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Transportation Technical Memorandum

5-11 Washington Street
Ipswich, MA

Prepared for:

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ASB Project #2021-11

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- Figure 1: Existing Conditions Aerial Locus Map
- Figure 2: Proposed Conditions Aerial Locus Map
- Figure 3 and 4: Fire Truck Turning Movements
- Figure 5: Train Station Location Plan
- Figure 6: Washington Street Aerial Map
- Figure 7: Line of Sight Washington and Mineral Street

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1 Introduction

On behalf of our client *Wash Station Village LLC*, ASB design group has prepared this Technical Memorandum (TM) for the proposed Wash Station Village development. The proposed development is located at 5-11 Washington Street, the northeasterly corner of the intersection of Mineral Street and Washington Street in Ipswich, Massachusetts. This TM will review existing roadway conditions, access/egress, and crash data, and it will assess future traffic conditions associated with the development.

Figures 1 (Existing Conditions Aerial Locus Map) and **Figure 6** (Washington Street Aerial Map) shows the proximity of the proposed development and the surrounding roadway network.

1.1 Existing Site

The 35,557-square foot (s.f.) site at 5-11 Washington Street contains an existing 3,875 square-foot structure consisting of four self-serve carwash bays, one automated car wash bay and one automotive service detailing center. Access to site is provided by a 162 feet long curb cut on Washington Street and a 33-foot curb cut on Mineral Street. The MBTA rail line traverses the rear of the site as shown on Sheet C1 - 14 Unit Site Layout, Existing Conditions and Property Line Survey prepared by Donohoe Survey Inc.

1.2 Proposed Development

The proposed project when fully constructed will include six transit-oriented buildings consisting of fourteen townhouses as outlined below (see Figure 2 Proposed Conditions Aerial Locus Map):

- One Four Plex Structure that will be comprised of Units A-D,
- One Three Plex Structure that will be comprised of Units E-G,
- A Second Three Plex Structure that will be comprised of Units H-J,
- Two single Units K and L,
- and one Duplex Structure that will be comprised of Units M and N.

Two of the units will be affordable housing units. Ten of the units will have a two-car garage and four of the units will have single car garages and one on-site parking space. Another four on-site parking spaces are proposed for visitors (see Sheet C1). In addition, there are 8 guest parking spaces that are specific to Units B, F, I and L (2 per unit). This would result in a total of 12 guest parking spaces. The Units will range from 1,250 s.f. to 2,100 s.f. of living space.

The main ingress and egress to the site will be via a 24-foot curb cut on Washington Street. In addition, two of the units will be accessed via their private 18-foot driveway on Washington Street and two units will be accessed via their private 20-foot driveway on Mineral Street.

1.3 Study Area

The study area includes the existing site, plus two roadways and one intersection as follows:

Roadways

1. Washington Street
2. Mineral Street

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Intersections

1. Washington Street and Mineral Street

1.4 Methodology

This TM involves an evaluation of existing traffic conditions within the study area, including an inventory of existing roadway and intersection geometry, observations of traffic volumes, and assess travel demand forecasts for the project.

The standards used for this memorandum conform to the most recent editions of the **Manual on Uniform Traffic Control Devices (MUTCD)**, the **Highway Capacity Manual (HCM)**, and are consistent with the guidelines set forth by the **Massachusetts Department of Transportation (MassDOT)**.

2 Existing Conditions

2.1 Roadways

Washington Street

The project's primary impact area is proposed to be identified by the immediate roadway segment of Washington Street. Washington Street is classified by the Massachusetts Department of Transportation (MassDOT) as a local roadway that runs in the east-west directions with its eastern terminus at the Market Street and its western terminus at Depot Square (see Figure 6). The posted speed limit along the roadway is 30 miles per hour. The land use along Washington Street is a mix of commercial and residential. The roadway is within the jurisdiction of the Town of Ipswich. Washington Street is approximately 28 feet wide, with one 13-foot-wide lane in each direction. A double yellow centerline separates the travel lanes at the site. Bituminous concrete sidewalks are present on both sides of Washington Street. Utility poles are located on the southerly side of the road along the eastbound side. See Sheet C1 - 14 Unit Site Layout, Existing Conditions and Property Line Survey prepared by Donohoe Survey Inc.

