![vhb logo]

Memorandum

To:	City of Newton	Date:	September 3, 2019
		Project #:	10865.03
From:	Randall C. Hart, Principal	Re:	Riverside Redevelopment
			Program Modification Traffic Generation
	Matthew Duranleau, EIT		Newton, Massachusetts

VHB, on behalf of Mark Development (The Proponent) has prepared a traffic generation memorandum to outline program traffic generation changes for the project known as The Station at Riverside (The Project). The Project is located on an approximately 14.4-acre site along Grove Street in Newton, Massachusetts (The Site). The Site is currently home to the Massachusetts Bay Transportation Authority's (MBTA) Riverside Station, the terminus of the D Branch on the Green Line, and the existing Indigo Hotel.

Based on discussions with the City and to be responsive to concerns expressed by the public, the project program is being modified (reduced) in scale. The Project initially included approximately 1.47 million gross square feet (sf) of development, which was described in detail in the March 2019 Transportation Impact and Access Study. The revised project as of September 2019 will include approximately 1.23 million gross sf of development, which constitutes an approximately 200,000 sf reduction in building program.

The proposed changes in the building program is summarized in Table 1.

Table 1   Riverside Redevelopment Changes in Building Program

Land Use	Existing Site	TIAS Building Program [a]	September 2019 Building Program	Change in Building Program
Hotel	194 rooms	194 rooms	154 rooms	**- 40 rooms**
Office	n/a	562,247 sf	523,509 sf	**- 38,738 sf**
Residential	n/a	675 units	524 units	**- 151 units**
Retail/Restaurant	n/a	64,609 sf	71,070 sf	**+ 6,461 sf**
Parking Spaces	960 [b]	2,866 spaces	2,758 spaces	**- 108 spaces**

a   Building Program as outlined in March 2019 TIA for the Station at Riverside Development.
b   Existing parking space count only includes MBTA parking spaces.

The revised building program results in 40 fewer hotel rooms, 38,738 less square feet of total proposed office space, 151 fewer proposed residential units, 6,461 additional square feet of proposed retail space, and 108 fewer parking spaces on-Site than previously proposed.

An analysis of the revised program is presented below:

Trip Generation Summary

To assess the changes that would be expected as a result of the program modifications, traffic generation projections have been prepared for the revised program. The rate at which any development generates traffic is dependent upon the size, location, and concentration of surrounding developments. As mentioned previously, the Project is comprised

of office, residential, hotel, and retail use. The ITE *Trip Generation Manual*[1] categorizes these land uses and provides weekday daily, weekday morning peak hour, and weekday evening peak hour unadjusted vehicle trip generation estimates for each use. The trip generation estimates for the proposed uses were projected using Land Use Code (LUC) 221 (Mid-Rise Residential), LUC 310 (Hotel), LUC 710 (General Office Building), and LUC 820 (Shopping Center).

The change in total site-generated vehicle trips with the building program is summarized below in Table 2 and a breakdown of the detailed trip generation analyses for the revised building program as requested by the City of Newton Planning Department is described in the following sections.

Table 2   Total Site-Generated Vehicle Trip Generation Comparison

		Total Site-Generated Vehicle Trips			
Time Period	Direction	Existing Hotel / MBTA Trips [a]	Previously Proposed Building Program [b]	Revised Building Program [c]	Total Trip Difference
Weekday Morning	Enter	295	853	837	- 16
Peak Hour	Exit	170	399	351	- 48
	Total	465	1,252	1,188	- 64
Weekday Evening	Enter	200	494	478	- 16
Peak Hour	Exit	270	906	911	+ 5
	Total	470	1,400	1,389	- 11

a   Based on empirical counts conducted by VHB; from Table 4 in the Station at Riverside Redevelopment TIA.
b   Trip generation estimate including credits for mode share, internal capture, and existing trips; from Table 8 in the Station at Riverside Redevelopment TIA (includes MBTA-generated traffic).
c   Trip generation estimate for entire building program and including credits for mode share, internal capture, and existing trips; breakdown of trip generation by use and credit is described in the following sections below (includes MBTA-generated traffic).

As shown in Table 2, the revised building program as compared to the previous building program will result in 64 fewer vehicle trips (-16 entering / -48 exiting) during the weekday morning peak hour and 11 fewer vehicle trips (-16 entering / +5 exiting) during the weekday evening peak hour.

Project-Generated Trips

Estimating future conditions volumes for the Site involved a review of the existing development on those parcels, along with the additional trip generation expected from the Project development.

Existing Site-Generated Traffic

The planned development parcels currently are occupied by the Hotel Indigo, which features 194 hotel rooms and an on-site restaurant, and a commuter park and ride, kiss and ride, and pick-up / drop-off loop for the MBTA Riverside Station featuring approximately 960 parking spaces. The vehicular Site trip generation for the weekday morning and weekday evening peak hours under existing conditions was estimated based on turning movement counts conducted at the two Site driveways. Table 3 summarizes the Project-related trips for the existing uses on Site.

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

Table 3   Existing Site Trip Generation

	Hotel [a]	MBTA Station [a]	Total Vehicle Trips
Weekday Morning			
Enter	45	250	**295**
Exit	45	125	**170**
Total	90	375	**465**
Weekday Evening			
Enter	50	150	**200**
Exit	35	235	**270**
Total	85	385	**470**

a   Based on turning movement counts conducted by VHB in October 2018.
b   Based on turning movement counts conducted by VHB in June 2018.

As shown in Table 3, the Site under existing conditions currently generates approximately 465 vehicular trips (295 entering / 170 exiting) during the weekday morning peak hour and 470 vehicular trips (200 entering / 270 exiting) during the weekday evening peak hour. It should be noted that the existing Site also contains the Riverside MBTA maintenance yard and supporting facilities, but it was assumed that the maintenance yard generated negligible trips during the weekday morning and weekday evening peak hours.

