

MEMORANDUM

Ref: 2000A

To: Michael J. Sievert, P.E.
MJS Engineering, P.C.

From: Stephen G. Pernaw, P.E., PTOE

Subject: Proposed Residential Development
Durham, New Hampshire

Date: February 21, 2020

As requested, Pernaw & Company, Inc. has conducted a trip generation analysis for the proposed residential development located off of Ambler Way in Durham, New Hampshire. The purpose of this memorandum is to summarize the results of our trip generation analyses for several different development scenarios as well as our trip distribution analysis. To summarize:

Proposed Development – According to the plan entitled “*Sketch Plan C*,” prepared by MJS Engineering, P.C. for Michael & Martha Mulhern (see Attachment 1), the proposed residential development will consist of ten residential dwelling units constructed along two separate cul-de-sac roadways. The site is located on the east side of Ambler Way at its intersection with Gerrish Drive. Access to the proposed development will be provided via a two-way site access road that will extend easterly from the Ambler Way/Gerrish Drive intersection.

At this juncture, consideration is being given to developing these dwellings as 10 age-restricted units or 10 condominium units. Alternatively, 8 single-family detached dwelling units are also being considered.

Trip Generation - To estimate the quantity of vehicle-trips that will be produced by the proposed residential development, Pernaw & Company, Inc. considered standard trip generation rates published by the Institute of Transportation Engineers¹ (ITE). Land Use Code LUC 210: (Single-Family Detached Housing), LUC 251: (Senior Adult Housing – Detached) and LUC 220: (Multifamily Housing/Low-Rise) are the most applicable categories and the number of dwelling units was utilized as the independent variables. The average “trip rate” method was utilized due to the small independent variable size (8-10 units).

The following table summarizes the results of the trip generation analyses for the three development scenarios. The computations pertaining to the trip generation analyses are attached (see Attachments 2 & 3).

¹ Institute of Transportation Engineers, *Trip Generation*, 10th Edition (Washington, D.C., 2017)

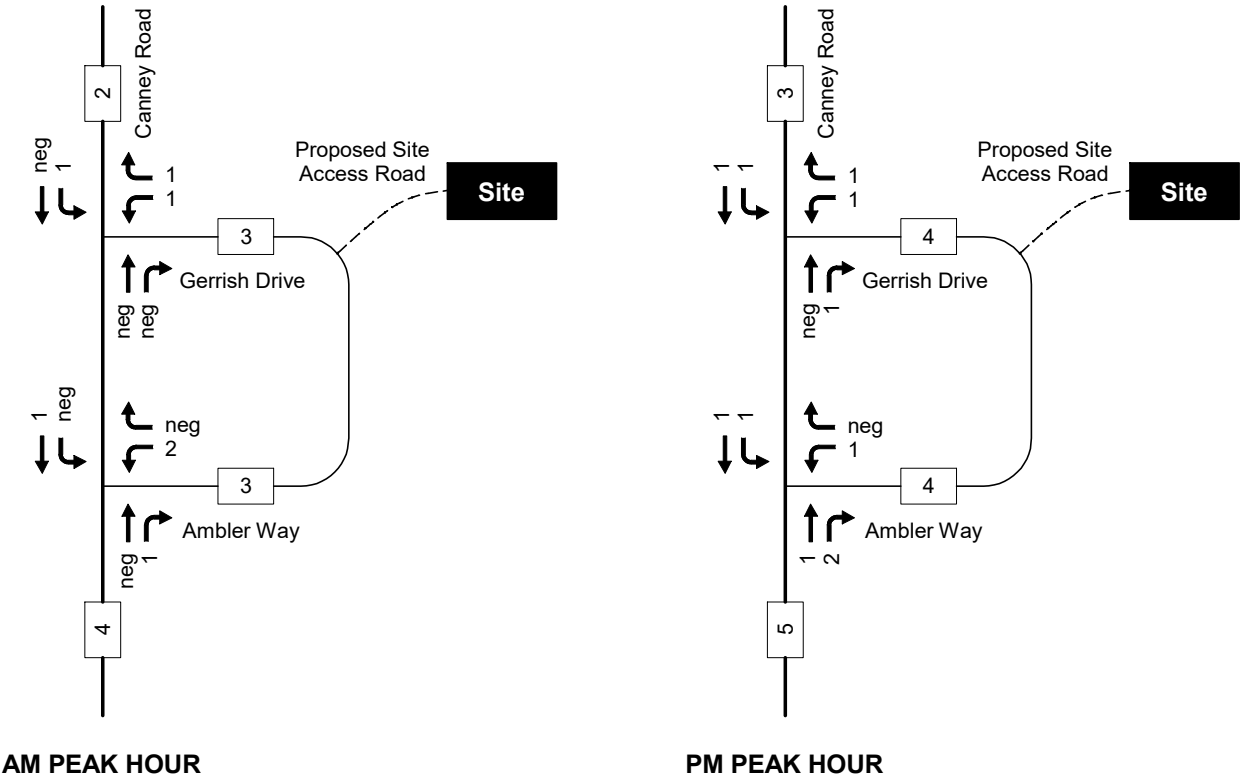
Table 1 **Trip Generation Summary / Comparison**