Mineral Street

Mineral Street is classified by the Massachusetts Department of Transportation (MassDOT) as a local roadway that runs in the north-south directions from its northern terminus at the High Street and its southern terminus at Washington Street. The posted speed limit along the roadway is 25 miles per hour. The land use along Mineral Street is residential. The roadway is within the jurisdiction of the Town of Ipswich. Mineral Street is approximately 24 feet wide, with two 12-foot-wide one-way lanes in southbound direction. Sidewalks are not present on either side of Mineral Street except for a concrete and pavement sidewalk that traverses the developments property line along Mineral Street. Utility poles are located on the easterly side of the road. The Existing Conditions and Property Line Survey was prepared by Donohoe Survey Inc.

2.2 Study Intersection

Washington Street and Mineral Street

Washington Street and Mineral Street intersection to form a three-legged, unsignalized intersection with Washington Street approaching from the east and the west and Mineral Street approaching from the north. Washington Street operates freely with no control and Mineral Street operates under "STOP" (stop sign) control.

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The Washington Street eastbound approach consists of one left-turn/through travel lane and westbound approach consists of one through/right-turn travel lane. No bicycle accommodations are present on the eastbound and westbound approaches of the intersection.

The Mineral Street southbound approach consists of an exclusive left-turn lane and an exclusive right-turn lane. No bicycle accommodations are present on the southbound approach of the intersection.

Pedestrian crosswalks are provided on southbound and eastbound approaches of the intersection.

2.3 Public Transportation

The Massachusetts Bay Transportation Authority (MBTA) Ipswich Train Station is within walking distance to the project site. The Ipswich Station, 0.3 miles (1,500 ft.) from the project site, is located on the MBTA Newburyport/Rockport Line, providing service between North Station in Boston and Rockport Station (see Figure 5).

3 Safety Analysis

3.1 Crash Data

ASB reviewed the crash data available from MassDOT for the three (3) most recent closed years available – 2016 to 2018 – for the study intersection. There were no crashes reported for the three most recent years.

4 Proposed Conditions

The proposed new transit-oriented development will be located at 5-11 Washington Street in Ipswich, at the site of the existing Jim's Auto Installations & Detailing Center and approximately 900 feet northwest of the Depot Square which houses the Ipswich Train Station (see Figures 2 and 5). The main ingress and egress to the site will be via a 24-foot curb cut on Washington Street (see Figure 7 – Line of Site Washington and Mineral Street). In addition, two of the units will be accessed via their private 18-foot driveway on Washington Street and two units will be accessed via their private 20-foot driveway on Mineral Street as shown on Sheet C1 - 14 Unit Site Layout.

5 Future Vehicular Traffic

ASB used the Institute of Transportation Engineers (ITE) publication Trip Generation, 10th Edition to estimate the vehicle trip rates for the proposed development. To be conservative in our study, ASB assumed that all 14 townhouses would be market rate units and the automated car wash would also be a car wash & detail center. Trip generation rates for the 14-unit development was based on the Land Use Code (LUC) 210 (Single-Family detached Housing). Trip generation rates for the existing four-bay car wash were based on the LUC 947 (Self-Service Car Wash) and for the existing one-bay automated car wash and the detail center were based on LUC 949 (Car Wash & Detail Center).

Table T1 summarizes the total Project generated trips for the daily morning and daily evening peak hours.

Table T1 – Site Generated Trips

	Existing Trips		Proposed	Net Trips (Decrease)
	4-Bay Self-serve Car Wash (LUC 947)	2-Bay Car Wash & Detail Center (LUC 949)	14 Units Townhouses (LUC 210)	
Weekday Daily	432	312	170	(574)
Entering	216	156	85	(287)
Exiting	216	156	85	(287)
Weekday Midday Peak	32	17	15	(34)
Entering	16	11	4	(23)
Exiting	16	6	11	(11)
Weekday Evening Peak	22	27	15	(34)
11	11	13	9	(15)
11	11	14	6	(19)

As illustrated in **Table T1**, the proposed development is expected to generate approximately 574 less daily trips (287 trips in and 287 trips out) than the existing car wash, with 34 less trips (23 in and 11 out) during the weekday morning peak hour, and 34 less trips (15 in and 19 out) during the weekday evening peak hour.

Based on the MassDOT Statewide Traffic Data, and above site generated trips, we firmly believe that the proposed development will not significantly impact the area traffic and Washington Street will continue to operate at its current levels of service with no additional delays on all approaches.