It is expected that the existing MBTA Station-generated vehicular trips will continue to be generated by the Site under future conditions. A parking garage with approximately 958 parking spaces for commuters and a pick-up / drop-off loop near the station entrance will be provided on Site to accommodate the commuters that use the Riverside MBTA Station today. While the site under existing conditions contains a 194-room hotel, the proposed building program includes a 154-room hotel, which is 40-rooms fewer than the existing hotel. Therefore, it is expected that the proposed hotel will generate a different number of peak hour trips than the existing hotel. To be consistent with the analysis for the rest of the proposed building program, ITE data was used to project the future number of hotel trips as opposed to the existing driveway counts.

Unadjusted Project-Generated Traffic

The proposed development will consist of a mixture of residential, office, hotel, and supporting retail uses. Specifically, the Site is proposed to include approximately 524 residential units, 523,509 sf of office space, a 154-room hotel, 71,070 sf of supporting restaurant/retail uses, and 2,758 parking spaces on-Site to accommodate the proposed development and the commuters using the Riverside MBTA Station. Traffic associated with the residential units was estimated using ITE LUC 221 (Mid-Rise Residential), traffic associated with the hotel was estimated using ITE LUC 310 (Hotel), traffic associated with the office space was estimated using ITE LUC 710 (General Office Building), and traffic associated with the retail uses was estimated with ITE LUC 820 (Shopping Center). As noted previously, traffic associated with the MBTA station was estimated based on the observed existing Site-generated vehicular trips.

Approximately 10,000 sf of the proposed office space to be built will be dedicated office space for the Riverside MBTA maintenance yard on-Site and will be transferred from an existing one-story office building that is located within the maintenance yard. While this small portion of office space will not be considered a new use and will replace existing office on-Site, to present a conservative analysis all of the proposed office space on-Site was analyzed as a new use and no existing trip credits were applied.

It should be noted that the retail uses are expected to be smaller, Main Street style businesses catering to the residential and office space on-Site and the adjacent neighborhoods as opposed to large big-box style retail stores. Potential uses will include small eating establishments, coffee shops, pharmacies, convenience stores, or gallery uses. While these do not fit the exact description of a traditional ITE "Shopping Center", retail traffic was estimated using this land use code, which results in an overly conservative analysis.

The unadjusted new vehicle trip estimates are presented in Table 4 and trip generation worksheets are included in the Appendix.

Table 4   Project Trip Generation – <u>Unadjusted</u> Vehicle Trips

	Residential [a]	Hotel [b]	Office [c]	Retail [d]	Total New Unadjusted Vehicle Trips
Weekday Daily					
Enter	1,427	656	2,643	2,383	**7,109**
Exit	1,427	656	2,643	2,383	**7,109**
Total	2,854	1,312	5,286	4,766	**14,217**
Weekday Morning					
Enter	45	42	446	116	**650**
Exit	128	29	73	17	**302**
Total	174	72	519	187	**951**
Weekday Evening					
Enter	133	46	88	203	**469**
Exit	85	44	461	219	**809**
Total	217	89	549	422	**1,277**

a   Based on ITE LUC 221 (Mid-Rise Residential) for 524 residential units.
b   Based on ITE LUC 310 (Hotel) for 154 rooms
c   Based on ITE LUC 710 (General Office Building) for 523,509 sf
d   Based on ITE LUC 820 (Shopping Center) for 71,070 sf
Note: MBTA Station generated trips are already generated under existing conditions and therefore are not included as "new" trips to the Site.

Person Trips

The unadjusted vehicle trips are converted into person trips by applying the average vehicle occupancy (AVO) of 1.13 for residential and office trips and of 1.78 for retail trips, as outlined by the U.S. Department of Transportation[2]. The unadjusted vehicle trips were converted into person trips in order to apply internal capture credits and applicable mode share credits, as described below. Applying these credits to person trips allows for estimates to be made for the total number of Site-generated transit users, walkers, and bicyclists in addition to the total number of Site-generated vehicles.

[2]   Summary of Travel Trends: 2009 National Household Survey, US Department of Transportation, Federal Highway Administration, Washington D.C., 2009

Internal Capture Trips

Since the proposed development is a mixed-use project, the trip generation characteristics of the Site will be different from a single-use project. Some of the traffic to be generated by the proposed development will be contained on site as "internal" or "shared vehicle" trips. For example, workers at the office space on Site may patron the retail shops after work, or residents who live in the development may also work in the office 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.

As described in the ITE Trip Generation Handbook[3] "because of the complementary nature of these land uses, some trips are made among the on-site uses. This capture of trips internal to the site has the net effect of reducing vehicle trip generation between the overall development site and the external street system (compared to the total number of trips generated by comparable land uses developed individually on stand-alone sites) an internal capture rate can generally be defined as the percentage of total person trips generated by a site that are made entirely within the site. The trip origin, destination, and travel path are all within the site."

Based on the methodology outlined in the ITE Trip Generation Handbook, internal capture rates were applied to the gross person trips. Internal capture worksheets are included in the Appendix to this report.

Mode Share

The Project is conveniently located at the Riverside MBTA Station, providing direct access to both the MBTA Green Line and several MBTA bus routes, local shuttles, etc. and making it a true Transit Oriented Development. Mode shares for the proposed development were assigned in the March 2019 TIA based on research and previously submitted traffic studies. Table 5 provides a summary of the projected mode shares by land use.

Table 5   Project Mode Share

Use	Vehicle	Transit	Walk/Bike
Residential	75%	25%	0%
Office	95%	5%	0%
Retail	100%	0%	0%

While the mode shares listed above may be conservative for a transit-oriented development, these mode shares were used for the traffic analyses to be consistent with the 2015 FEIR for the previously proposed Riverside redevelopment. The 2015 FIER used conservative mode shares at the direction of MassDOT to provide a conservative analysis and the updated traffic study follows the same conservative methodology. It should be noted that transit analyses will be conducted for the updated environmental impact report process and will use the mode shares presented in Table 5 as well as another set of mode shares with a proposed higher share of transit usage to provide a more conservative transit impact analysis.

The mode shares discussed above were applied to the net-new person trips to generate the adjusted Project trips by mode. The local average vehicle occupancy, based US Census data for each primary use, was then applied to the vehicle mode to reflect the number of vehicle trips generated by the Site.

