

June 2, 2022

MAX-0465419.00

Mr. Tom Frawley  
Summit Distributing, LLC  
240 Mechanic Street  
Lebanon, New Hampshire 05477

SUBJECT: Trip Generation Letter  
Retail Motor Fuel Outlet  
1436 West Main Street (US Route 2)  
Richmond, Vermont

Dear Mr. Frawley:

**Greenman-Pedersen Inc.** (GPI) has prepared this letter to evaluate the expected trip increases to the site and adjacent roadways associated with the proposed retail motor fuel outlet redevelopment located at 1436 West Main Street (US Route 2) in Richmond, Vermont. The site currently contains a 1,514 square foot (SF) convenience store and gasoline facility consisting of 4 Multi-Product Dispensers (MPDs) having 8 vehicle fueling positions (vfps). As part of the redevelopment, the existing site will be razed and a 3,890 SF convenience store which includes a 640 sf quick service restaurant will be constructed along with a gasoline facility containing 4 MPDs having 8 vfps. In addition, two electric vehicle charging stations will be provided. Access and egress to the site is currently provided via one full access/egress driveway on West Main Street (US Route 2). No change in access/egress is proposed as part of the redevelopment.

## Trip Generation

To estimate the volume of traffic to be generated by the proposed redevelopment, trip-generation rates published by the Institute of Transportation Engineers (ITE) *Trip Generation Manual*<sup>1</sup> were researched. Land Use Code (LUC) 944 (Gasoline/Service Station) was used to estimate the existing trip generation of the current site. LUC 945 (Convenience Store/Gas Station) was used to estimate the trip generation of the proposed site. The trip generation worksheets are attached to this letter.

Not all of the vehicle trips expected to be generated by the proposed redevelopment represent *new* trips on the study area roadway system. Studies have shown that for developments such as the one proposed, a substantial portion of the site-generated vehicle trips are already present in the adjacent passing stream of traffic or are diverted from another route to the proposed site. For example, some vehicles which are already on the roadways may decide to visit the site on their way to another destination. Based on information published in the ITE *Trip Generation Manual*, the average *pass-by* trip percentage is 60 percent during the weekday AM peak hour and 56 percent during the weekday PM peak hour for a Convenience Store/Gas Station (LUC 945). Table 1 summarizes the results of the trip-generation estimates. The *pass-by* data are attached to this letter.

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<sup>1</sup> *Trip Generation, 11<sup>th</sup> Edition*. Institute of Transportation Engineers; Washington, DC; 2021.

**Table 1  
 TRIP-GENERATION SUMMARY**

Time Period/Direction	Existing Trips <sup>a</sup>	Proposed Trips <sup>b</sup>	Additional Trips		
			Total <sup>c</sup>	Pass-By <sup>d</sup>	New <sup>e</sup>
<b>Weekday Daily</b>	1,376	2,116	740	414	326
<b>Weekday AM Peak Hour:</b>					
<i>In</i>	41	64	23	14	9
<i>Out</i>	41	64	23	14	9
<i>Total</i>	82	128	46	28	18
<b>Weekday PM Peak Hour:</b>					
<i>In</i>	55	73	18	10	8
<i>Out</i>	56	74	18	10	8
<i>Total</i>	111	147	36	20	16
<b>Saturday Daily</b>	1,458	1,942	484	272	212
<b>Saturday Midday Peak Hour:</b>					
<i>In</i>	51	68	17	10	7
<i>Out</i>	51	68	17	10	7
<i>Total</i>	102	136	34	20	14

<sup>a</sup> ITE LUC 944 (Gasoline/Service Station) based on 8 vfps.

<sup>b</sup> ITE LUC 945 (Convenience Store/Gas Station) based on 8 vfps.

<sup>c</sup> Proposed Trip minus Existing Trips.

<sup>d</sup> 56 percent of the Total Additional Trips during the Weekday Daily, Weekday PM Peak Hour, Saturday Daily, and Saturday Midday Peak Hour and 60 percent of the Total Additional Trips during the Weekday AM Peak Hour.

<sup>e</sup> Total Additional Trips minus Pass-By Trips.