6 Sight Distance

Sight distance is the length of roadway ahead that is visible to the roadway user. In most cases, specific sight distance measures apply to motor vehicles and bicyclists (see Figure 7). At intersections sight distance is provided to allow drivers to perceive the presence of potentially conflicting vehicles. This should occur in sufficient time for a motorist to stop or adjust their speed, as appropriate, to avoid colliding in the intersection. Sight distance also allows drivers of stopped vehicles with a sufficient view of the intersecting roadway to decide when to enter or cross the intersecting roadway. AASHTO’s *A Policy on the Geometric Design of Highways and Streets* provides procedures to determine desirable sight distances at intersections for various cases are described below and include:

- Case A – Intersections with no control on any approach
- **Case B – Intersections with stop control on the minor street**
- Case C – Intersections with yield control on the minor street
- Case D – Intersections with traffic signal control
- Case E – Intersections with all-way stop sign control

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- Case F – Left turns from the major road

The development's driveway is the minor movement at the 3-legged intersection and is controlled by a stop sign, which is in conformance with Case B. The excerpt below from Section 3.7.4.4 of MassDOT Project Development & Design Guide 2006 Edition describes the method used to determine the desirable Site Distance.

Case B – Stop Control on Minor Street

At an intersection with stop control on the minor street, as illustrated in **Table T2**, the stopped minor-street driver must be able to see motor vehicles and bicycles approaching on the major street from either direction, at sufficient distance to allow crossing or turning maneuvers from the minor street. The leg of the intersection sight triangle on the minor street (Dimension A) is the distance between the driver's eye and front of vehicle (8 feet) plus distance from front of vehicle to edge of pavement (6.5 feet, prefer 10 feet) plus the distance from edge of pavement to middle of lane of interest (e.g., 6 feet for a right turn, 18 feet for a left turn on an undivided 2-lane highway, etc.) The major street leg of the triangle is the intersection sight distance along the major road (Dimension B).

Left Turns from Stop Controlled Minor Street

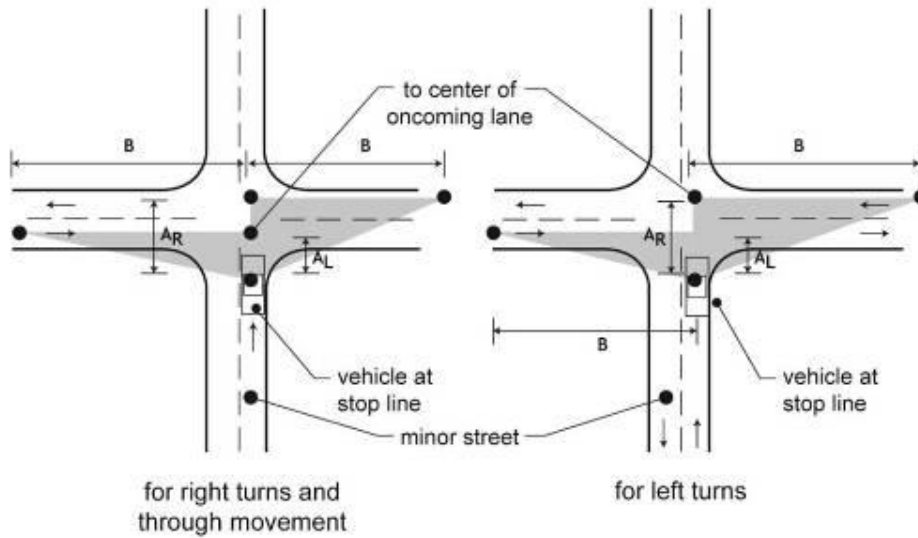
For motor vehicles making a left turn, the intersection sight distance along the major street (Dimension B) is given for an intersection with two 2-lane streets in Table T5. It is recommended that this intersection sight distance (Dimension B) be applied along the major street for left turns. At a design speed of 30 mile per hour for Washington Street, the recommended intersection sight distance (Dimension B) is 335 feet. The present layout has a minimum of 500'

Right Turns from Stop Controlled Minor Street

For motor vehicles making a right turn from the minor street, the intersection sight distances are given in **Table T2**. It is recommended that this intersection sight distance (Dimension B) be applied along the major street for right turns. At a design speed of 30 mile per hour for Washington Street, the recommended intersection sight distance (Dimension B) is 290 feet. The present layout has a minimum of 500'.