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[3]   Trip Generation Handbook, 3rd Edition, Institute of Transportation Engineers, Washington, D.C., 2017.

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Pass-By Trips

While the ITE rates provide estimates for all the traffic associated with each land use, not all of the traffic generated by the Project will be new to the area roadways. A portion of the vehicle-trips generated by the retail land use will likely be drawn from the traffic volume roadways adjacent to the Project Site. For example, someone traveling on Grove Street may choose to deviate from their original travel path to visit the site retail, before heading back to continue to their final destination. For this evaluation, ITE pass-by rates for LUC 820 (Shopping Center) were utilized for the retail trip generation and applied to existing trips on Grove Street. Specifically, 34-percent of the retail trip generation was assumed to be drawn from the surrounding roadway network during the weekday evening peak hour, as outlined in the ITE Trip Generation Handbook. For all other time periods studied, a 25-percent pass-by rate was assumed.

Project-Generated Trips

As described above, internal capture credit, mode share credit, and pass-by credit for the retail portion of the Project was applied to the unadjusted new vehicle trips presented in Table 4 to develop the net new trips expected to be generated by the Site. Table 6 presents the Project-generated net new peak hour trips by mode and Table 7 presents the Project-generated net new vehicle peak hour trips by land use.

Table 6   Net New Project-Generated Peak-Hour Trips by Mode

	Net Vehicle Trips [a]	Net New Transit Trips
Weekday Morning		
Enter	513	37
Exit	168	40
Total	681	77
Weekday Evening		
Enter	211	25
Exit	561	39
Total	773	64

a   Net vehicle trips not including pass-by trips associated with the retail portion.
Note: MBTA Station generated trips are already generated under existing conditions and therefore are not included as "new" trips to the Site.

As shown in Table 6, the Project is expected to generate between 64 and 77 new transit trips during the weekday morning and weekday evening peak hours and between 681 and 773 net vehicular trips during the same peak hours. The breakdown of the vehicle trips by use are summarized below in Table 7.

Table 7   Project-Generated Peak-Hour Vehicle Trips by Use

	Residential [a]	Hotel [b]	Office [c]	Retail [d]	Total Net Vehicle Trips [e]	Existing Hotel Trips [f]	Total Net New Vehicle Trips [g]	Pass-By [h]	Existing MBTA Trips [i]	Total Site-Generated Vehicle Trips [j]
Weekday Morning										
Enter	35	42	412	78	**567**	-45	**522**	20	250	**837**
Exit	98	16	53	39	**206**	-45	**161**	20	125	**351**
Total	133	58	465	117	**773**	-90	**683**	40	375	**1,188**
Weekday Evening										
Enter	52	36	78	106	**272**	-50	**222**	56	150	**478**
Exit	37	40	431	112	**620**	-35	**585**	56	235	**911**
Total	89	76	509	218	**892**	-85	**807**	112	385	**1,389**

a	Residential vehicle trips with internal capture and mode share credits applied.
b	Hotel vehicle trips with internal capture and mode share credits applied (does not include removal of existing hotel trips).
c	Office vehicle trips with internal capture and more share credits applied.
d	Retail vehicle trips with internal capture and pass-by credits applied.
e	Sum of columns a through d.
f	Existing Hotel Indigo trips based on traffic counts conducted by VHB in October 2018.
g	Sum of columns e and f.
h	Pass-by Credits of 25% and 34% applied to weekday morning and weekday evening peak hour retail trip generation, respectively.
i	MBTA Station trips based on traffic counts conducted by VHB in June 2018.
j	Sum of columns e, h, and i.

As shown in Table 7, the Project is expected to generate a total of 1,188 vehicle trip (837 entering / 351 exiting) during the weekday morning peak hour and 1,389 vehicle trips (478 entering / 911 exiting) during the weekday evening peak hour. However, these totals include traffic already generated on-Site by the hotel and the MBTA station and pass-by trips that will not be added as new trips to the roadway. After considering the existing traffic generation and the pass-by trips, the Project will result in an additional 683 vehicle trips (522 entering / 161 exiting) during the weekday morning peak hour and 807 vehicle trips (222 entering / 585 exiting) during the weekday evening peak hour to the roadway network.

As discussed previously, the Site currently contains a 194-room hotel and the proposed revised building program includes a 154-room hotel (which is a reduction of 40 rooms from existing). The trip generation analyses summarized above include this reduction of hotel rooms on-Site, as the proposed hotel is expected to generate fewer trips than the existing hotel. The proposed hotel trip generation is based on ITE data to be consistent with the rest of the development trip generation while the existing hotel trip generation is based on driveway counts conducted by VHB in October 2018.

Traffic Volumes

For the purpose of demonstration, project traffic volumes under the revised building program have been provided for the key intersections surrounding the Site and are included in the Attachments to this memorandum. It should be noted that an updated traffic impact and access study is currently being prepared with the revised building program. VHB expects that document will be available and submitted to the City the first week of October 2019.

Attachments

- Site-Generated Volume Figures

- Trip Generation Worksheets

- Shared Trip Calculations

5
(7)
(79)
(30)
26
250 [10]
158

6
[31]
[13]
8
9 [10]
71
[20] (14)
(32)
[10] 39
39
(18)

4
88 [10]
[-10]
[10] (23)
[10] (22)
[-10]

3
(22)
[-10]

2
(30)
(22)
[10] 250
[-10]

