



To: Westwood Marketplace Holdings LLC
c/o New England Development
Mr. Paul S. Cincotta, Vice President
One Wells Avenue
Newton, MA 02459-3295

From: Nancy B. Doherty, P.E., Tetra Tech
Jeffrey S. Dirk, P.E., PTOE, Vanasse & Associates, Inc.

Re: University Station – Preliminary Traffic Impact Assessment

Date: October 2, 2012

Tetra Tech and Vanasse & Associates, Inc. (Tt/VAI) have completed a preliminary assessment of the traffic impacts associated with the refined development program for the University Station mixed-use, transit oriented development to be located off University Avenue in Westwood, Massachusetts (hereafter referred to as the “Project”). This assessment has been prepared in advance of a formal Traffic Impact and Access Study (TIAS) and focused on the following specific areas as they relate to the Project: i) trip-generation calculations and methodology; ii) trip distribution patterns; and iii) evaluation of the planned improvements that are to be completed along University Avenue, at the University Avenue/Blue Hill Drive interchange, and at the University Avenue/Canton Street/Dedham Street intersection to support the build-out of the Project.

The information that forms the basis of this preliminary assessment has been reviewed and conceptually approved by MassDOT with specific regard to the methodology used to establish the traffic characteristics of the Project and the anticipated trip distribution pattern, and is currently being evaluated with regard to the assessment of the planned transportation infrastructure improvements that are to be completed along University Avenue and at the University Avenue/Blue Hill Drive interchange and the University Avenue/Canton Street/Dedham Street intersection. The formal TIAS will build upon the analyses presented herein and will expand the scope of the study to include additional roadways and intersections outside of the University Avenue corridor, consistent with the prior traffic analyses that were conducted for the former Westwood Station development.

Based on a review of the findings of this preliminary assessment, we have concluded that the Project, as presently contemplated, can be accommodated with defined improvements at the University Avenue/Blue Hill Drive interchange and at the University Avenue/Canton Street/Dedham Street intersection accompanied by the

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reconstruction of University Avenue. The following summarizes our preliminary assessment of the Project and the infrastructure improvements along the University Avenue corridor.

Project Description

As presently contemplated, the reconstituted Project will entail the phased development of approximately 2 million square feet (sf) of mixed-use commercial and residential space to be located on approximately 130 acres of primarily vacant, partially cleared land located in the underutilized University Avenue Industrial Park and proximate to the I-93/I-95 interchange and within walking distance of the Massachusetts Bay Transportation Authority (MBTA) Route 128 Station on the Providence/Stoughton Commuter Rail Line in Westwood. The current development program (2 million \pm sf) represents a significant reduction (approximately 56 percent) from the previously proposed build-out of the Project (4.5 million \pm sf of mixed use development formerly known as Westwood Station) and the associated impacts on the transportation system. As proposed, the reconstituted Project¹ is expected to consist of the following components:

- 140,000 sf supermarket
- 610,000 sf of retail/restaurant space
- 325,000 sf of office space
- 160 room hotel
- 750 residential units to be generally comprised of:
 - 100 units of senior housing
 - 450 apartments
 - 200 condominium/townhouse units

Access to the Project will be provided by way of an interconnected network of roadways, sidewalks and bicycle facilities that will link the uses within the Project site to University Avenue and the Route 128 MBTA station. University Avenue will be reconstructed in conjunction with the Project following a *Complete Streets* design approach. Associated improvements are being advanced by MassDOT at both Blue Hill Drive/Greenlodge Street and Canton Street that will support the Project and the planned reconstruction of University Avenue. The previously proposed Westwood Station Boulevard has been eliminated from the Project given that the improved University Avenue will afford sufficient capacity to accommodate the current development proposal in a safe and efficient manner, thereby: i) reducing the land

¹The Proponent reserves the opportunity to reallocate uses provided the overall total impacts are not increased.

alteration and wetland impacts that were associated with the construction of Westwood Station Boulevard; and ii) reducing the potential traffic impacts on the upper portion of Canton Street.

Project Trip Generation

The traffic characteristics of the Project were developed using information obtained from *Trip Generation* published by the Institute of Transportation Engineers (ITE)² for land uses similar to those to be contained within the Project. ITE Land Use Codes (LUCs) 230, *Residential Condominium/Townhouse*; 220, *Apartment*; 252, *Senior Housing – Attached*; 310, *Hotel*; 710, *General Office Building*; 820, *Shopping Center*; and 850 *Supermarket*; were used to establish the base (unadjusted) traffic characteristics of the Project. In order to account for the interaction between the retail uses to be located within the Project site (i.e., retail, restaurant and supermarket uses), the traffic characteristics of the combined retail/restaurant/supermarket space (750,000 sf) were determined using LUC 820, *Shopping Center*, and then proportionately reduced to reflect the 610,000 sf of retail/restaurant space, thereby eliminating trips associated with the supermarket use from the calculation as the traffic characteristics of the supermarket were developed separately.

Factors influencing the total generated trips within a mixed-use development similar to the Project include: i) travel mode selection (automobile, transit, pedestrian or bicycle); ii) internal trips (trips made between uses within the Project); iii) pass-by trips (motorists travelling on the roadway network immediately adjacent to the Project site for other purposes that will also patronize the Project); and iv) diverted linked trips (similar to pass-by trips except that the motorist will divert or alter their original travel path to patronize the Project site). The following details the procedures used to apply these adjustments to the base traffic volume projections for the Project. The following details the procedures used to apply these adjustments to the base traffic volume projections for the Project. The detailed trip generation calculations are provided in Attachment A.

