:00 PM	1	1	0	0	0	0	0	0	0
Saturday 11:00 AM – 2:00 PM	1	1	0	0	0	0	0	0	0
Weekday, other time	18	4	3	0	0	0	0	0	0
Weekend, other time	9	0	1	0	0	0	0	0	0
<b>Pavement Conditions</b>									
Dry	27	3	4	0	0	0	0	0	0
Wet	3	2	0	0	0	0	0	0	1
Snow	0	1	0	0	0	0	0	0	0
<b>Non-Motorist (Bike, Ped.)</b>	0	0	0	0	0	0	0	0	0

Source: MassDOT vehicle crash data, accessed June 2018.

The MBTA provides commuter rail service out of the Greenbush Station, located immediately adjacent to Old Driftway. The station operates as the southern terminus of the Greenbush Line, which offers weekday and weekend service to South Station in Boston. Service is most frequent during peak commute times in peak directions. The schedule for the MBTA Greenbush Line is included in the Attachments to this memorandum.

Local transit service is provided by the Greater Attleboro Taunton Regional Transit Authority (GATRA) on its Scituate Loop (SLOOP) line. The SLOOP, which links the Greenbush MBTA station to Scituate Harbor, North Scituate, and several intermediate destinations, operates on weekdays and weekends with 55-minute to 75-minute headways. The schedule for the GATRA SLOOP Line is included in the Attachments to this memorandum.

### **3.7 Pedestrian and Bicycle Accommodations**

Sidewalks run along one or both sides of portions of New Driftway, Old Driftway, Country Way, Chief Justice Cushing Highway (Route 3A), and Stockbridge Road. Some of these sidewalks, however, extend only a few hundred feet from a major intersection, such as the Scituate Rotary. Sidewalks generally do not run along Cornet Stenson Road (Route 123) or Old Oaken Bucket Road, though there are pedestrian crossings at the intersections between these roads and where Route 123 enters the Scituate Rotary. Sidewalk conditions vary within the study area.

In addition, the Driftway Pedestrian/Bicycle Trail runs along the southerly side of New Driftway and, upon completion of Phase II, will connect the MBTA Greenbush Station and the Scituate Harbor. The trail is largely constructed and funding for Phase II, which will complete the trail, has been approved. No other formal bicycle facilities exist within the vicinity of the Site.

## **4.0 Future Conditions**

To determine the impacts of the Project-generated traffic volumes in the area surrounding the Site, future traffic conditions were evaluated. A seven-year horizon (2025) was used for the evaluation, consistent with MassDOT TIA requirements.

### **4.1 Future Traffic Growth**

Traffic growth on area roadways independent of the Project is a function of the expected land development and changes in demographics. Future growth comprises both general regional growth and traffic generated by specific planned projects that would be expected to affect the Project study area roadways. Transportation infrastructure improvements can also affect traffic patterns or growth.

#### Regional Growth

Historic traffic data from a MassDOT permanent count station along Route 3 and recent traffic studies conducted in the vicinity of the Site were reviewed to determine an appropriate growth rate. Based on this review, an annual growth rate of one-percent per year was determined to be appropriate for this study.

### Specific Planned Projects

In addition to general regional growth, traffic associated with other planned and/or approved developments near the Site and anticipated to be completed within the seven-year horizon were identified based on discussions with the Town of Scituate. These include the following projects in the vicinity of the Site:

- **50 Country Way** – This project involves the razing of an existing 5-unit multi-family residential building and the construction of a mixed-use development of three buildings containing 30 dwelling units, 6,400 sf of office space, and 2,200 of retail space. The Project is expected to be completed by the end of 2018. Projected traffic volumes expected to be generated by this project were obtained from the published traffic study submitted as part of the permitting process for the project and were included in the analysis.
- **Gunther Tooties** – This project, which is currently going through the permitting process, is located at 52 Country Way and will replace the existing Morning Glories bakery. The proposed Gunther Totties Bagel Cafe consists of the same number of seats as the existing Morning Glories. Therefore, no increase in trips is anticipated.
- **Cumberland Farms** – A Cumberland Farms is being discussed at 56 New Driftway, the existing South Short Auto Parts site. However, no formal filing has been made and no other details of the potential project are available at this time. Therefore, trips associated with the potential project were assumed to be included in the general background growth.
- **60 New Driftway** – This project includes a proposed mixed-use building within the existing Riverway development, which was permitted in 2008. The proposed mixed-use building would support the existing Riverway development and is not anticipated to generate many new trips. Therefore, trips associated with the proposed mixed-use building were assumed to be included in the general background growth.
- **6 McDonald Terrace** – A mixed-use building is being discussed at 6 McDonald Terrace. However, no formal filing has been made and no other details of the potential project are available at this time. Therefore, trips associated with the potential project were assumed to be included in the general background growth.