1
(12)
(41)
209
41

128
INTERSTATE
95

SITE

6
4
5
3
2
1

Exit 24, 25

Exit 22, 23

XX - Entering Volumes
(XX) - Exiting Volumes
[XX] - Pass-By Volumes

0   250   500 Feet

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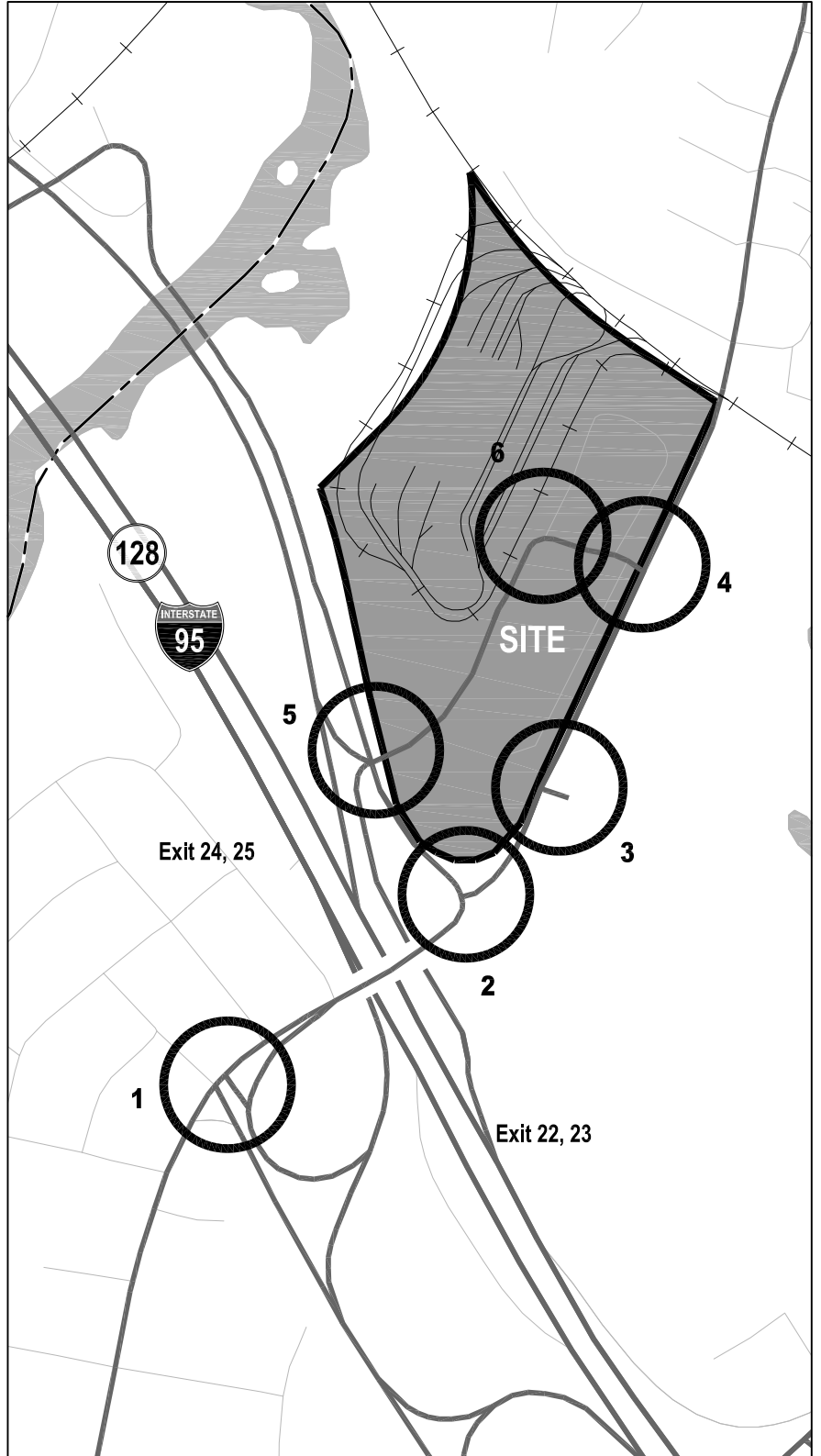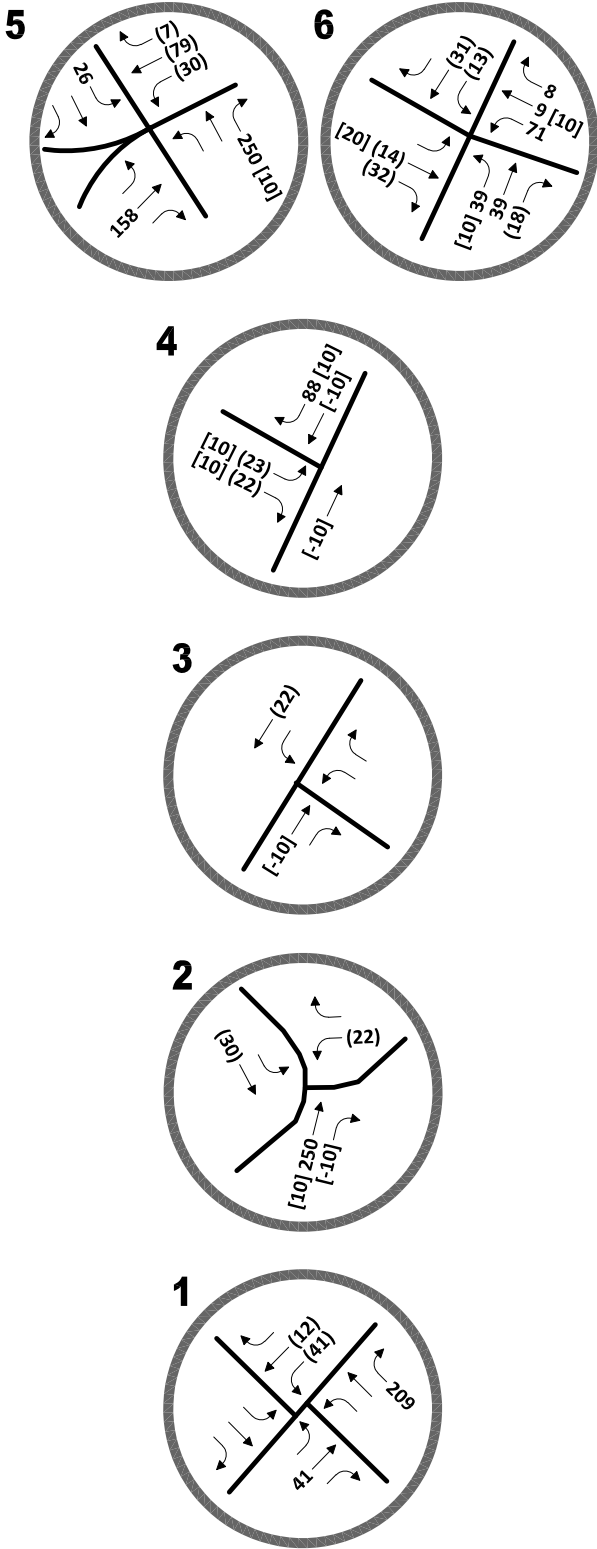
Figure A1
Total New Site Generated Trips
Weekday Morning Peak Hour with Mitigation