²*Trip Generation*, 8th Edition; Institute of Transportation Engineers; Washington, DC; 2008.

Transit Mode Share. The transit mode share for residential trips was based on a study conducted for the former Westwood Station development by the Central Transportation Planning Staff (CTPS) of the Boston Metropolitan Planning Organization (Memorandum to Efi Pagitsas from Thomas J. Humphrey regarding *Analysis of Projected Commuter Rail Shares of Trips Generated by Development at Route 128 Station*, March 15, 2006). This study is contained in Attachment B.

The CTPS memorandum described two residential developments located in the vicinity of commuter rail stations in eastern Massachusetts: Jefferson at Salem Station located off Bridge Street in Salem and Windsor Gardens located off Route 1A in Norwood. Surveys of the residents of these developments indicate transit ridership at the Norwood site at 18 percent during the morning peak-hour and 11 percent during the afternoon peak-hour, and at the Salem site at 46 percent during the morning peak-hour and 40 percent during the afternoon peak-hour. In their analysis, the CTPS suggested that the transit utilization rates documented for the Jefferson at Salem Station project (46 percent for the morning peak-hour and 40 percent for the afternoon peak-hour) be used for the Project as the commuter rail service to Salem Station is similar to that provided at the Route 128 Station.

A review of the Salem location indicates that the site lacks convenient highway access, access which is available to the Norwood site. In this respect (convenient highway access), the Project is more aligned with the Norwood site than to the Salem site; however, the frequency of train service at the Salem site (10 trains in the morning and 10 trains in the afternoon) is more analogous to the service available to the Project site (10 trains in the morning and 7 trains in the afternoon) than the Norwood site (5 trains in the morning and 5 trains in the afternoon). Accordingly, after a careful review of this information, the transit share for the Project was estimated by using the Norwood rates (18 percent in the morning and 11 percent in the afternoon) and then doubling the resulting value in order to account for the increased frequency of service that will be available to the Project site by way of the Route 128 Station (10 trains at Route 128 Station vs. 5 trains at Norwood Station). This results in a 36 percent transit share for the Project during the weekday morning peak-hour and a 22 percent transit share during the afternoon peak hour, far less than the 40 to 46 percent transit share suggested by CTPS for the residential component of the Project.

The transit mode share for office trips was also developed based on data provided by CTPS in its March 2006 memorandum. The CTPS memorandum provided an evaluation of 2000 Journey-to-Work data from the US Census which indicated that 10 percent of workers in Westwood are from Boston and 11 percent of work trips from Boston to Westwood are via transit. The CTPS memorandum also indicated that approximately one-half of all transit trips arriving at Route 128 Station in the morning are from Boston. Further, evaluation of the 2000 Journey-to-Work data indicates that approximately

2.1 percent of all workers in the vicinity of the Project site (Census Tract 412300, Block Group 1) travel to work by bus or another transit mode. Given that the office buildings proposed as a part of the Project are within walking distance of the Route 128 Station and that the Project will include specific amenities that will encourage use of public transportation resources (i.e., interconnected sidewalk and bicycle network and a Transportation Demand Management (TDM) program), a 3.0 percent transit share was assumed for weekday Project-related office trips.

Transit utilization by employees and patrons of the retail/restaurant component of the Project are anticipated to be similar to that expected for the office component. However, given: i) the variability of retail employee schedules; ii) the duration of employee shifts (often hourly blocks of time vs. an 8 hour day); and iii) the limited ability to incentivize retail/restaurant patrons to use transit; it is expected that such utilization will occur at a more diminished rate. Accordingly, the transit mode share for weekday Project-related retail/restaurant trips was assumed to be one-half of that assumed for the office component, or 1.5 percent.

A transit share was not applied to trips associated with the hotel component of the Project nor for Project-related trips during the Saturday midday peak-hour.

Internal Trips. Estimates of internal trips for the Project were developed based on the methodologies contained in the *Trip Generation Handbook, 2nd Edition* published by the ITE.³ The internal capture trip rates are based on data collected at several mixed-use developments in Florida in the 1990s between 12:00 PM and 6:30 PM, and were applied only to auto trips. Based on this approach, the overall computed internal trip reductions for the Project would be approximately 11 percent for the weekday morning peak-hour, 7 percent for the afternoon peak-hour and 6 percent for the Saturday midday peak-hour.

Although this methodology results in reasonable overall internal trip reductions for the Project, closer inspection of the impact to the trip-generation for specific land uses indicates that total residential trips would be reduced by 40 percent during both the weekday morning and Saturday midday peak hours, a reduction that would be unrealistic. Accordingly, internal trips for the residential component of the Project were capped at 10 percent for the weekday morning and Saturday midday peak hours. With this adjustment, the overall computed internal trip reductions for the Project would be approximately 5 percent for the weekday morning peak-hour, 7 percent for the weekday afternoon peak-hour and 3 percent for the Saturday midday peak-hour. The supporting calculations for the ITE methodology for shared trips are provided in Attachment A.

³*Trip Generation Handbook*; Second Edition; Institute of Transportation Engineers; Washington, DC; June 2004.