As shown in Table 1, the proposed retail motor fuel outlet is expected to generate 46 *additional* trips (23 entering and 23 exiting) during the weekday AM peak hour, 36 *additional* trips (18 entering and 18 exiting) during the weekday PM peak hour, and 34 *additional* trips (17 entering and 17 exiting) during the Saturday midday peak hour at the site driveway. On area roadways, however, the proposed retail motor fuel outlet is expected to add 18 *additional new* trips (9 entering and 9 exiting) during the weekday AM peak hour, 16 *additional new* trips (8 entering and 8 exiting) during the weekday PM peak hour, and 14 *additional new* trips (7 entering and 7 exiting) during the Saturday midday peak hour.

**Trip Distribution**

Having estimated project-generated vehicle trips, the next step is to determine the distribution of the project traffic and assign these trips to the local roadway network. The directional distribution of site traffic is dependent on expected travel route to and from the site and existing travel patterns. Based on traffic counts available on the Vermont Agency of Transportation (VTTrans) Transportation Data Management System website, approximately 50 percent of the site traffic is expected to/from the west along West Main Street (US Route 2) and approximately 50 percent to/from the east along West Main Street (US Route 2). Accordingly, traffic volume

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increases leading beyond the study area are anticipated to be between 7 to 9 vehicle trips. These increases represent, on average, one additional vehicle trip approximately every 6.5 to 8.5 minutes during the peak hours. The count data is attached to this letter.

Should you have any questions, or require additional information, please contact me at (978) 570-2968.

Sincerely,

**GREENMAN-PEDERSEN, INC.**



Heather L. Monticup, P.E.  
Assistant Vice President / Director of Traffic Engineering - Land Development

**Enclosures:**

**Trip Generation Data**  
**VTrans Count Data**

	EXISTING	PROPOSED	ADDITIONAL		
	LUC 944 8 VFPS	LUC 945 8 VFPS	Total Trips	Pass-By Trips	New Trips
<b>Weekday</b>					
Enter	688	1,058	370	207	163
Exit	<u>688</u>	<u>1,058</u>	<u>370</u>	<u>207</u>	<u>163</u>
Total	1,376	2,116	740	414	326
<b>Weekday AM</b>					
Enter	41	64	23	14	9
Exit	<u>41</u>	<u>64</u>	<u>23</u>	<u>14</u>	<u>9</u>
Total	82	128	46	28	18
<b>Weekday PM</b>					
Enter	55	73	18	10	8
Exit	<u>56</u>	<u>74</u>	<u>18</u>	<u>10</u>	<u>8</u>
Total	111	147	36	20	16
<b>Saturday</b>					
Enter	729	971	242	136	106
Exit	<u>729</u>	<u>971</u>	<u>242</u>	<u>136</u>	<u>106</u>
Total	1,458	1,942	484	272	212
<b>Saturday Midday</b>					
Enter	51	68	17	10	7
Exit	<u>51</u>	<u>68</u>	<u>17</u>	<u>10</u>	<u>7</u>
Total	102	136	34	20	14

	Pass-By
Weekday	56%
AM	60%
PM	56%
Saturday	56%
SAT	56%

**Institute of Transportation Engineers (ITE)**  
**Land Use Code (LUC) 944 - Gasoline/Service Station**  
**General Urban/Suburban**

Average Vehicle Trips Ends vs: Vehicle Fueling Positions  
Independent Variable (X): 8

**AVERAGE WEEKDAY DAILY**

$T = 172.01 * (X)$   
 $T = 172.01 * 8$   
 $T = 1376.08$   
 $T = 1,376$  vehicle trips  
with 50% ( 688 vpd) entering and 50% ( 688 vpd) exiting.

**WEEKDAY MORNING PEAK HOUR OF ADJACENT STREET TRAFFIC**

$T = 10.28 * (X)$   
 $T = 10.28 * 8$   
 $T = 82.24$   
 $T = 82$  vehicle trips  
with 50% ( 41 vph) entering and 50% ( 41 vph) exiting.