The Station at Riverside
Newton, Massachusetts

Revised Building Program (September 2019)

5

(29)
(265)
(198)
10
105 [28]
65

6

(45)
(19)
12
12 [28]
17
[56] (20)
(46)
[28] 54
54
(54)

4

42 [28]
[-28]
[28] (66)
[28] (27)
[-28]

3

(27)
[-28]

2

(198)
(27)
[28] 105
[-28]

1

(46)
(180)
87
17

128

INTERSTATE
95

SITE

5

4

3

2

1

Exit 24, 25

Exit 22, 23

6

XX - Entering Volumes
(XX) - Exiting Volumes
[XX] - Pass-By Volumes

0   250   500 Feet

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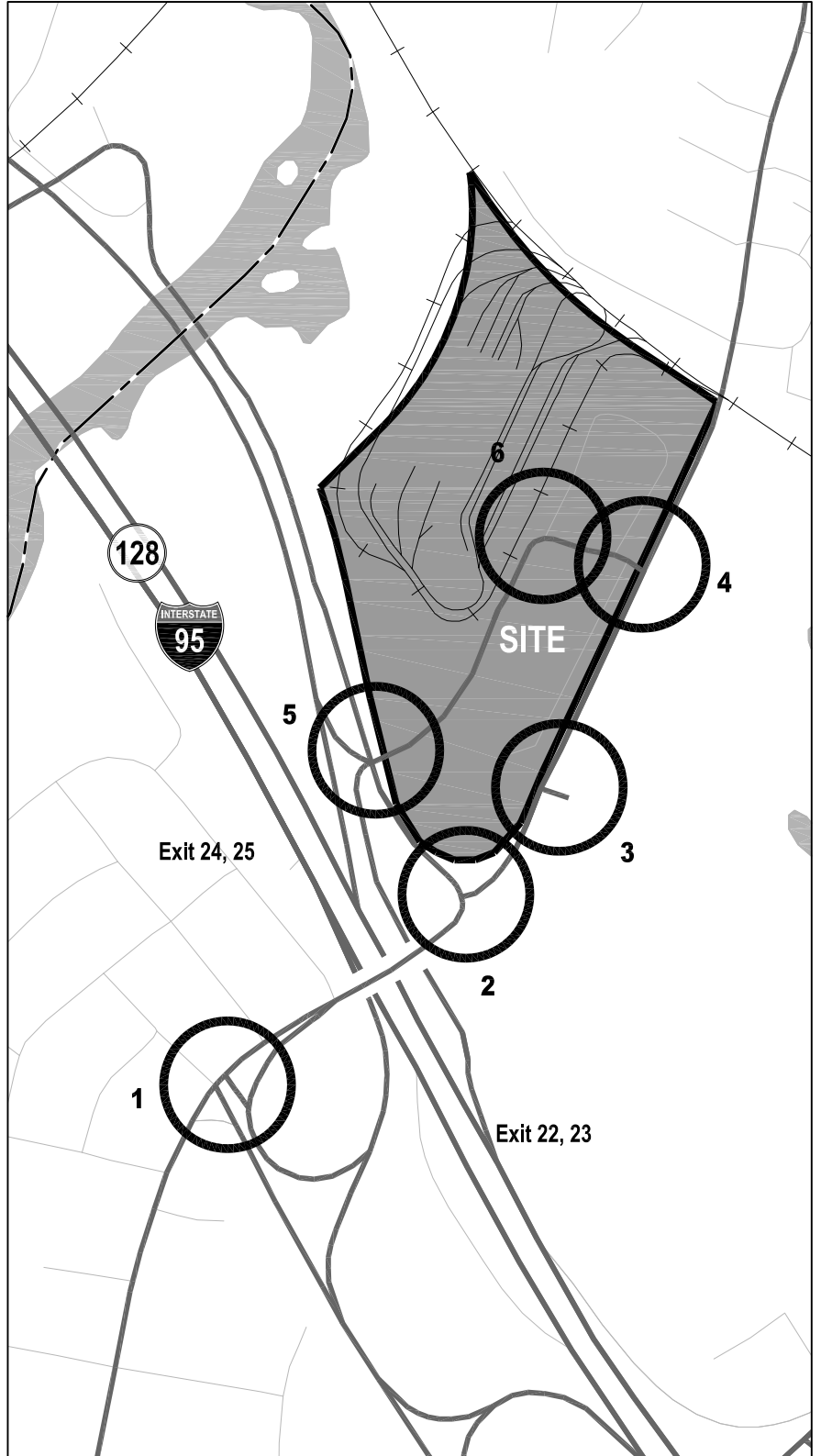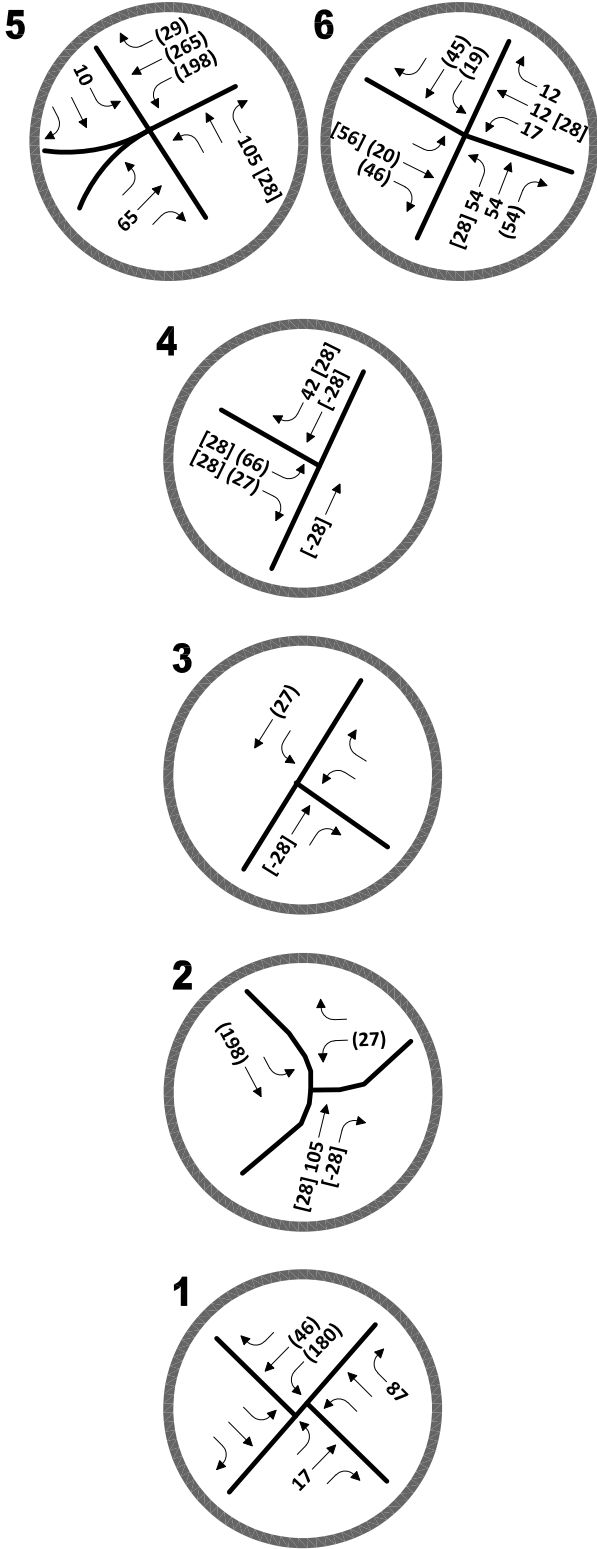
Figure A2
Total New Site Generated Trips
Weekday Evening Peak Hour with Mitigation