Recently, new internal capture trip rates have been proposed as a result of National Cooperative Highway Research Program (NCHRP) Project 8-51 and are being evaluated by the ITE for promulgation as a part of the 3rd edition to the *Trip Generation Handbook*. NCHRP Project 8-51 included data collection to support internal capture rates for retail, office, residential, restaurant, hotel and cinema land uses for both the weekday morning and afternoon peak hours. Using the data contained in NCHRP Project 8-51 as summarized in the August 2010 *ITE Journal* article titled “Improved Estimation of Internal Trip Capture for Mixed-Use Development” and fully documented in *NCHRP Report 864 Enhancing Internal Trip Capture Estimation for Mixed-Use Developments* (Transportation Research Board, 2011), an internal trip rate of 16 percent was calculated for the Project for the weekday morning peak-hour and a 6 percent internal trip rate was calculated for the afternoon peak-hour. These rates are provided for comparison purposes only and serve to further validate the 5 to 7 percent internal capture trip rates that were used for the weekday peak hours for the Project.

Pass-By Trips. Pass-by trips are derived from the existing traffic stream on roadways adjacent to the Project site. With specific regard to the Project, pass-by trips would be derived from University Avenue. The No-Build traffic volume projections for University Avenue estimate 1,300 vehicles per hour during the weekday morning peak-hour, 1,000 vehicles per hour during the weekday afternoon peak-hour and at 200 vehicles per hour during the Saturday midday peak-hour. Based on these projections, the pass-by trip rate for the Project was held at 10 percent, 5 percent and 2 percent for the weekday morning, weekday afternoon and Saturday midday peak hours, respectively, and were applied to the automobile trips associated with the retail/restaurant and supermarket components of the Project. This approach results in a reasonable approximation of the traffic volume contribution from University Avenue that may be associated with the Project.

Diverted Linked Trips. Diverted linked trips are trips already on study area roadways that will divert to the Project site on their way to/from their primary destination. Consistent with the previously approved approach for estimating the contribution of pass-by and diverted linked trips for the Project, the combined pass-by/diverted linked trip percentage was limited to 20 percent. Therefore, diverted linked trips were estimated as 10 percent of the weekday morning peak-hour retail auto trips, 15 percent of the weekday afternoon peak-hour retail auto trips and 18 percent of the Saturday midday peak-hour retail auto trips. It is important to recall that diverted linked trips, although not new trips on the roadways from which they are diverted, do represent new trips on the roadways immediately proximate to the Project site.

Summary. Table 1 in Appendix A summarizes the weekday morning, weekday afternoon and Saturday midday peak-hour trip generation calculations for the Project and include total, auto, internal, external, pass-by, diverted linked and new trips for each of the proposed land uses. With the adjustments to account for transit share, pass-by, diverted linked and internal trips, the Project is expected to generate approximately 1,563 new vehicle trips during the weekday morning peak-hour (1,027 vehicles entering and 536 exiting), with 3,221 new vehicle trips expected during the weekday evening peak-hour (1,504 vehicles entering and 1,717 exiting) and 3,762 new vehicle trips expected during the Saturday midday peak-hour (1,971 entering and 1,792 exiting).

Trip Distribution

Regional distribution patterns were developed for the office, residential and retail components of the Project taking into account: i) Journey-to-Work data obtained from the 2000 Census; ii) the market area for the Project (i.e., a population based gravity model); iii) accessibility of the Project site to/from the local and regional roadway network; and iv) the location of competing opportunities within the Project market area, including other grocery shopping opportunities along the Route 24 corridor (i.e., BJ's Wholesale Club, Costco, etc.). The trip-distribution calculations for the individual components of the Project are included as Attachment C to this document. Figures depicting the trip distribution patterns for each land use and the associated weekday and Saturday peak-hour trip assignments are also provided in Attachment C.

Traffic Operations Analysis

In order to assess the adequacy of the improved transportation infrastructure to accommodate the Project in a safe and efficient manner, traffic operations and vehicle queue analyses were performed at the University Avenue/Blue Hill Drive interchange and at the University Avenue/Canton Street/Dedham Street intersection under 2017 and 2022 Build conditions with the full build-out of the Project.

In brief, six levels of service are defined for each type of facility. They are given letter designations ranging from "A" to "F", with a level-of-service (LOS) "A" representing the best operating conditions and a LOS "F" representing congested or constrained operations. A LOS "E" is representative of a transportation facility that is operating at its design capacity with a LOS "D" generally defined as the limit of "acceptable" traffic operations. Since the level-of-service of a traffic facility is a function of the flows placed upon it, such a facility may operate at a wide range of levels of service depending on the time of day, day of week, or period of the year. The Synchro® intersection capacity

analysis software, which is based on the analysis methodologies and procedures presented in the 2000 Highway Capacity Manual (HCM), was used to complete the level-of-service and vehicle queue analyses for the study intersections.

The traffic volumes that form the basis of this preliminary analysis were developed using accepted transportation planning methodologies as follows and will be updated and refined in conjunction with the preparation of the subsequent TIAS that will accompany the NPC filing for the Project:

1. 2012 traffic count data was obtained and increased by a compounded annual traffic growth rate of 0.5 percent per year to represent 2017 and 2022 Baseline (No-Build) traffic volume conditions;
2. Traffic volumes associated with the reoccupancy of 200,000± sf of currently vacant office space on Rosemont Drive and 27,000± sf of light industrial space on University Avenue south of Yale Street were added to the Baseline traffic volumes (2017 and 2022);
3. The Blue Hill Drive ramp improvements were assumed to be complete within the 2017 horizon year;
4. The Blue Hill Drive ramp improvements, the I-95 northbound off-ramp to Dedham Street and the Dedham Street corridor improvements were assumed to be complete within the 2022 horizon year; and
5. Traffic volumes for the full build-out of the Project were developed and added to the 2017 and 2022 Baseline traffic volume conditions.