- **14-16 Old Country Way** – This project includes the demolition of two single family dwellings and accessory structures and construction of two buildings containing eight shops and office space for “carpenter(s), cabinetmaker(s), electrician(s), job printer(s), painter(s), paperhanger(s), plumber(s), sign painter(s), or upholsterer(s). No formal traffic study was filed as part of the project. The Zoning Board of Appeals (ZBA) issued a Section 6 finding approving the project on April 9, 2018. The ZBA Section 6 finding indicated that the project will “not be substantially more detrimental to the neighborhood.” Therefore, trips associated with the potential project were assumed to be included in the general background growth.

#### Background Transportation Projects

In assessing future traffic conditions, proposed roadway improvements within the study area were considered. Based on discussions with the Town of Scituate, there are no proposed roadway improvement projects in the vicinity of the Site that are likely to influence traffic conditions within the seven-year horizon.

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

The 2025 No-Build conditions traffic volumes were generated by adding the one-percent per year general regional growth and the background projects to the existing conditions traffic volumes. The resulting 2025 No-Build conditions peak hour traffic volume networks are presented in Figures 4a, 4b, and 4c for the weekday morning, weekday evening and Saturday midday peak hours, respectively.

#### **4.4 Project Trip Generation**

The rate at which any development generates traffic is dependent upon several factors such as size, location, and concentration of surrounding developments. As previously discussed, the Project consists of approximately 13,000 sf of retail/commercial uses and 78 residential units. Trip generation estimates for the proposed uses were projected using trip generation rates published by the Institute of Transportation Engineers (ITE) *Trip Generation, 10<sup>th</sup> Edition*<sup>3</sup>, for Land Use Code (LUC) 221 (Mid-Rise Residential) and LUC 820 (Shopping Center). Shopping Centers are described by the ITE as an integrated group of commercial establishments, including retail and restaurant uses, that are planned, developed, owned, and managed as a unit.

#### Shared Trips

Because the Project proposes a mix of uses, the trip generation characteristics of the Site will be different from a single-use project. Some of the traffic to be generated by the Project will be contained on Site as “internal” or “shared vehicle” trips. For example, residents may also visit the general retail on Site. While these shared trips represent new traffic to the individual uses, they would not show up as new vehicle trips on the surrounding roadway network.

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<sup>3</sup> Trip Generation, 10th Edition, Institute of Transportation Engineers, Washington D.C., 2017.

To account for shared trips between the proposed uses, the shared trip methodology outlined in the ITE Trip Generation Handbook, 3<sup>rd</sup> Edition<sup>4</sup> was applied. The shared trip calculations are included in the Attachments to this memorandum.

### Mode Share

Because of the Project's proximity to public transportation, mode splits were applied to the projected trip generation. The mode shares for the residential portion of the Project are based on 2010 Census data for the Town of Scituate. Due to the limited local data and research available on retail mode shares, a 100-percent vehicle mode share was assumed to provide a conservative estimate. Table 4 summarizes the mode shares by use.

**Table 4 Project Mode Shares**

Use	Vehicle	Transit	Bike/Walk
Residential <sup>1</sup>	91%	8%	1%
Retail <sup>2</sup>	100%	0%	0%

<sup>1</sup> Mode shares based on 2010 Census data for the Town of Scituate.

<sup>2</sup> Mode share assumed to be 100% vehicle.

A local average vehicle occupancy, based on 2010 Census Data for tracts the Town of Scituate, was applied to the vehicle mode to more accurately reflect the number of vehicles generated by the Site. The local AVO for residential was 1.07. Due to limited data and research available for local AVO characteristics for retail uses, the national AVO of 1.67 was applied.

### Pass-by Trips

Not all the trips generated by the Project will be new traffic that is added to the study area intersections and roadways. Retail uses typically attract a significant percentage of their traffic from the traffic streams passing the Site, particularly during peak periods. These trips, which are considered pass-by trips, are already on the roadway system traveling to and from locations other than the Site (such as home, work, or other shopping destinations).