The Station at Riverside
Newton, Massachusetts

Revised Building Program (September 2019)

ITE TRIP GENERATION WORKSHEET
(10th Edition, Updated 2017)   **PROPOSED REVISED BUILDING PROGRAM**

LANDUSE: Hotel
LANDUSE CODE: 310   Independent Variable --- Number of Rooms
SETTING/LOCATION: General Urban/Suburban
JOB NAME: <u>154</u>   rooms
JOB NUMBER:

WEEKDAY

RATES:

	# Studies	R^2	Total Trip Ends			Independent Variable Range			Directional Distribution	
			Average	Low	High	Average	Low	High	Enter	Exit
DAILY	6	0.92	8.36	5.31	9.53	146	100	260	50%	50%
AM PEAK (ADJACENT ST)	25	0.85	0.47	0.20	0.84	178	74	426	59%	41%
PM PEAK (ADJACENT ST)	28	0.80	0.60	0.26	1.06	183	74	426	51%	49%

TRIPS:

	BY AVERAGE			BY REGRESSION		
	Total	Enter	Exit	Total	Enter	Exit
DAILY	1,287	644	644	1,312	656	656
AM PEAK (ADJACENT ST)	72	43	30	72	42	29
PM PEAK (ADJACENT ST)	92	47	45	89	46	44

SATURDAY

RATES:

	# Studies	R^2	Total Trip Ends			Independent Variable Range			Directional Distribution	
			Average	Low	High	Average	Low	High	Enter	Exit
DAILY	8	0.93	8.19	6.35	9.79	206	100	355	50%	50%
PEAK OF GENERATOR	9	0.80	0.72	0.49	1.23	194	100	355	56%	44%

TRIPS:

	BY AVERAGE			BY REGRESSION		
	Total	Enter	Exit	Total	Enter	Exit
DAILY	1,261	631	631	1,187	593	593
PEAK OF GENERATOR	111	62	49	111	62	49

SUNDAY

RATES:

	# Studies	R^2	Total Trip Ends			Independent Variable Range			Directional Distribution	
			Average	Low	High	Average	Low	High	Enter	Exit
DAILY	8	0.90	5.95	4.01	8.48	206	100	355	50%	50%
PEAK OF GENERATOR	8	0.87	0.56	0.39	0.72	206	100	355	46%	54%

TRIPS:

	BY AVERAGE			BY REGRESSION		
	Total	Enter	Exit	Total	Enter	Exit
DAILY	916	458	458	780	390	390
PEAK OF GENERATOR	86	40	47	78	36	42

ITE TRIP GENERATION WORKSHEET
(10th Edition, Updated 2017)   **PROPOSED REVISED BUILDING PROGRAM**

LANDUSE: Mid-Rise Residential
LANDUSE CODE: 221
SETTING/LOCATION: General Urban/Suburban   Independent Variable --- Number of Units
JOB NAME: _____524_____   units
JOB NUMBER:

WEEKDAY

RATES:			Total Trip Ends			Independent Variable Range			Directional Distribution	
	# Studies	R^2	Average	Low	High	Average	Low	High	Enter	Exit
DAILY	27	0.77	5.44	1.27	12.50	205	21	494	50%	50%
AM PEAK (ADJACENT ST)	53	0.67	0.36	0.06	1.61	207	26	703	26%	74%
PM PEAK (ADJACENT ST)	60	0.72	0.44	0.15	1.11	208	26	703	61%	39%

TRIPS:	BY AVERAGE			BY REGRESSION		
	Total	Enter	Exit	Total	Enter	Exit
DAILY	2,851	1,425	1,425	2,854	1,427	1,427
AM PEAK (ADJACENT ST)	189	49	140	174	45	128
PM PEAK (ADJACENT ST)	231	141	90	217	133	85