Attachment D includes the 2017 and 2022 Build condition traffic volumes that form the basis of this assessment. The reassignment of Baseline traffic that will result from the completion of the Blue Hill Drive ramp project is reflected in the 2017 horizon year.

For the 2022 horizon year, preliminary estimates have been made that account for the redistribution of Baseline traffic which will occur upon completion of the I-95 northbound off-ramp to Dedham Street. Project-related traffic reassignments that will result from the completion of the I-95 northbound off-ramp to Dedham Street are also reflected in the 2022 horizon year analysis. Attachment D includes figures illustrating the anticipated reassignment of Project-generated traffic that is expected to occur as a result of these improvements under 2022 Build conditions.

In addition, the following improvements depicted on Figures 1 and 2 were assumed at the University Avenue/Blue Hill Drive interchange and the University Avenue/Canton Street/Dedham Street intersection under both the 2017 and 2022 horizon years:

University Avenue/Blue Hill Drive (Figure 1):

- Realignment of the I-95 southbound off-ramp and extending the ramp to intersect University Avenue;
- Installation of a raised median separating the I-95 southbound on and off-ramps and reconfiguring intersecting driveways to reflect the resulting one-way traffic flow;
- Terminating Blue Hill Drive West in a cul-de-sac configuration west of the Blue Hill ramps;
- Widening the Blue Hill Drive off-ramp approach to University Avenue to accommodate a left-turn lane, a through travel lane and a channelized right-turn lane;
- Widening the Greenlodge Street approach to University Avenue to accommodate a left-turn lane and a through/right-turn lane;
- Reconstructing the University Avenue northbound approach to provide two (2) left-turn lanes and a shared through/right-turn lane;
- Reconstructing the University Avenue southbound approach to provide a left-turn lane, two (2) through travel lanes and a shared through/right-turn lane; and
- Installation of a fully actuated traffic signal system.

University Avenue/Canton Street/Dedham Street (Figure 2):

- Widening the Dedham Street westbound approach to accommodate a left-turn lane, a through travel lane and a channelized right-turn lane;
- Widening the Canton Street eastbound approach to accommodate a left-turn lane, a through travel lane and a shared through/right-turn lane;
- Widening the University Avenue northbound approach to accommodate a left-turn lane, a through travel lane and a right-turn lane;
- Reconstructing the University Avenue southbound approach to provide two (2) left-turn lanes and a shared through/right-turn lane; and
- Installation of a fully actuated traffic signal system.

The results of the intersection capacity and vehicle queue analyses are summarized in Tables 1 and 2 for 2017 and 2022 Build conditions, respectively. As detailed therein, the intersections of University Avenue at Blue Hill Drive and University Avenue at Canton Street and Dedham Street are expected to operate at an overall level-of-service of

“D” or better during the peak periods under both 2017 and 2022 Build conditions with the full build-out of the Project and the completion of the improvements described above and depicted on Figures 1 and 2. A further review of vehicle queuing at both intersections indicates that the planned intersection improvements are appropriately designed to accommodate the projected vehicle queue lengths without hindering intersection/interchange operations or the operation of the State Highway System.

Table 1
UNIVERSITY STATION – TRAFFIC OPERATIONS ANALYSIS SUMMARY
2017 BUILD CONDITIONS

Intersection/Lane Group	Morning Peak Hour					Afternoon Peak Hour					Saturday Peak Hour				
	v/c ¹	Delay ²	LOS ³	Ave Q ⁴	95th Q ⁴	v/c ¹	Delay ²	LOS ³	Ave Q ⁴	95th Q ⁴	v/c ¹	Delay ²	LOS ³	Ave Q ⁴	95th Q ⁴
Blue Hill Drive & University Ave															
Ramp EB LT	0.67	34	C	106	152	0.21	45	D	24	48	0.25	45	D	19	38
Ramp EB TH	0.20	26	C	40	65	0.23	45	D	47	75	0.25	44	D	39	63
Ramp EB RT	0.31	1	A	0	0	0.35	1	A	0	0	0.42	1	A	0	0
Green Lodge St. WB LT	0.10	25	C	13	30	0.32	46	D	48	78	0.12	43	D	11	26
Green Lodge St. WB TH/RT	0.11	25	C	12	39	0.32	46	D	58	99	0.25	44	D	29	67
University Ave. NB LT	0.65	36	D	92	137	1.01	61	E	578	740	0.85	40	D	346	432
University Ave. NB TH/RT	0.48	9	A	113	261	0.55	7	A	136	436	0.40	4	A	73	287
University Ave. SB LT	0.12	13	B	11	m28	0.24	27	C	13	m36	0.13	19	B	15	m46
University Ave. SB TH/RT	0.62	18	B	202	314	0.81	34	C	240	558	0.64	26	C	261	484
Overall	0.64	18	B	--	--	0.81	35	C	--	--	0.68	23	C	--	--
Canton Street/Dedham Street & University Ave															
Canton St. EB LT	0.50	30	C	33	107	0.69	33	C	109	291	0.52	22	C	54	163
Canton St. EB TH/RT	0.52	36	D	40	101	0.90	53	D	217	449	0.34	29	C	30	76
Dedham St. WB LT	0.85	30	C	172	495	0.75	44	D	72	213	0.44	25	C	36	110
Dedham St. WB TH	0.93	52	D	211	559	0.53	39	D	96	207	0.62	37	D	40	130
Dedham St. WB RT	0.19	0	A	0	0	0.19	0	A	0	0	0.16	0	A	0	0
University Ave. NB LT	0.39	27	C	19	76	0.18	28	C	13	48	0.06	20	B	3	19
University Ave. NB TH	0.81	38	D	162	438	0.87	50	D	257	591	0.81	35	D	133	402
University Ave. NB RT	0.16	10	A	0	19	0.66	29	C	99	276	0.08	14	B	0	19
University Ave. SB LT	0.74	44	D	59	157	0.96	63	E	210	442	0.82	37	D	89	242
University Ave. SB TH/RT	0.82	29	C	215	601	0.76	23	C	280	721	0.67	16	B	120	445
Overall	0.79	31	C	--	--	0.86	39	D	--	--	0.68	25	C	--	--

¹v/c = volume-to-capacity ratio.