**WEEKDAY EVENING PEAK HOUR OF ADJACENT STREET TRAFFIC**

$T = 13.91 * (X)$   
 $T = 13.91 * 8$   
 $T = 111.28$   
 $T = 111$  vehicle trips  
with 50% ( 55 vph) entering and 50% ( 56 vph) exiting.

**SATURDAY DAILY**

$T = 182.17 * (X)$   
 $T = 182.17 * 8$   
 $T = 1457.36$   
 $T = 1,458$  vehicle trips  
with 50% ( 729 vpd) entering and 50% ( 729 vpd) exiting.

**SATURDAY PEAK HOUR OF GENERATOR**

$T = 12.77 * (X)$   
 $T = 12.77 * 8$   
 $T = 102.16$   
 $T = 102$  vehicle trips  
with 50% ( 51 vph) entering and 50% ( 51 vph) exiting.

**Institute of Transportation Engineers (ITE)**  
**Land Use Code (LUC) 945 - Convenience Store/Gas Station**  
**Subcategory: GFA (2-4k)**  
**General Urban/Suburban**

Average Vehicle Trips Ends vs: Vehicle Fueling Positions  
 Independent Variable (X): 8

**AVERAGE WEEKDAY DAILY**

$$T = 158.28 * (X) + 850.23$$

$$T = 158.28 * 8 + 850.23$$

$$T = 2116.47$$

T = 2,116 vehicle trips  
 with 50% ( 1,058 vph) entering and 50% ( 1,058 vph) exiting.

**WEEKDAY MORNING PEAK HOUR OF ADJACENT STREET TRAFFIC**

$$T = 16.06 * (X)$$

$$T = 16.06 * 8$$

$$T = 128.48$$

T = 128 vehicle trips  
 with 50% ( 64 vph) entering and 50% ( 64 vph) exiting.

**WEEKDAY EVENING PEAK HOUR OF ADJACENT STREET TRAFFIC**

$$T = 18.42 * (X)$$

$$T = 18.42 * 8$$

$$T = 147.36$$

T = 147 vehicle trips  
 with 50% ( 73 vph) entering and 50% ( 74 vph) exiting.

**SATURDAY DAILY**

$$\frac{\text{ITE LUC 945 [4-5.5k] Saturday Daily Trip Rate}}{\text{ITE LUC 945 [4-5.5k] Saturday Midday Trip Rate}} = \frac{\text{ITE LUC 945 [2-4k] Saturday Daily Trip Rate}}{\text{ITE LUC 945 [2-4k] Saturday Midday Trip Rate}}$$

$$\frac{291.67}{20.44} = \frac{(Y)}{17.01} \quad Y = 242.73$$

$$T = Y * 8$$

$$T = 1941.80$$

T = 1,942 vehicle trips  
 with 50% ( 971 vpd) entering and 50% ( 971 vpd) exiting.  
*(same distribution split as ITE LUC 945 [4-5.5k] during the saturday daily traffic)*

**SATURDAY PEAK HOUR OF GENERATOR**

$$T = 17.01 * (X)$$

$$T = 17.01 * 8$$

$$T = 136.08$$

T = 136 vehicle trips  
 with 50% ( 68 vph) entering and 50% ( 68 vph) exiting.