	<u>CASE A</u> ¹	<u>CASE B</u> ²	<u>CASE C</u> ³
	<u>Single-Family</u> (8 Dwelling Units)	<u>Age-Restricted</u> (10 Dwelling Units)	<u>Condominiums</u> (10 Dwelling Units)
Weekday Total			
Entering	38 veh	22 veh	37 veh
Exiting	<u>38 veh</u>	<u>22 veh</u>	<u>37 veh</u>
Total	76 trips	44 trips	74 trips
Weekday AM Peak Hour			
Entering	2 veh	1 veh	1 veh
Exiting	<u>4 veh</u>	<u>1 veh</u>	<u>4 veh</u>
Total	6 trips	2 trips	5 trips
Weekday PM Peak Hour			
Entering	5 veh	2 veh	4 veh
Exiting	<u>3 veh</u>	<u>1 veh</u>	<u>2 veh</u>
Total	8 trips	3 trips	6 trips
Saturday Total			
Entering	38 veh	14 veh	41 veh
Exiting	<u>38 veh</u>	<u>14 veh</u>	<u>41 veh</u>
Total	76 trips	28 trips	82 trips
Saturday Peak Hour			
Entering	4 veh	1 veh	4 veh
Exiting	<u>3 veh</u>	<u>1 veh</u>	<u>3 veh</u>
Total	7 trips	2 trips	7 trips

¹ITE Land Use Code 210 - Single-Family Detached Housing (Trip Rate Method due to Independent Variable Size)
²ITE Land Use Code 251 - Senior Adult Housing - Detached (Trip Rate Method due to Independent Variable Size)
³ITE Land Use Code 220 - Multifamily Housing/Low-Rise (Trip Rate Method due to Independent Variable Size)

This table shows that the proposed single-family residences (Case A) are estimated to generate approximately 6 vehicle-trips (2 arrivals, 4 departures) during the weekday AM peak hour and 8 vehicle-trips (5 arrivals, 3 departures) during the weekday PM peak hour. The age-restricted scenario (Case B) will generate the fewest trips, and the condominium case (Case C) will be comparable to Case A.

The highest hourly traffic volume that will be generated by the proposed development is only 8 vehicle-trips during the weekday PM peak hour period. It should be noted that site traffic will be immediately dispersed at the site entrance as one group will utilize Gerrish Drive for access and the remainder will utilize Ambler Way, depending upon the driver's origin or destination. Figure 1 shows the anticipated travel patterns in the immediate study area for Case A (8 single-family detached dwelling units). The trip distribution analysis is summarized on Attachment 4.



AM PEAK HOUR

PM PEAK HOUR

Figure 1

Site Generated Traffic Volumes
Traffic Evaluation, Proposed Residential Development, Durham, New Hampshire

Findings & Conclusions

1. Access to the proposed development is proposed via a two-way site access road that will extend from the Gerrish Drive/Ambler Way intersection.
2. The trip generation analysis indicates that the proposed development will generate approximately 3 to 8 vehicle-trips during the worst-case PM peak hour period; depending upon the development scenario.
3. Site traffic is expected to be split equally between Gerrish Drive and Ambler Way. This means each roadway will accommodate only +4 vehicles over a one-hour period (PM peak hour). This translates into one additional vehicle every 15 minutes, on average.
4. Traffic increases of this order of magnitude will not significantly impact traffic operations at nearby intersections.
5. Development sites that generate fewer than 500 vehicles per day are generally considered to be “low-volume” traffic generators. Clearly, none of the development scenarios constitute a major traffic generator.
6. The proposed site access road approach Gerrish Drive/Ambler Way should operate under STOP sign control (MUTCD R1-1) and include the installation of an 18-inch white stop line. As an option, the access road could be delineated with a four-inch double-yellow centerline to separate ingress and egress vehicles.

Attachments

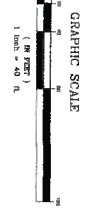


ATTACHMENTS

DATE: 10/10/19
SCALE: 1"=40'
DESIGNED BY: MJS
DRAWN BY: MJS
APPROVED BY: MJS
DWG FILE: 19063 CIVIL.dwg



- EXISTING MAJOR CONTOUR
- EDGE OF WETLANDS
 - 75'-FT. WETLANDS BUFFER (TOWN)
 - 100'-FT. WETLANDS BUFFER (TOWN)
 - 10'-FT. SIDEWALKS
 - 15'-FT. SIDEWALKS
 - 20'-FT. SIDEWALKS
 - 25'-FT. SIDEWALKS
 - 30'-FT. SIDEWALKS
 - 35'-FT. SIDEWALKS
 - 40'-FT. SIDEWALKS
 - 45'-FT. SIDEWALKS
 - 50'-FT. SIDEWALKS
 - 55'-FT. SIDEWALKS
 - 60'-FT. SIDEWALKS
 - 65'-FT. SIDEWALKS
 - 70'-FT. SIDEWALKS
 - 75'-FT. SIDEWALKS
 - 80'-FT. SIDEWALKS
 - 85'-FT. SIDEWALKS
 - 90'-FT. SIDEWALKS
 - 95'-FT. SIDEWALKS
 - 100'-FT. SIDEWALKS