²Delay = Average delay expressed in seconds per vehicle.

³LOS= Level of Service.

⁴Average and 95th percentile vehicle queues in feet.

LT = Left Turn, TH = Through, RT = Right Turn

m = queue is metered by adjacent traffic signal system

Table 2
UNIVERSITY STATION – TRAFFIC OPERATIONS ANALYSIS SUMMARY
2022 BUILD CONDITIONS

Intersection/Lane Group	Morning Peak Hour					Afternoon Peak Hour					Saturday Peak Hour				
	v/c ¹	Delay ²	LOS ³	Ave. Q ⁴	95 th Q ⁴	v/c ¹	Delay ²	LOS ³	Ave. Q ⁴	95 th Q ⁴	v/c ¹	Delay ²	LOS ³	Ave. Q ⁴	95 th Q ⁴
Blue Hill Drive & University Ave															
Ramp EB LT	0.66	31	C	101	142	0.21	45	D	24	48	0.22	40	D	17	34
Ramp EB TH	0.20	23	C	38	61	0.23	45	D	48	77	0.24	39	D	36	57
Ramp EB RT	0.32	1	A	0	0	0.35	1	A	0	0	0.42	1	A	0	0
Green Lodge St. WB LT	0.10	23	C	12	27	0.33	46	D	49	80	0.11	39	D	11	25
Green Lodge St. WB TH/RT	0.10	23	C	11	37	0.33	46	D	61	102	0.25	39	D	27	62
University Ave. NB LT	0.67	35	C	87	130	0.94	43	D	541	699	0.82	33	C	304	386
University Ave. NB TH/RT	0.50	9	A	114	274	0.55	7	A	141	446	0.41	4	A	72	296
University Ave. SB LT	0.13	15	B	11	38	0.30	33	C	14	m59	0.15	21	C	14	43
University Ave. SB TH	0.53	18	B	148	239	0.71	33	C	215	421	0.52	24	C	168	331
Overall	0.60	17	B	--	--	0.75	28	C	--	--	0.62	20	C	--	--
Canton Street/Dedham Street & University Ave															
Canton St. EB LT	0.60	37	D	33	135	0.77	41	D	137	294	0.59	30	C	69	185
Canton St. EB TH/RT	0.42	37	D	46	104	0.84	51	D	270	492	0.31	33	C	38	92
Dedham St. WB LT	0.79	24	C	192	509	0.88	67	E	98	291	0.43	27	C	51	143
Dedham St. WB TH	1.05	78	E	374	876	0.65	48	D	163	334	0.52	36	D	65	164
Dedham St. WB RT	0.47	1	A	0	0	0.42	1	A	0	0	0.44	1	A	0	0
University Ave. NB LT	0.69	55	D	25	115	0.18	31	C	16	51	0.05	23	C	4	22
University Ave. NB TH	0.92	59	E	199	503	0.83	49	D	302	608	0.77	36	D	169	521
University Ave. NB RT	0.16	11	B	0	20	0.72	35	D	171	361	0.09	17	B	0	29
University Ave. SB LT	0.84	59	E	70	182	0.99	77	E	266	517	0.70	35	D	109	232
University Ave. SB TH/RT	0.91	44	D	278	692	0.73	24	C	334	714	0.64	16	B	152	485
Overall	0.94	40	D	--	--	0.83	41	D	--	--	0.61	22	C	--	--

¹v/c = volume-to-capacity ratio.

²Delay = Average delay expressed in seconds per vehicle.

³LOS= Level of Service.

⁴Average and 95th percentile vehicle queues in feet.