Pass-by trips are attracted to the Site as they pass through the area. The rate at which pass-by trips are attracted to a Site is highly dependent on the type of land use at that Site, the proximity of the Site to major traffic corridors, and the location and type of nearby land uses. ITE data shows pass-by rates for shopping centers of 34-percent during the weekday evening peak hour and 26-percent during the Saturday midday peak hour. Based on the MassDOT TIA Guidelines, pass-by trips should not account for more than 15-percent of an adjacent street traffic volume. Using the ITE pass-by rates does not result in the pass-by volumes exceeding 15-percent of the adjacent street traffic. As such, the ITE pass-by rates were used for the projections.

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<sup>4</sup> Trip Generation Handbook, 3rd Edition, Institute of Transportation Engineers, Washington, D.C., September 2017.

The estimated trip generation by mode for the proposed Project is summarized in Table 5 and calculations are included in the Attachments to this memorandum.

**Table 5 Project Trip Generation Summary**

Time Period	New Vehicle Trips <sup>1</sup>	Pass-by Vehicle Trips <sup>2</sup>	Transit Trips	Bike/Walk Trips
<b>Weekday Daily</b>				
Enter	588	151	13	2
<u>Exit</u>	<u>588</u>	<u>151</u>	<u>12</u>	<u>1</u>
Total	1,172	302	25	3
<b>Weekday Morning</b>				
Enter	84	20	1	neg
<u>Exit</u>	<u>60</u>	<u>20</u>	<u>2</u>	neg
Total	140	40	3	neg
<b>Weekday Evening</b>				
Enter	40	16	1	neg
<u>Exit</u>	<u>40</u>	<u>16</u>	<u>1</u>	neg
Total	80	32	2	neg
<b>Saturday Daily</b>				
Enter	981	258	20	2
<u>Exit</u>	<u>981</u>	<u>258</u>	<u>18</u>	<u>2</u>
Total	1,956	516	38	4
<b>Saturday Midday</b>				
Enter	52	12	1	neg
<u>Exit</u>	<u>40</u>	<u>12</u>	<u>1</u>	neg
Total	92	24	2	neg

neg negligible

<sup>1</sup> Vehicle trip generation estimate based on ITE LUC 221 (Mid-Rise Residential) for 78 units and ITE LUC 820 (Shopping Center) for 10,580 sf of space, with shared trip and pass-by trip credits removed.

<sup>2</sup> Pass-by rates for the weekday evening peak hour (34-percent) and Saturday midday peak hour (26-percent) based on ITE LUC 820 (Shopping Center), 25-percent pass-by rate assumed for time periods with no available data.

As shown in Table 5, the proposed Project is expected to result in a total of 144 new vehicle trips (84 entering/ 60 exiting) during the weekday morning peak hour and a total of 80 new vehicle trips (40 entering/40 exiting) during the weekday evening peak hour. The proposed Project is expected to result in a total of 92 new vehicle trips (52 entering/40 exiting) trips during the Saturday midday peak hour.

It should be noted that under the proposed Project a total of 240 parking spaces will be maintained for use by the MBTA. Therefore, the existing trips entering and exiting the Site were not removed under the future Build conditions.

#### 4.5 Trip Distribution

The directional distribution of traffic approaching and departing the Site is a function of several variables. These include population densities, existing travel patterns, and the efficiency of the roadways leading to and from the Site. The trip distribution for the residential uses is based on 2010 Census data and for the retail uses is based on existing observed travel patterns. The trip distribution patterns for the Project are summarized in Table 6.

**Table 6 Trip Distribution**

Roadway	Direction (From/To)	Residential	Retail
Country Way	North	14%	9%
Stockbridge Road	North	2%	7%
New Driftway	East	4%	20%
Chief Justice Cushing Highway (Route 3A)	South	6%	23%
Cornet Stetson Road (Route 123)	West	49%	17%
Old Oaken Bucket Road	West	3%	5%
Chief Justice Cushing Highway (Route 3A)	North	22%	19%
<b>Total</b>		<b>100%</b>	<b>100%</b>

#### 4.6 Trip Assignment and Build Traffic Volumes

The Project-generated vehicular traffic volumes are assigned to the study area roadway network based on the trip distribution shown in Table 6. The assignment patterns to the roadway network are presented in Figures 7a and 7b for the residential and retail Project trips, respectively.