**Vehicle Pass-By Rates by Land Use**

Source: ITE Trip Generation Manual, 11th Edition

Land Use Code	945									
Land Use	Convenience Store/Gas Station									
Setting	General Urban/Suburban									
Time Period	Weekday AM Peak Period									
# Data Sites	16 Sites with between 2 and 8 VFP					28 Sites with between 9 and 20 VFP				
Average Pass-By Rate	60% for Sites with between 2 and 8 VFP					76% for Sites with between 9 and 20 VFP				
Pass-By Characteristics for Individual Sites										
GFA (000)	VFP	State or Province	Survey Year	# Interviews	Pass-By Trip (%)	Non-Pass-By Trips			Adj Street Peak Hour Volume	Source
						Primary (%)	Diverted (%)	Total (%)		
2	8	Maryland	1992	46	87	13	0	13	2235	25
2.1	6	Maryland	1992	26	58	23	19	42	2080	25
2.1	6	Maryland	1992	26	58	23	19	42	2080	25
2.2	8	Maryland	1992	31	47	34	19	53	1785	25
2.2	< 8	Indiana	1993	79	56	6	38	44	635	2
2.2	8	Maryland	1992	35	78	9	13	22	7080	25
2.3	6	Maryland	1992	37	32	41	27	68	2080	25
2.3	< 8	Kentucky	1993	58	64	5	31	36	1255	2
2.3	6	Maryland	1992	37	32	41	27	68	2080	25
2.4	< 8	Kentucky	1993	—	48	17	35	52	1210	2
2.6	< 8	Kentucky	1993	—	72	15	13	28	940	2
2.8	< 8	Kentucky	1993	—	54	11	35	46	1240	2
3	< 8	Indiana	1993	62	74	10	16	26	790	2
3.6	< 8	Kentucky	1993	49	67	4	29	33	1985	2
3.7	< 8	Kentucky	1993	49	66	16	18	34	990	2
4.694	12	Maryland	2000	—	72	—	—	28	2440	30
4.694	12	Maryland	2000	—	78	—	—	22	1561	30
4.694	12	Maryland	2000	—	79	—	—	21	2764	30
4.848	12	Virginia	2000	—	55	—	—	45	1398	30
5.06	12	Pennsylvania	2000	—	84	—	—	16	3219	30
5.242	12	Virginia	2000	—	74	—	—	26	1160	30
5.242	12	Virginia	2000	—	71	—	—	29	548	30
5.488	12	Delaware	2000	—	80	—	—	20	—	30
5.5	12	Pennsylvania	2000	—	85	—	—	15	2975	30
4.2	< 8	Kentucky	1993	47	62	19	19	38	1705	2
4.694	16	Maryland	2000	—	90	—	—	10	2278	30
4.694	16	Delaware	2000	—	74	—	—	26	2185	30
4.694	16	Delaware	2000	—	58	—	—	42	962	30
4.694	16	Delaware	2000	—	84	—	—	16	2956	30
4.694	16	New Jersey	2000	—	79	—	—	21	1859	30
4.694	20	Delaware	2000	—	84	—	—	16	3864	30
4.848	16	Virginia	2000	—	68	—	—	32	2106	30
4.848	16	Virginia	2000	—	85	—	—	15	2676	30
4.848	16	Virginia	2000	—	75	—	—	25	3244	30
4.848	16	Virginia	2000	—	71	—	—	29	1663	30
4.993	16	Pennsylvania	2000	—	75	—	—	25	1991	30
5.094	16	New Jersey	2000	—	86	—	—	14	1260	30
5.5	16	Pennsylvania	2000	—	82	—	—	18	1570	30
5.543	16	Pennsylvania	2000	—	84	—	—	16	1933	30
5.565	16	Pennsylvania	2000	—	77	—	—	23	2262	30
5.565	16	Pennsylvania	2000	—	68	—	—	32	2854	30
5.565	16	New Jersey	2000	—	58	—	—	42	1253	30
5.565	16	New Jersey	2000	—	79	—	—	21	1928	30
5.565	16	New Jersey	2000	---	84	---	---	16	1953	30