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Summary

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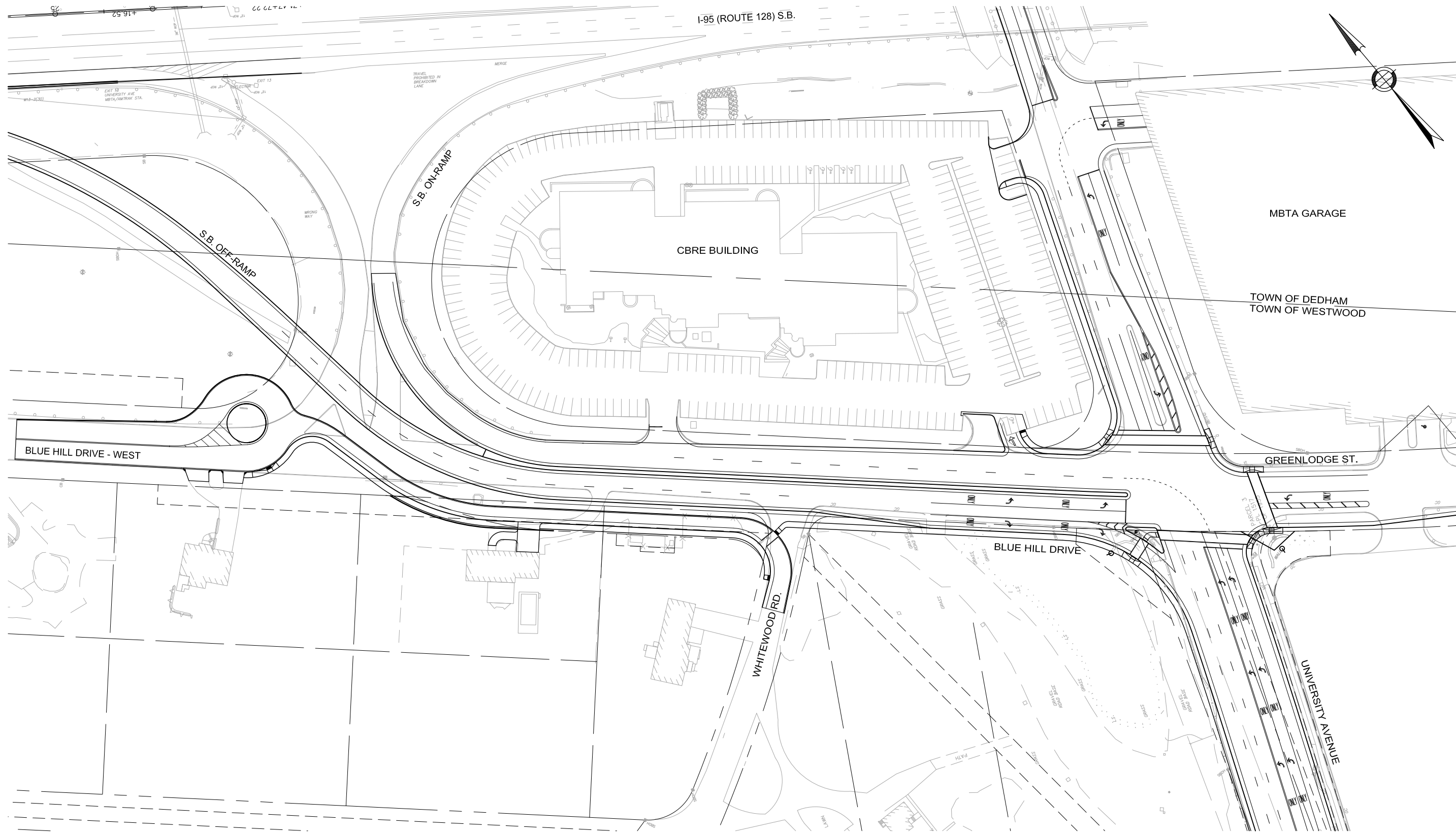
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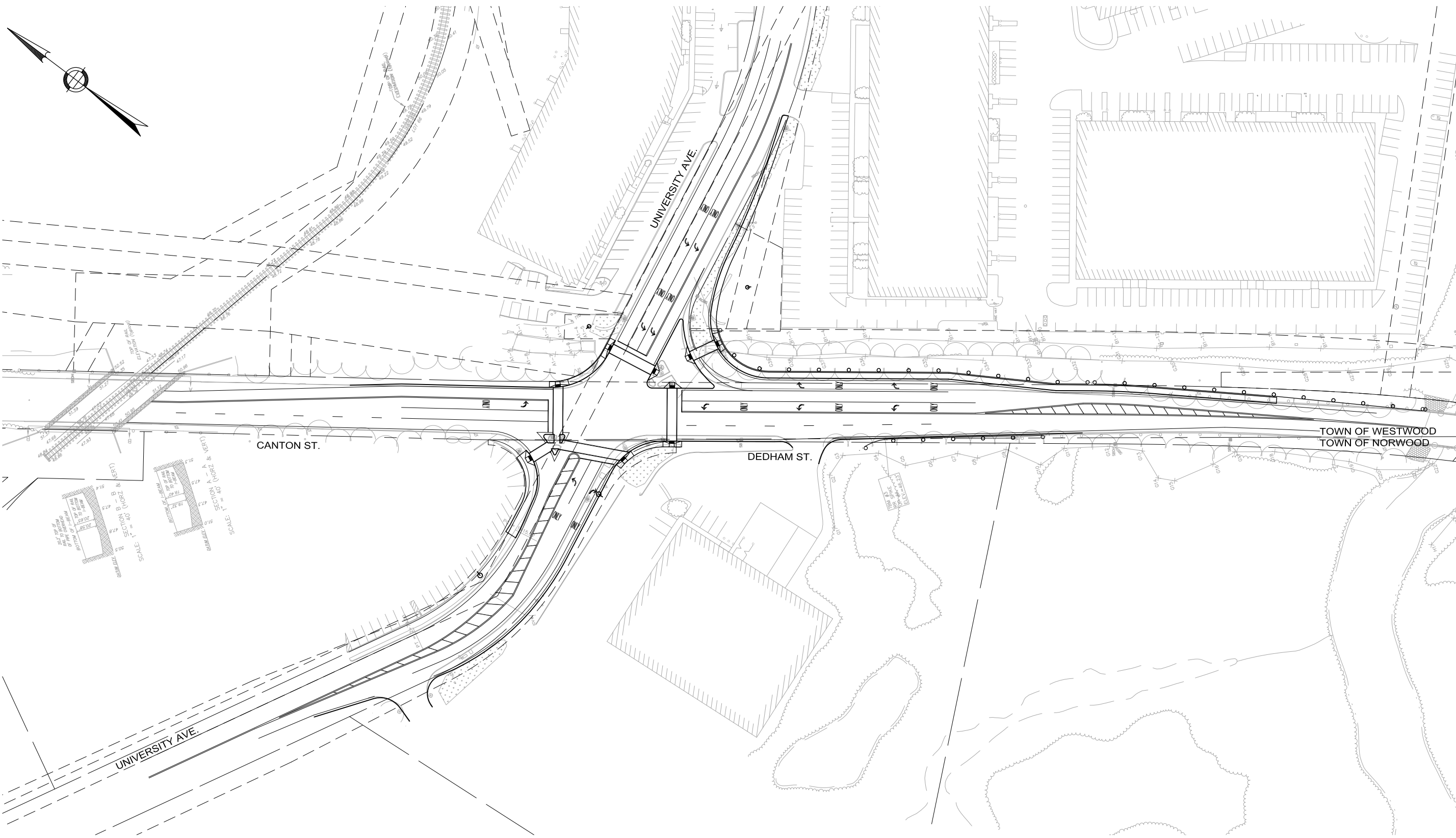
Attachments:

- Attachment A: Trip-Generation Calculations
- Attachment B: Transit Mode Share
- Attachment C: Trip Distributions and Project Trip Figures
- Attachment D: 2017 and 2022 Build Condition Traffic Volume Figures

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CONCEPTUAL IMPROVEMENT PLAN
UNIVERSITY AVENUE @ BLUE HILL DRIVE / GREENLODGE STREET
DEDHAM / WESTWOOD, MASSACHUSETTS



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CONCEPTUAL IMPROVEMENT PLAN
 UNIVERSITY AVENUE @ CANTON STREET / DEDHAM STREET
 WESTWOOD / NORWOOD, MASSACHUSETTS



Attachment A

Trip Generation Calculations

University Station Full Build Trip Generation Calculations

8/30/2012

Source: Trip Generation, 8th Edition, (Institute of Transportation Engineers, 2008.)

Methodology: Equations used when R² is greater than 0.75

Land Use Code 220 - Apartment									
450 Dwelling Units									
R ²	Equation	A=	B=	Total Trips	Rate		% In	Trips In	Trips out
					Rate	Trips			
0.83	Where: Wkdy AM Street Peak	0.49	3.73	224	0.51	230	20%	45	179
0.77	Wkdy PM Street Peak	0.55	17.65	265	0.62	279	65%	172	93
0.87	Wkdy Daily	0.87	2.46	2380	6.65	2993	50%	1190	1190
0.56	Saturday Site Peak	0.29	42.63	173	0.52	234	53%	124	110
0.85	Saturday Daily	7.85	-256.19	3276	6.39	2876	50%	1638	1638

Land Use Code 230 - Residential Condominium/Townhouse									
200 Dwelling Units									
R ²	Equation	A=	B=	Total Trips	Rate		% In	Trips In	Trips out
					Rate	Trips			
0.76	Where: Wkdy AM Street Peak	0.8	0.26	90	0.44	88	17%	15	75
0.80	Wkdy PM Street Peak	0.82	0.32	106	0.52	104	67%	71	35
0.80	Wkdy Daily	0.87	2.46	1176	5.81	1162	50%	588	588
0.84	Saturday Site Peak	0.29	42.63	101	0.47	94	54%	54	46
0.84	Saturday Daily	3.62	427.93	1152	5.67	1134	50%	576	576

Land Use Code 252 - Senior Adult Housing - Attached									
100 Occupied Dwelling Units									
R ²	Equation	A=	B=	Total Trips	Rate		% In	Trips In	Trips out
					Rate	Trips			
0.78	Where: Wkdy AM Street Peak	0.19	-13.86	5	0.44	44	36%	2	3
0.85	Wkdy PM Street Peak	0.24	-16.45	8	0.52	52	60%	5	3
na	Wkdy Daily				3.48	348	50%	174	174
na	Saturday Site Peak				0.30	30	48%	14	16
na	Saturday Daily				2.51	251	50%	126	126

Land Use Code 310 - Hotel									
160 Rooms									
R ²	Equation	A=	B=	Total Trips	Rate		% In	Trips In	Trips out
					Rate	Trips			
0.75	Where: Wkdy AM Street Peak	1.24	-2	73	0.56	90	61%	55	35
na	Wkdy PM Street Peak				0.59	94	53%	50	44
0.98	Wkdy Daily	8.95	-373.16	1059	8.17	1307	50%	529	529
0.80	Saturday Site Peak	0.69	4.32	115	0.72	115	56%	64	50
0.93	Saturday Daily	9.62	-294.56	1245	8.19	1310	50%	622	622

Land Use Code 710 - General Office Building									
325 Floor Area (KSF)									
R ²	Equation	A=	B=	Total Trips	Rate		% In	Trips In	Trips out
					Rate	Trips			
0.83	Where: Wkdy AM Peak	0.8	1.55	482	1.55	504	88%	424	58
0.82	Wkdy PM Peak	1.12	78.81	443	1.49	484	17%	75	368
0.80	Wkdy Daily	0.77	3.65	3306	11.01	3578	50%	1653	1653
0.59	Saturday Site Peak	0.81	-0.12	96	0.41	133	54%	72	61
0.66	Saturday Daily	2.14	18.47	714	2.37	770	50%	385	385