**OPTION C
LAYOUT**



MJS ENGINEERING, P.C.
CIVIL • STRUCTURAL • ENVIRONMENTAL

1000 W. 10TH STREET
SUITE 200
DURHAM, NH 03824

DATE: 10/10/19
SCALE: 1"=40'
DESIGNED BY: MJS
DRAWN BY: MJS
APPROVED BY: MJS
DWG FILE: 19063 CIVIL.dwg

SKETCH PLAN C
prepared for
MICHAEL & MARTHA MULLER
MAIL 10, LOT 8-6
91 RASDALE ROAD
DURHAM, NH 03824

SEAL

NO.	REVISIONS	DATE	INT.

JOB: 19-063
L3.1

Trip Generation Summary

Alternative: Alternative 1

Phase:

Project: 2000A

Open Date: 2/11/2020

Analysis Date: 2/11/2020

ITE	Land Use	Weekday Average Daily Trips			Weekday AM Peak Hour of Adjacent Street Traffic			Weekday PM Peak Hour of Adjacent Street Traffic		
		* Enter	Exit	Total	* Enter	Exit	Total	* Enter	Exit	Total
210	SFHOUSE 1 8 Dwelling Units	38	38	76	2	4	6	5	3	8
220	LOW-RISE 1 10 Dwelling Units	37	36	73	1	4	5	4	2	6
251	SENIORDETACHED 1 10 Dwelling Units	22	21	43	1	1	2	2	1	3
Unadjusted Volume		97	95	192	4	9	13	11	6	17
Internal Capture Trips		0	0	0	0	0	0	0	0	0
Pass-By Trips		0	0	0	0	0	0	0	0	0
Volume Added to Adjacent Streets		97	95	192	4	9	13	11	6	17

Total Weekday Average Daily Trips Internal Capture = 0 Percent

Total Weekday AM Peak Hour of Adjacent Street Traffic Internal Capture = 0 Percent

Total Weekday PM Peak Hour of Adjacent Street Traffic Internal Capture = 0 Percent

* - Custom rate used for selected time period.

Trip Generation Summary

Alternative: Alternative 1

Phase:

Open Date: 2/11/2020

Project: 2000A

Analysis Date: 2/11/2020

ITE	Land Use	Saturday Average Daily Trips			Saturday Peak Hour of Generator				
		*	Enter	Exit	Total	*	Enter	Exit	Total
210	SFHOUSE 1 8 Dwelling Units		38	38	76		4	3	7
220	LOW-RISE 1 10 Dwelling Units		41	40	81				7
251	SENIORDETACHED 1 10 Dwelling Units		14	13	27		1	1	2
Unadjusted Volume			93	91	184		5	4	9
Internal Capture Trips			0	0	0		0	0	0
Pass-By Trips			0	0	0		0	0	0
Volume Added to Adjacent Streets			93	91	184		5	4	9

Total Saturday Average Daily Trips Internal Capture = 0 Percent

Total Saturday Peak Hour of Generator Internal Capture = 0 Percent

* - Custom rate used for selected time period.

Source: Institute of Transportation Engineers, Trip Generation Manual 10th Edition

TRIP GENERATION 10, TRAFFICWARE, LLC

P. 1

TRIP DISTRIBUTION ANALYSIS

A. Work Destination Report - Where Workers are Employed Who Live in the Selection Area - by County Subdivisions

To/From	Count	Gateway %		Gateway Allocation		
		North	South	North	South	
		Canney Rd	Canney Rd	Canney Rd	Canney Rd	
Durham town (Strafford, NH)	628	0.40	0.60	251	377	628
Portsmouth city (Rockingham, NH)	416	0.40	1.00	0	416	416
Dover city (Strafford, NH)	309	0.90	0.10	124	185	309
Manchester city (Hillsborough, NH)	191	0.90	0.10	172	19	191
Nashua city (Hillsborough, NH)	147	0.20	0.80	132	15	147
Exeter town (Rockingham, NH)	143	1.00	0.00	0	143	143
Salem town (Rockingham, NH)	121	1.00	0.00	24	97	121
Concord city (Merrimack, NH)	87	0.10	0.90	87	0	87
Rochester city (Strafford, NH)	85	0.10	0.90	9	77	86
Boston city (Suffolk, MA)	77	0.10	0.90	0	77	77
	2204			799	1406	2205
				36.2%	63.8%	100%
				35	65	100