**Vehicle Pass-By Rates by Land Use**

Source: ITE Trip Generation Manual, 11th Edition

Land Use Code	945									
Land Use	Convenience Store/Gas Station									
Setting	General Urban/Suburban									
Time Period	Weekday PM Peak Period									
# Data Sites	12 Sites with between 2 and 8 VFP					28 Sites with between 9 and 20 VFP				
Average Pass-By Rate	56% for Sites with between 2 and 8 VFP					75% for Sites with between 9 and 20 VFP				
Pass-By Characteristics for Individual Sites										
GFA (000)	VFP	State or Province	Survey Year	# Interviews	Pass-By Trip (%)	Non-Pass-By Trips			Adj Street Peak Hour Volume	Source
						Primary (%)	Diverted (%)	Total (%)		
2.1	8	Maryland	1992	31	52	13	35	48	1785	25
2.1	6	Maryland	1992	30	53	20	27	47	1060	25
2.2	< 8	Indiana	1993	115	48	16	36	52	820	2
2.3	< 8	Kentucky	1993	67	57	16	27	43	1954	2
2.3	6	Maryland	1992	55	40	11	49	60	2760	25
2.4	< 8	Kentucky	1993	—	58	13	29	42	2655	2
2.6	< 8	Kentucky	1993	68	67	15	18	33	950	2
2.8	< 8	Kentucky	1993	—	62	11	27	38	2875	2
3	< 8	Indiana	1993	80	65	15	20	35	1165	2
3.6	< 8	Kentucky	1993	60	56	17	27	44	2505	2
3.7	< 8	Kentucky	1993	70	61	16	23	39	2175	2
4.2	< 8	Kentucky	1993	61	58	26	16	42	2300	2
4.694	12	Maryland	2000	—	78	—	—	22	3549	30
4.694	12	Maryland	2000	—	67	—	—	33	2272	30
4.694	12	Maryland	2000	—	66	—	—	34	3514	30
4.848	12	Virginia	2000	—	71	—	—	29	2350	30
5.06	12	Pennsylvania	2000	—	91	—	—	9	4181	30
5.242	12	Virginia	2000	—	70	—	—	30	2445	30
5.242	12	Virginia	2000	—	56	—	—	44	950	30
5.488	12	Delaware	2000	—	73	—	—	27	—	30
5.5	12	Pennsylvania	2000	—	84	—	—	16	4025	30
4.694	16	Maryland	2000	—	89	—	—	11	2755	30
4.694	16	Delaware	2000	—	73	—	—	27	1858	30
4.694	16	Delaware	2000	—	59	—	—	41	1344	30
4.694	16	Delaware	2000	—	72	—	—	28	3434	30
4.694	16	New Jersey	2000	—	81	—	—	19	1734	30
4.694	20	Delaware	2000	—	76	—	—	24	1616	30
4.848	16	Virginia	2000	—	67	—	—	33	2.954	30
4.848	16	Virginia	2000	—	78	—	—	22	3086	30
4.848	16	Virginia	2000	—	83	—	—	17	4143	30
4.848	16	Virginia	2000	—	73	—	—	27	2534	30
4.993	16	Pennsylvania	2000	—	72	—	—	28	2917	30
5.094	16	New Jersey	2000	—	86	—	—	14	1730	30
5.5	16	Pennsylvania	2000	—	90	—	—	10	2616	30
5.543	16	Pennsylvania	2000	—	87	—	—	13	2363	30
5.565	16	Pennsylvania	2000	—	81	—	—	19	2770	30
5.565	16	Pennsylvania	2000	—	76	—	—	24	3362	30
5.565	16	New Jersey	2000	—	61	—	—	39	1713	30
5.565	16	New Jersey	2000	—	86	—	—	14	1721	30
5.565	16	New Jersey	2000	---	81	---	---	19	2227	30



Location Info		Count Data Info	
Location ID	D112_EB	Start Date	8/18/2015
Type	I-SECTION	End Date	8/19/2015
Functional Class	5	Start Time	12:00 AM
Located On	W Main St	End Time	12:00 AM
		Direction	
Direction	EB	Notes	
Community	Richmond	Count Source	D112_EB
MPO_ID		File Name	D112_EB.txt
HPMS ID	U002049.864	Weather	
Agency	Vermont Agency of Transportation	Study	
		Owner	jblodgett
		QC Status	Accepted

Interval: 15 mins					
Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	5	7	3	4	19
01:00 - 02:00	3	4	2	7	16
02:00 - 03:00	0	2	0	3	5
03:00 - 04:00	3	0	1	3	7
04:00 - 05:00	2	3	2	2	9
05:00 - 06:00	0	4	7	6	17
06:00 - 07:00	20	15	25	31	91
07:00 - 08:00	29	42	61	58	190
08:00 - 09:00	53	46	68	62	229
09:00 - 10:00	67	59	67	80	273
10:00 - 11:00	50	69	63	73	255
11:00 - 12:00	73	84	67	78	302
12:00 - 13:00	74	80	79	67	300
13:00 - 14:00	79	86	92	80	337
14:00 - 15:00	83	70	64	83	300
15:00 - 16:00	96	100	101	115	412
16:00 - 17:00	135	130	132	172	569
17:00 - 18:00	168	173	165	133	639
18:00 - 19:00	139	100	87	96	422
19:00 - 20:00	79	59	61	55	254
20:00 - 21:00	41	52	51	41	185
21:00 - 22:00	29	39	28	27	123
22:00 - 23:00	28	20	19	11	78
23:00 - 24:00	12	12	9	18	51
TOTAL					5083