Project trips are added to the 2025 No-Build peak hour traffic volume networks to develop the 2025 Build peak hour traffic volume networks. The residential project-generated trip traffic volume networks are shown in Figures 8a, 8b, and 8c for the weekday morning, weekday evening and Saturday midday peak hours, respectively. The retail project-generated trip traffic volume networks are shown in Figures 9a, 9b, and 9c for the weekday morning, weekday evening and Saturday midday peak hours, respectively. The resulting 2025 Build conditions peak hour traffic volume networks are presented in Figures 10a, 10b, and 10c for the weekday morning, weekday evening and Saturday midday peak hours, respectively.

*Note: Since the time that the original traffic operations analysis was performed, the retail/commercial components of the Project program was reduced from 13,00 sf to 10,580 sf, an approximately 23% reduction. While the Project trip generation presented in Table 5 is based on the current program, the retail trips and Build condition trips presented in Figures 9a, 9b & 9c and Figures 10a, 10b & 10c are based on the original program, and are therefore over-estimated accordingly. Similarly, the Build conditions traffic operations analysis presented in Section 5.0 over-estimates the Project impacts, and therefore reflects a conservative analysis.*

## 5.0 Traffic Operations Analysis

To assess quality of flow, intersection capacity analyses were conducted with respect to 2018 Existing, 2025 No-Build, and 2025 Build traffic volume conditions. Capacity analyses provide an indication of how well the roadway facilities serve the traffic demands placed upon them. Roadway operating conditions are classified by calculated levels-of-service.

The evaluation criteria used to analyze area intersections and roadways in this traffic study are based on the Synchro results (percentile-delay method) for signalized intersections and 2010 Highway Capacity Manual (HCM) for unsignalized intersections. Level-of-service (LOS) is the term used to denote the different operating conditions that occur on a given roadway segment under various traffic volume loads. It is a qualitative measure that considers a number of factors including roadway geometry, speed, travel delay, freedom to maneuver, and safety. Level-of-service provides an index to operational qualities of a roadway segment or an intersection. Level-of-service designations range from A to F, with LOS A representing the best operating conditions and LOS F representing congested operating conditions.

### 5.1 Intersection Capacity Analysis

Levels-of-service analyses were conducted for the 2018 Existing, 2025 No-Build, and 2025 Build conditions for the study area intersections. Tables 7 and 8 summarize the capacity analysis for the signalized and unsignalized intersections, respectively. The capacity analyses worksheets are included in the Attachments to this memorandum.

As shown in Tables 7 and 8, the Project-generated trips are expected to have minimal operational impacts at any of the study area intersections.

**Table 7 Signalized Intersection Capacity Analysis**

Location / Movement	2018 Existing Condition					2025 No-Build Conditions					2025 Build Conditions				
	v/c <sup>a</sup>	Del <sup>b</sup>	LOS <sup>c</sup>	50% Q <sup>d</sup>	95% Q <sup>e</sup>	v/c	Del	LOS	50% Q	95% Q	v/c	Del	LOS	50% Q	95% Q
<b>3. New Driftway at Old Driftway</b>															
<b>Weekday Morning</b>															
EB L	0.13	6	A	0	41	0.12	5	A	0	43	0.19	5	A	0	59
EB T/R	0.33	6	A	0	216	0.32	6	A	0	228	0.35	6	A	0	250
WB L/T/R	0.48	15	B	33	252	0.42	13	B	38	275	0.50	15	B	42	300
NB L/T/R	0.06	17	B	1	20	0.05	19	B	1	22	0.05	20	C	1	23
SB L/T	0.08	24	C	4	35	0.07	25	C	4	38	0.08	27	C	5	40
SB R	0.23	6	A	0	22	0.22	7	A	0	33	0.30	7	A	0	40
<b>Overall</b>		<b>10</b>	<b>B</b>				<b>9</b>	<b>A</b>				<b>10</b>	<b>A</b>		
<b>Weekday Evening</b>															
EB L	0.14	7	A	7	47	0.14	6	A	8	46	0.18	6	A	10	58
EB T/R	0.41	9	A	65	301	0.40	8	A	69	311	0.40	7	A	72	323
WB L/T/R	0.58	19	B	103	325	0.52	16	B	101	334	0.52	16	B	110	367
NB L/T/R	0.17	15	B	4	24	0.13	17	B	3	34	0.14	17	B	3	34
SB L/T	0.32	31	C	21	54	0.22	29	C	15	65	0.24	31	C	16	66
SB R	0.32	5	A	0	0	0.28	6	A	0	44	0.33	6	A	0	46
<b>Overall</b>		<b>13</b>	<b>B</b>				<b>11</b>	<b>B</b>				<b>11</b>	<b>B</b>		
<b>Saturday Midday</b>															
EB L	0.11	7	A	5	36	0.12	7	A	6	40	0.19	7	A	9	55
EB T/R	0.45	9	A	80	370	0.50	10	A	92	438	0.52	10	A	97	456
WB L/T/R	0.55	17	B	147	#535	0.59	18	B	159	#593	0.66	20	B	168	#624
NB L/T/R	0.08	1	A	0	0	0.02	0	A	0	0	0.02	0	A	0	0
SB L/T	0.41	36	D	30	78	0.37	35	D	28	85	0.39	37	D	28	87
SB R	0.16	7	A	0	24	0.15	7	A	0	31	0.20	6	A	0	36
<b>Overall</b>		<b>14</b>	<b>B</b>				<b>14</b>	<b>B</b>				<b>15</b>	<b>B</b>		