Table T2 - Sight Distance Criteria - Sight Triangle Case B

Departure Sight Triangles



Sight Triangle Legs: Case B – Stop Control on Cross Street

Major Street Design Speed (mph)	Length of Sight Triangle Legs (feet)			
	Minor Street for Vehicles Approaching From Right (AR, feet)	Minor Street for Vehicles Approaching From Left (AL, feet)	Major Street For Left Turns (B, feet)	Major Street for Right Turns or Through (B, feet)
15	32.5	20.5	170	145
20	32.5	20.5	225	195
25	32.5	20.5	280	240
30	32.5	20.5	335	290
35	32.5	20.5	390	335
40	32.5	20.5	445	385
45	32.5	20.5	500	430
50	32.5	20.5	555	480
55	32.5	20.5	610	530
60	32.5	20.5	665	575
65	32.5	20.5	720	625
70	32.5	20.5	775	670
75	32.5	20.5	830	720

Sight triangle legs shown are for passenger car crossing or turning into a two-lane street, with grades (all approaches) 3 percent or less. For other grades and for other major street widths, recalculate using AASHTO *Green Book* formulas.
 Source: *A Policy on Geometric Design of Streets and Highways*, AASHTO, Washington DC, 2004. Chapter 3 Elements of Design

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Stopping Sight Distance (SSD) is the length of the roadway ahead that is visible to the driver and should be sufficiently long to enable a vehicle traveling at or near the design speed to stop before reaching a stationary object in its path. Stopping sight distance is the sum of the distance traversed by the vehicle from the instant the driver sights an object necessitating a stop to the instant the brakes are applied and the distance needed to stop the vehicle from the instant brake application begins.

The SSD values associated with a given design speed are shown in **Table T3**. The site distance evaluations for the intersection are shown in **Table T4**.

Table T3 - Sight Distance Criteria

DESIGN SPEED	DESIGN STOPPING SIGHT DISTANCE VALUE1 (SSD)	RECOMMENDED INTERSECTION SIGHT DISTANCE VALUE2 (ISD)
(MPH)	(FT)	(FT)
15	80	170
20	115	225
25	155	280
30	200	335
35	250	390
40	305	445
45	360	500
50	425	555
55	495	610
60	570	665
65	645	720
70	730	775
75	820	830
80	910	885

Source: *A Policy on Geometric Design of Highways and Streets, AASHTO, Washington DC (2011)*

¹Design value based on a grade of less than 3%, a brake reaction distance predicted on a time of 2.5 seconds and a deceleration rate of 11.2 ft/s²

²Recommended value based on Case B1 - a stopped passenger car to turn left onto a two-lane highway with no median and grades 3% or less

We used the posted speed limit for Washington Street, which is 30 MPH to calculate the minimum sight distances (also see Figure 7).

Table T4 - Proposed Sight Distance Evaluation

INTERSECTION	POSTED SPEED (MPH)	MINIMUM (FEET) ^{1,2}	MEASURED (FEET)	OBSTRUCTION
<i>Washington Street at the driveway</i>				
Stopping Sight Distance:				
Washington Street EB	30	200	>500	
Washington Street WB	30	200	>500	
Intersection Sight Distance:				
Looking to the right from driveway	30	335	>500	
Looking to the left from driveway	30	335	>500	
<small>Source: A Policy on Geometric Design of Highways and Streets, AASHTO, Washington DC (2011) ¹ Table 3-1. Stopping Sight Distance on Level Roadways ² Table 9-6. Design Intersection Sight Distance - Case B1, Left Turn from Stop</small>				

At the Washington Street and 5-11 Washington Street driveway intersection the values for SSD and ISD are both above the minimum values (see Figure 7).

7 Fire Truck Turning Movements

Turning movements for the largest fire truck for the Ipswich Fire Department are shown in Figures 3 and 4. The fire truck can make both turns into and exiting the site.

8 Summary

ASB design group has prepared this Technical Memorandum (TM) for the proposed 5-11 Washington Street development (see Figure 2 and Sheet C1), located at 5-11 Washington Street in Ipswich, Massachusetts. This TM reviewed existing roadway conditions, access/egress, and crash data, and assessed future traffic conditions associated with the development.

The proposed project when fully constructed will include six transit-oriented buildings consisting of fourteen townhouses, of which two are affordable housing units. Ten of the units will have a two-car garage and four units will have single car garages and an on-site parking space. Another 12 guest parking spaces are proposed for visitors.

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