51%

Location Info	
Location ID	D112_WB
Type	I-SECTION
Functional Class	5
Located On	W Main St
Direction	WB
Community	Richmond
MPO_ID	
HPMS ID	U002049.864
Agency	Vermont Agency of Transportation

Count Data Info	
Start Date	8/18/2015
End Date	8/19/2015
Start Time	12:00 AM
End Time	12:00 AM
Direction	
Notes	
Count Source	D112_WB
File Name	D112_WB.txt
Weather	
Study	
Owner	jblodgett
QC Status	Accepted

Interval: 15 mins					
Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	3	3	4	1	11
01:00 - 02:00	2	2	2	1	7
02:00 - 03:00	2	1	3	0	6
03:00 - 04:00	2	3	5	1	11
04:00 - 05:00	5	6	13	16	40
05:00 - 06:00	10	13	43	42	108
06:00 - 07:00	42	59	99	90	290
07:00 - 08:00	103	137	168	158	566
08:00 - 09:00	127	128	126	104	485
09:00 - 10:00	63	97	88	79	327
10:00 - 11:00	79	83	85	64	311
11:00 - 12:00	69	68	81	85	303
12:00 - 13:00	68	67	70	70	275
13:00 - 14:00	71	79	96	79	325
14:00 - 15:00	72	77	80	71	300
15:00 - 16:00	87	82	86	73	328
16:00 - 17:00	70	77	79	75	301
17:00 - 18:00	94	99	92	77	362
18:00 - 19:00	64	64	50	54	232
19:00 - 20:00	43	41	37	28	149
20:00 - 21:00	30	36	29	19	114
21:00 - 22:00	14	25	12	16	67
22:00 - 23:00	5	11	14	12	42
23:00 - 24:00	3	8	5	1	17
TOTAL					4977

49%

Location Info	
Location ID	D112
Type	I-SECTION
Functional Class	5
Located On	W Main St
Direction	2-WAY
Community	Richmond
MPO_ID	
HPMS ID	U002049.864
Agency	Vermont Agency of Transportation

Count Data Info	
Start Date	8/18/2015
End Date	8/19/2015
Start Time	12:00 AM
End Time	12:00 AM
Direction	
Notes	
Count Source	D112_WB
File Name	
Weather	
Study	
Owner	jblodgett
QC Status	Accepted

Interval: 15 mins					
Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	8	10	7	5	30
01:00 - 02:00	5	6	4	8	23
02:00 - 03:00	2	3	3	3	11
03:00 - 04:00	5	3	6	4	18
04:00 - 05:00	7	9	15	18	49
05:00 - 06:00	10	17	50	48	125
06:00 - 07:00	62	74	124	121	381
07:00 - 08:00	132	179	229	216	756
08:00 - 09:00	180	174	194	166	714
09:00 - 10:00	130	156	155	159	600
10:00 - 11:00	129	152	148	137	566
11:00 - 12:00	142	152	148	163	605
12:00 - 13:00	142	147	149	137	575
13:00 - 14:00	150	165	188	159	662
14:00 - 15:00	155	147	144	154	600
15:00 - 16:00	183	182	187	188	740
16:00 - 17:00	205	207	211	247	870
17:00 - 18:00	262	272	257	210	1001
18:00 - 19:00	203	164	137	150	654
19:00 - 20:00	122	100	98	83	403
20:00 - 21:00	71	88	80	60	299
21:00 - 22:00	43	64	40	43	190
22:00 - 23:00	33	31	33	23	120
23:00 - 24:00	15	20	14	19	68
TOTAL					10060