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

**Table 8 Unsignalized Intersection Capacity Analysis**

Location / Movement	2018 Existing Conditions					2025 No-Build Conditions					2025 Build Conditions				
	D <sup>a</sup>	v/c <sup>b</sup>	Del <sup>c</sup>	LOS <sup>d</sup>	95% Q <sup>e</sup>	D	v/c	Del	LOS	95% Q	D	v/c	Del	LOS	95% Q
<b>4. New Driftway at Site driveway west/commercial driveway</b>															
<b>Weekday Morning</b>															
EB L	Neg	0.00	0	A	0	Neg	0.00	0	A	0					
WB L	Neg	0.00	8	A	0	Neg	0.00	8	A	0	Neg	0.00	8	A	0
NB L/T/R	5	0.02	12	B	0	5	0.01	12	B	0	5	0.01	12	B	0
SB L/T/R	5	0.02	10	B	3	5	0.01	11	B	0					
<b>Weekday Evening</b>															
EB L	10	0.01	8	B	0	10	0.01	8	A	0					
WB L	Neg	0.00	9	A	0	Neg	0.00	9	A	0	Neg	0.00	9	A	0
NB L/T/R	10	0.05	12	A	5	10	0.05	12	B	5	10	0.02	13	B	3
SB L/T/R	10	0.04	14	B	3	10	0.04	14	B	3					
<b>Saturday Midday</b>															
EB L	Neg	0.00	0	A	0	Neg	0.00	0	A	0					
WB L	5	0.01	9	A	0	5	0.01	9	A	0	5	0.01	9	A	0
NB L/T/R	5	0.01	13	B	0	5	0.01	14	B	0	5	0.01	14	B	0
SB L/T/R	Neg	0.00	0	A	0	Neg	0.00	0	A	0					
<b>5. New Driftway at Site driveway east</b>															
<b>Weekday Morning</b>															
EB L	Neg	0.00	0	A	0	Neg	0.00	0	A	0	35	0.03	8	A	3
<b>Weekday Evening</b>															
EB L	Neg	0.00	0	A	0	Neg	0.00	0	A	0	30	0.03	8	A	3
<b>Saturday Midday</b>															
EB L	Neg	0.00	0	A	0	Neg	0.00	0	A	0	20	0.02	9	A	3
<b>6. Old Driftway at MBTA driveway south/Site driveway south</b>															
<b>Weekday Morning</b>															
EB L/T/R	25	0.03	10	A	0	25	0.03	10	A	3	25	0.04	10	B	3
WB L/T/R	5	0.01	10	B	0	5	0.01	10	B	0	20	0.04	11	B	3
NB L	Neg	0.00	7	A	0	Neg	0.00	7	A	0	Neg	0.00	8	A	0
SB L	5	0.00	8	A	0	5	0.01	8	A	0	5	0.01	8	A	0
<b>Weekday Evening</b>															
EB L/T/R	100	0.19	10	A	18	100	0.12	10	A	10	100	0.13	10	A	10
WB L/T/R	15	0.06	11	B	5	15	0.02	10	B	3	20	0.04	11	B	3
NB L	Neg	0.00	0	A	0	Neg	0.00	0	A	0	Neg	0.00	0	A	0
SB L	Neg	0.00	0	A	0	Neg	0.00	0	A	0	Neg	0.00	0	A	0
<b>Saturday Midday</b>															
EB L/T/R	15	0.04	9	A	3	15	0.02	9	A	3	15	0.02	9	A	3
WB L/T/R	5	0.02	11	B	0	5	0.01	10	B	0	10	0.02	11	B	3
NB L	Neg	0.00	7	A	0	Neg	0.00	8	A	0	Neg	0.00	8	A	0
SB L	Neg	0.00	0	A	0	Neg	0.00	0	A	0	Neg	0.00	8	A	0