SATURDAY

RATES:			Total Trip Ends			Independent Variable Range			Directional Distribution	
	# Studies	R^2	Average	Low	High	Average	Low	High	Enter	Exit
DAILY	6	0.73	4.91	4.03	8.51	224	111	336	50%	50%
PEAK OF GENERATOR	8	0.89	0.44	0.34	0.73	264	111	462	49%	51%

TRIPS:	BY AVERAGE			BY REGRESSION		
	Total	Enter	Exit	Total	Enter	Exit
DAILY	2,573	1,286	1,286	2,010	1,005	1,005
PEAK OF GENERATOR	231	113	118	227	111	116

SUNDAY

RATES:			Total Trip Ends			Independent Variable Range			Directional Distribution	
	# Studies	R^2	Average	Low	High	Average	Low	High	Enter	Exit
DAILY	6	--	4.09	3.06	8.41	224	111	336	50%	50%
PEAK OF GENERATOR	6	--	0.39	0.26	1.07	224	111	336	62%	38%

TRIPS:	BY AVERAGE			BY REGRESSION		
	Total	Enter	Exit	Total	Enter	Exit
DAILY	2,143	1,072	1,072	N/A	N/A	N/A
PEAK OF GENERATOR	204	127	78	N/A	N/A	N/A

ITE TRIP GENERATION WORKSHEET
(10th Edition, Updated 2017)　　　　　　　　　**PROPOSED REVISED BUILDING PROGRAM**

LANDUSE: General Office Building
LANDUSE CODE: 710　　　　　　　　　　Independent Variable --- Square Feet
SETTING/LOCATION: General Urban/Suburban
JOB NAME:　　　　　　　　　　　**FLOOR AREA (KSF):**　　523.51
JOB NUMBER:

WEEKDAY

RATES:			Total Trip Ends			Independent Variable Range			Directional Distribution	
	# Studies	R^2	Average	Low	High	Average	Low	High	Enter	Exit
DAILY	66	0.83	9.74	2.71	27.56	171	6	1,300	50%	50%
AM PEAK (ADJACENT ST)	35	0.85	1.16	0.37	4.23	117	5	511	86%	14%
PM PEAK (ADJACENT ST)	32	0.88	1.15	0.47	3.23	114	6	511	16%	84%

TRIPS:	BY AVERAGE			BY REGRESSION		
	Total	Enter	Exit	Total	Enter	Exit
DAILY	5,099	2,549	2,549	5,286	2,643	2,643
AM PEAK (ADJACENT ST)	607	522	85	519	446	73
PM PEAK (ADJACENT ST)	602	96	506	549	88	461

SATURDAY

RATES:			Total Trip Ends			Independent Variable Range			Directional Distribution	
	# Studies	R^2	Average	Low	High	Average	Low	High	Enter	Exit
DAILY	5	--	2.21	1.24	7.46	94	28	183	50%	50%
PEAK OF GENERATOR	3	--	0.53	0.30	1.57	82	28	183	54%	46%

TRIPS:	BY AVERAGE			BY REGRESSION		
	Total	Enter	Exit	Total	Enter	Exit
DAILY	1,157	578	578	N/A	N/A	N/A
PEAK OF GENERATOR	277	150	128	N/A	N/A	N/A

SUNDAY

RATES:			Total Trip Ends			Independent Variable Range			Directional Distribution	
	# Studies	R^2	Average	Low	High	Average	Low	High	Enter	Exit
DAILY	5	--	0.70	0.19	3.05	94	28	183	50%	50%
PEAK OF GENERATOR	3	--	0.21	0.11	0.68	82	28	183	58%	42%

TRIPS:	BY AVERAGE			BY REGRESSION		
	Total	Enter	Exit	Total	Enter	Exit
DAILY	366	183	183	N/A	N/A	N/A
PEAK OF GENERATOR	110	64	46	N/A	N/A	N/A

ITE TRIP GENERATION WORKSHEET
(10th Edition, Updated 2017)

PROPOSED REVISED BUILDING PROGRAM

LANDUSE: Shopping Center
LANDUSE CODE: 820
SETTING/LOCATION: General Urban/Suburban
JOB NAME:
JOB NUMBER:

Independent Variable --- Square Feet

FLOOR AREA (KSF):   71.1

WEEKDAY

RATES:

	# Studies	R^2	Total Trip Ends			Independent Variable Range			Directional Distribution	
			Average	Low	High	Average	Low	High	Enter	Exit
DAILY	147	0.76	37.75	7.42	207.98	453	9	1,510	50%	50%
AM PEAK (ADJACENT ST)	84	0.90	0.94	0.18	23.74	351	9	1,510	62%	38%
PM PEAK (ADJACENT ST)	261	0.82	3.81	0.74	18.69	327	2	2,200	48%	52%

TRIPS:

	BY AVERAGE			BY REGRESSION		
	Total	Enter	Exit	Total	Enter	Exit
DAILY	2,683	1,341	1,341	4,766	2,383	2,383
AM PEAK (ADJACENT ST)	67	41	25	187	116	71
PM PEAK (ADJACENT ST)	271	130	141	422	203	219

SATURDAY

RATES:

	# Studies	R^2	Total Trip Ends			Independent Variable Range			Directional Distribution	
			Average	Low	High	Average	Low	High	Enter	Exit
DAILY	58	0.71	46.12	13.07	167.89	602	56	1,510	50%	50%
PEAK OF GENERATOR	119	0.87	4.50	1.42	15.10	416	4	1,510	52%	48%

TRIPS:

	BY AVERAGE			BY REGRESSION		
	Total	Enter	Exit	Total	Enter	Exit
DAILY	3,278	1,639	1,639	7,212	3,606	3,606
PEAK OF GENERATOR	320	166	154	473	246	227

SUNDAY

RATES:

	# Studies	R^2	Total Trip Ends			Independent Variable Range			Directional Distribution	
			Average	Low	High	Average	Low	High	Enter	Exit
DAILY	30	–	21.10	4.15	148.15	509	47	1,510	50%	50%
PEAK OF GENERATOR	24	–	2.79	0.39	12.40	382	47	1,268	49%	51%