**Table 8 Unsignalized Intersection Capacity Analysis (continued)**

Location / Movement	2018 Existing Conditions					2025 No-Build Conditions					2025 Build Conditions				
	D <sup>a</sup>	v/c <sup>b</sup>	Del <sup>c</sup>	LOS <sup>d</sup>	95% Q <sup>e</sup>	D	v/c	Del	LOS	95% Q	D	v/c	Del	LOS	95% Q
<b>7. Old Driftway at MBTA driveway north/Site driveway north</b>															
<b>Weekday Morning</b>															
EB L/T/R	Neg	0.00	0	A	0	Neg	0.00	0	A	0	Neg	0.00	0	A	0
WB L/T/R	Neg	0.01	11	B	0	Neg	0.00	10	A	0	35	0.06	11	B	5
NB L	30	0.03	8	A	3	30	0.02	8	A	3	30	0.02	8	A	3
SB L	5	0.01	8	A	0	5	0.00	8	A	0	20	0.02	8	A	0
<b>Weekday Evening</b>															
EB L/T/R	10	0.05	9	A	3	10	0.02	9	A	0	10	0.02	9	A	0
WB L/T/R	25	0.08	10	B	8	25	0.04	10	B	3	50	0.08	11	B	10
NB L	25	0.02	8	A	3	25	0.02	8	A	3	25	0.02	8	A	0
SB L	5	0.00	8	A	0	5	0.00	8	A	0	10	0.01	8	A	0
<b>Saturday Midday</b>															
EB L/T/R	Neg	0.01	11	B	0	Neg	0.00	11	B	0	Neg	0.00	11	B	0
WB L/T/R	5	0.02	9	A	3	5	0.01	9	A	0	30	0.05	10	B	3
NB L	15	0.01	8	A	0	15	0.01	8	A	0	15	0.01	8	A	0
SB L	Neg	0.00	7	A	0	Neg	0.00	7	A	0	10	0.01	8	A	0
<b>8. Old Driftway at Stockbridge Road</b>															
<b>Weekday Morning</b>															
EB T/R	160	0.26	9	A	25	175	0.22	9	A	23	185	0.24	9	A	23
WB L/T	200	0.81	24	C	225	220	0.29	9	A	30	225	0.30	9	A	33
NB L/R	60	0.13	9	A	10	70	0.10	8	A	8	80	0.11	8	A	10
<b>Weekday Evening</b>															
EB T/R	165	0.23	9	A	25	185	0.24	9	A	18	190	0.25	9	A	25
WB L/T	120	0.20	9	A	23	130	0.19	9	A	25	130	0.19	9	A	18
NB L/R	140	0.30	10	A	30	155	0.21	9	A	20	165	0.23	9	A	23
<b>Saturday Midday</b>															
EB T/R	175	0.23	9	A	23	195	0.25	9	A	25	200	0.26	9	A	25
WB L/T	185	0.27	9	A	28	210	0.29	9	A	30	215	0.30	10	A	30
NB L/R	105	0.19	9	A	18	115	0.17	9	A	15	125	0.18	9	A	15
<b>9. Country Way at Stockbridge Road</b>															
<b>Weekday Morning</b>															
EB L/T/R	Neg	0.03	14	B	3	Neg	0.01	13	B	0	Neg	0.01	14	B	0
WB L/T/R	175	0.41	17	C	48	195	0.41	17	C	50	200	0.43	17	C	53
NB L	Neg	0.00	0	A	0	Neg	0.00	0	A	0	Neg	0.00	0	A	0
SB L	45	0.05	8	A	3	50	0.04	8	A	3	60	0.05	8	A	5
<b>Weekday Evening</b>															
EB L/T/R	10	0.02	12	B	3	10	0.02	12	B	3	10	0.02	12	B	3
WB L/T/R	170	0.48	18	C	65	190	0.44	18	C	55	195	0.45	19	C	58
NB L	Neg	0.00	0	A	0	Neg	0.00	0	A	0	Neg	0.00	0	A	0
SB L	40	0.04	8	A	3	45	0.04	8	A	3	50	0.05	8	A	3
<b>Saturday Midday</b>															
EB L/T/R	5	0.02	10	B	3	5	0.01	10	B	0	5	0.01	10	B	0
WB L/T/R	205	0.46	19	C	60	235	0.57	23	C	85	235	0.58	24	C	90
NB L	Neg	0.00	0	A	0	Neg	0.00	0	A	0	Neg	0.00	0	A	0
SB L	55	0.05	8	A	5	55	0.05	8	A	5	65	0.06	8	A	5



**Table 8 Unsignalized Intersection Capacity Analysis (continued)**

Location / Movement	2018 Existing Conditions					2025 No-Build Conditions					2025 Build Conditions				
	D <sup>a</sup>	v/c <sup>b</sup>	Del <sup>c</sup>	LOS <sup>d</sup>	95%Q <sup>e</sup>	D	v/c	Del	LOS	95%Q	D	v/c	Del	LOS	95%Q
<b>10. Old Driftway at Site driveway center (future intersection)</b>															
<b>Weekday Morning</b>															
WB L/R											5	0.01	10	A	0
<b>Weekday Evening</b>															
WB L/R											Neg	0.00	10	B	0
<b>Saturday Midday</b>															
WB L/R											Neg	0.00	10	B	0
<b>11. New Driftway at Site driveway west (future intersection)</b>															
<b>Weekday Morning</b>															
SB L/R											30	0.05	11	B	5
<b>Weekday Evening</b>															
SB L/R											20	0.05	12	B	3
<b>Saturday Midday</b>															
SB L/R											20	0.05	13	B	3

- 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.

## 6.0 Sight Distances

A sight distance analysis, in conformance with guidelines of the American Association of State Highway and Transportation Officials (AASHTO) was performed at the one exit only unsignalized Site driveway intersection along New Driftway and three unsignalized Site driveways along Old Driftway. Sight distance considerations are generally divided into two categories: Stopping Sight Distance (SSD) and Intersection Sight Distance (ISD). Stopping Sight Distance (SSD) 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 an object in the road, in this case 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.

Intersection Sight Distance (ISD) is based on the time required for perception, reaction and completion of the desired critical exiting maneuver once the driver on a minor street or driveway approach decided to execute the maneuver. Calculation for the critical ISD includes the time to (1) turn left, and to clear the half of the intersection without conflicting with the vehicles approaching from the left; and (2) accelerate to the operating speed of the roadway without causing approaching vehicles 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. Essentially, while SSD is the minimum distance needed to avoid collisions, ISD is the minimum distance needed so that mainline motorists will not have to substantially reduce their speed due to turning vehicles. To maintain the safe operation of an unsignalized intersection, ISD only needs to be equal to the stopping sight distance, though it is desirable to meet ISD requirements by themselves.

To calculate the required SSD and ISD at the one exit only unsignalized Site driveway intersection along New Driftway and three unsignalized Site driveways along Old Driftway, the 85th percentile speeds measured by the ATR counts were utilized. The 85th percentile speed along New Driftway was observed to be 34 mph northbound and 33 mph southbound. The posted speed limit along Arlington Street is 30 mph in the southbound direction and there is no posted speed limit along Arlington Street in the northbound direction. Table 9 summarizes the sight distance analysis and the sight distance worksheet is included in the Attachments to this memorandum.

**Table 9 Sight Distance Analysis Summary**

Location	Stopping Sight Distance <sup>1</sup>			Intersection Sight Distance <sup>1</sup>		
	Traveling	Required	Measured	Looking	Desired	Measured
11. New Driftway at Site driveway west <i>(future intersection)</i>	Eastbound	290	260 <sup>2</sup>	Left	430	565
	Westbound	260	565	Right	430	260 <sup>2</sup>
6. Old Driftway at Site driveway south	Northbound	220	240	Left	365	240 <sup>2</sup>
	Southbound	230	725	Right	365	725
10. Old Driftway at Site driveway center <i>(future intersection)</i>	Northbound	220	365	Left	365	365
	Southbound	230	585	Right	365	585
7. Old Driftway at Site driveway north	Northbound	220	635	Left	365	400
	Southbound	230	315	Right	365	315 <sup>3</sup>

<sup>1</sup> Based on guidelines established in A Policy on the Geometric Design of Highways and Streets, Sixth Edition, American Association of State Highway and Transportation Officials (AASHTO), 2011 for an 85<sup>th</sup> percentile speed of 51 mph eastbound and 48 mph westbound.