TRIPS:

	BY AVERAGE			BY REGRESSION		
	Total	Enter	Exit	Total	Enter	Exit
DAILY	1,500	750	750	N/A	N/A	N/A
PEAK OF GENERATOR	198	97	101	N/A	N/A	N/A

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SHARED TRIPS [1]

RETAIL - OFFICE

WEEKDAY DAILY

RETAIL	%	#	BALANCED	#	%	OFFICE
EXIT ->	3%	4,337	130	3,118	15%	-> ENTER
ENTER <-	4%	4,337	173	3,118	22%	<- EXIT

WEEKDAY MORNING

RETAIL	%	#	BALANCED	#	%	OFFICE
EXIT ->	29%	130	21	526	4%	-> ENTER
ENTER <-	32%	211	24	86	28%	<- EXIT

WEEKDAY EVENING

RETAIL	%	#	BALANCED	#	%	OFFICE
EXIT ->	2%	399	8	104	31%	-> ENTER
ENTER <-	8%	369	30	544	20%	<- EXIT

RETAIL - HOTEL

WEEKDAY DAILY

RETAIL	%	#	BALANCED	#	%	HOTEL
EXIT ->	11%	4,337	394	1,194	33%	-> ENTER
ENTER <-	9%	4,337	390	1,194	38%	<- EXIT

WEEKDAY MORNING

RETAIL	%	#	BALANCED	#	%	HOTEL
EXIT ->	0%	130	0	77	0%	-> ENTER
ENTER <-	4%	211	7	53	14%	<- EXIT

WEEKDAY EVENING

RETAIL	%	#	BALANCED	#	%	HOTEL
EXIT ->	5%	399	14	83	17%	-> ENTER
ENTER <-	2%	369	7	80	16%	<- EXIT

RETAIL - RESIDENTIAL

WEEKDAY DAILY

RETAIL	%	#	BALANCED	#	%	RESIDENTIAL
EXIT ->	11%	4,337	477	1,684	33%	-> ENTER
ENTER <-	9%	4,337	390	1,684	38%	<- EXIT

WEEKDAY MORNING

RETAIL	%	#	BALANCED	#	%	RESIDENTIAL
EXIT ->	14%	130	1	53	2%	-> ENTER
ENTER <-	17%	211	2	152	1%	<- EXIT

WEEKDAY EVENING

RETAIL	%	#	BALANCED	#	%	RESIDENTIAL
EXIT ->	26%	399	72	156	46%	-> ENTER
ENTER <-	10%	369	37	100	42%	<- EXIT

OFFICE - HOTEL

WEEKDAY DAILY

OFFICE	%	#	BALANCED	#	%	HOTEL
EXIT ->	2%	3,118	36	1,194	3%	-> ENTER
ENTER <-	0%	3,118	0	1,194	0%	<- EXIT

WEEKDAY MORNING

OFFICE	%	#	BALANCED	#	%	HOTEL
EXIT ->	0%	86	0	77	0%	-> ENTER
ENTER <-	3%	526	16	53	75%	<- EXIT

WEEKDAY EVENING

OFFICE	%	#	BALANCED	#	%	HOTEL
EXIT ->	0%	544	0	83	0%	-> ENTER
ENTER <-	0%	104	0	80	0%	<- EXIT

OFFICE - RESIDENTIAL

WEEKDAY DAILY

OFFICE	%	#	BALANCED	#	%	RESIDENTIAL
EXIT ->	2%	3,118	51	1,684	3%	-> ENTER
ENTER <-	0%	3,118	0	1,684	0%	<- EXIT

WEEKDAY MORNING

OFFICE	%	#	BALANCED	#	%	RESIDENTIAL
EXIT ->	1%	86	0	53	0%	-> ENTER
ENTER <-	3%	526	3	152	2%	<- EXIT

WEEKDAY EVENING

OFFICE	%	#	BALANCED	#	%	RESIDENTIAL
EXIT ->	2%	544	6	156	4%	-> ENTER
ENTER <-	57%	104	4	100	4%	<- EXIT

HOTEL - RESIDENTIAL

WEEKDAY DAILY

HOTEL	%	#	BALANCED	#	%	RESIDENTIAL
EXIT ->	0%	1,194	0	1,684	0%	-> ENTER
ENTER <-	0%	1,194	0	1,684	0%	<- EXIT

WEEKDAY MORNING

HOTEL	%	#	BALANCED	#	%	RESIDENTIAL
EXIT ->	0%	53	0	53	0%	-> ENTER
ENTER <-	0%	77	0	152	0%	<- EXIT

WEEKDAY EVENING

HOTEL	%	#	BALANCED	#	%	RESIDENTIAL
EXIT ->	2%	80	0	156	0%	-> ENTER
ENTER <-	12%	83	3	100	3%	<- EXIT

TOTAL SHARED TRIPS - WEEKDAY DAILY

	ENTER	EXIT	TOTAL
RETAIL	953	1,001	1954
OFFICE	130	260	390
HOTEL	430	390	820
RES	528	390	918
TOTAL	2,041	2,041	4082

TOTAL SHARED TRIPS - WEEKDAY MORNING

	ENTER	EXIT	TOTAL
RETAIL	33	22	55
OFFICE	40	24	64
HOTEL	0	23	23
RES	1	5	6
TOTAL	74	74	148

TOTAL SHARED TRIPS - WEEKDAY EVENING

	ENTER	EXIT	TOTAL
RETAIL	74	94	168
OFFICE	12	36	48
HOTEL	17	7	24
RES	78	44	122
TOTAL	181	181	362

Note: Shared trips based off of person-trips for each land use. Person trips were developed by multiplying the unadjusted vehicle trips for each ITE land use by an applicable VOR from the Summary of Travel Trends, 2017 National Household Travel Survey (Table 16), USDOT FHA

1 Weekday morning and evening internal capture rates based on NCHRP Report 684, Saturday midday rates assumed to be the same as weekday evening rates
  Weekday daily internal capture rates based on ITE Trip Generation Handbook, 2nd Edition, Saturday daily rates assumed to be the same as weekday daily rates

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