<sup>2</sup> Sight distance is satisfied because the visibility from the Site driveway extends as far as the next intersection, New Driftway at Old Driftway.

<sup>3</sup> Sight distance is satisfied because the visibility from the Site driveway extends as far as the next intersection, Old Driftway at Stockbridge Road.

As shown in Table 9, the minimum stopping sight distance requirements and the desired intersection sight distance requirements are met at all the unsignalized site driveway intersections, with the exception of the locations which are close to a fully controlled (signal or all-way stop) intersection and are therefore acceptable.

## 7.0 Mitigation

### 7.1 Site Access

As previously discussed, access to the Site is currently provided by two full-access driveways along Old Driftway and an entrance-only driveway along New Driftway. In addition, full access is available through a privately-owned parcel occupied by Celtic Paws.

Under the proposed development, the two full-access driveways along Old Driftway will remain and a third exit-only driveway from the residential parking will be added approximately mid-way between the two existing driveways. The entrance-only driveway along New Driftway will also remain, but access between the Site and the privately-owned parcel occupied by Celtic Paws will be closed. A new exit-only driveway will be added along New Driftway to the west of the existing entrance-only driveway. A proposed Site plan is included in the Attachments to this memorandum.

Closing access between the Site and the privately-owned parcel occupied by Celtic Paws and opening a new exit-only driveway further to the west will increase spacing between the Site driveways and the signalized intersection of New Driftway and Old Driftway. This will reduce vehicle conflicts in close proximity to the intersection and improve safety.

## **7.2 Transportation Demand Management Program**

Although the Project is anticipated to have minimal impacts to the roadway network, the Proponent is proposing to implement a Transportation Demand Management (TDM) program to help reduce the number of single occupant vehicles (SOV) traveling to and from the Site, to encourage the use of alternative modes of transportation, and better manage the traffic and parking generated by the Project. These TDM measures include the following:

- Provide secure bicycle racks, and locate racks in areas in close proximity to the entrances and convenient to the existing Driftway Pedestrian/Bicycle Trail;
- Encourage tenants to evaluate retail/commercial employee transportation needs, and support a carpool and ride-matching coordination program through the promotion of NuRide or other MassRIDE initiatives;
- Provide commuter information, such as information on public transportation (commuter rail and ferry), carpooling, and ride-matching, in residential lobbies and other high visibility locations accessible to residents, and encourage retail/commercial tenants to make similar information available to employees and patrons;
- Include public transportation information on development website(s) and encourage tenants to do the same;
- Encourage tenants to subsidize transit passes for retail/commercial employees;
- Encourage retail/commercial tenants to provide employees with a guaranteed ride home;
- Encourage retail/commercial tenants to use direct deposit for employee paychecks; and
- Encourage retail/commercial tenants to schedule supplier deliveries during weekday afternoon and off-peak hours where possible.

## **8.0 Conclusion**

VHB has conducted a traffic impact study for the proposed mixed-use development located on a portion of the existing Massachusetts Bay Transportation Authority (MBTA) Greenbush Station parking lot east of Old Driftway and north of New Driftway in Scituate, Massachusetts.

The proposed Project will comprise approximately 10,580 square feet (sf) of retail/commercial uses and 78 residential units, all supported by approximately 157 parking spaces. In addition, a total of 240 parking spaces will be maintained for use by the MBTA, of which 196 parking spaces will be on the development Site and 44 parking spaces will be on Town-owned land. The existing MBTA parking lot to the west of New Driftway will remain unchanged. Under the proposed site plan, access to the Site will be provided by one entrance only and one exit only driveway along New Driftway and two full-access driveways and one exit only driveway along Old Driftway.

The proposed Project is expected to result in a total of 144 new vehicle trips (84 entering/ 60 exiting) during the weekday morning peak hour and a total of 80 new vehicle trips (40 entering/40 exiting) during the weekday evening peak hour. The proposed Project is expected to result in a total of 92 new vehicle trips (52 entering/40 exiting) trips during the Saturday midday peak hour.

The Project is expected to have minimal impacts on roadways and intersections within the study area. However, the Proponent has proposed the implementation of a TDM program to minimize generation of vehicular traffic. Finally, sightlines at all site driveways satisfy appropriate design guidelines.