Land Use Code 820 - Shopping Center

750 Floor Area (KSF)

R ²	Equation	Equation			Rate	
		A=	B=	Total Trips	Rate	Trips
	Where:					
0.52	Wkdy AM Street Peak	0.59	2.32	506	1.00	750
0.81	Wkdy PM Street Peak	0.67	3.37	2454	3.73	2798
0.78	Wkdy Daily	0.65	5.83	25161	42.94	32205
0.83	Saturday Site Peak	0.65	3.76	3175	4.89	3668
0.82	Saturday Daily	0.63	6.23	32881	49.97	37478

Land Use Code 820 - Shopping Center

610 Floor Area (KSF)

Portion of retail dev.to total dev. = 610 retail/(140 grocery +610 retail) = 0.8133

	Trips at 750 s.f.	Portion	Trips at 610 s.f.	% In	Trips In	Trips out
Wkdy AM Street Peak	750	0.8133	610	61%	372	238
Wkdy PM Street Peak	2454	0.8133	1996	49%	978	1018
Wkdy Daily	25161	0.8133	20463	50%	10232	10232
Saturday Site Peak	3175	0.8133	2582	52%	1343	1239
Saturday Daily	32881	0.8133	26742	50%	13371	13371

Land Use Code 850 - Supermarket

140 Floor Area (KSF)

R ²	Equation	Equation			Rate		% In	Trips In	Trips out
		A=	B=	Total Trips	Rate	Trips			
	Where:								
na	Wkdy AM Street Peak	0	0	1	3.59	503	61%	307	196
0.52	Wkdy PM Street Peak	0.61	3.95	1058	10.50	1470	51%	750	720
0.52	Wkdy Daily	66.95	1391.56	10765	102.24	14314	50%	7157	7157
na	Saturday Site Peak				10.85	1519	51%	775	744
na	Saturday Daily				177.59	24863	50%	12431	12431

2017 (1)

Hotel	Retail	Vegman	Office	Condo	Apartment	Senior Units
160	610,000	140,000	325,000	200	450	100

Trip Generation Analysis

Morning Peak Hour

ITE Code and Land Use	Size	Percent Enter	Total Trips			Auto Trips			Internal Trips			External Trips			Diverted Trips			Pass-by Trips			New Trips								
			In	Out	Total	Portion	In	Out	Total	In	Out	Total	In	Out	Total	Portion	In	Out	Total	Portion	In	Out	Total						
310 Hotel	160 rooms	61%	55	35	90	100.00%	55	35	90				55	35	90									55	35	90			
820 Retail	610,000 s.f.	61%	372	238	610	98.50%	367	234	601	16	6	23	350	228	578	10%	29	29	58	10%	29	29	58	293	170	463			
850 Grocery	140,000 s.f.	61%	307	196	503	98.50%	302	193	495	13	5	19	289	188	476	10%	24	24	48	10%	24	24	48	241	140	381			
710 Office	325,000 s.f.	88%	424	58	482	97.00%	411	56	467	8	13	21	403	43	446									403	43	446			
230 Condominiums	200 units	17%	15	75	90	64.00%	10	48	58	1	5	6	9	43	52									9	43	52			
220 Apartment	450 units	20%	45	179	224	64.00%	29	115	144	3	11	14	26	103	129									26	103	129			
252 Sr. Adult Housing - Attached	100 units	36%	2	3	5	64.00%	1	2	3	0	0	0	1	2	3									1	2	3			
			1,219	784	2,003		1,174	683	1,857	41	41	83	1,132	642	1,774									105		105	1,027	536	1,563

INTERNAL TRIPS FOR DISTRIBUTION

Trip	INBOUND			OUTBOUND		
	From ITE	Adj.	Mirror Trip	From ITE	Adj.	Mirror Trip
Office in from Retail	8	8	Retail out to Office	8	8	
Office in from Reside	0	0	Residential out to C	0	0	
Retail in from Office	13	13	Office out to Retail	13	13	
Retail in from Resider	60	16	Residential out to F	60	16	
Residential in from Of	1	0	Office out to Resid	1	0	
Residential in from Rt	12	4	Retail out to Resid	12	4	
Totals	94	41		94	41	

Afternoon Peak Hour

ITE Code and Land Use	Size	Percent Enter	Total Trips			Auto Trips			Internal Trips			External Trips			Diverted Trips			Pass-by Trips			New Trips								
			In	Out	Total	Portion	In	Out	Total	In	Out	Total	In	Out	Total	Portion	In	Out	Total	Portion	In	Out	Total						
310 Hotel	160 rooms	53%	50	44	94	100.00%	50	44	94				50	44	94											50	44	94	
820 Retail	610,000 s.f.	49%	978	1,018	1,996	98.50%	963	1,003	1,966	45	41	87	918	961	1,879	15%	141	141	282	5%	47	47	94	730	773	1,504			
850 Grocery	140,000 s.f.	51%	750	720	1,470	98.50%	738	709	1,448	33	30	64	705	679	1,384	15%	104	104	208	5%	35	35	69	567	541	1,107			
710 Office	325,000 s.f.	17%	75	368	443	97.00%	73	357	430	23	37	60	50	319	370										50	319	370		
230 Condominiums	200 units	67%	71	35	106	64.00%	46	22	68	15	12	27	30	11	41										30	11	41		
220 Apartment	450 units	65%	172	93	265	64.00%	110	59	170	36	31	68	74	28	102										74	28	102		
252 Sr. Adult Housing - Attached	100 units	60%	5	3	8	64.00%	3	2	5	1	1	2	2	1	3										2	1	3		
			2,101	2,281	4,382		1,984	2,197	4,180	153	153	307	1,830	2,043	3,873									490		163	1,504	1,717	3,221

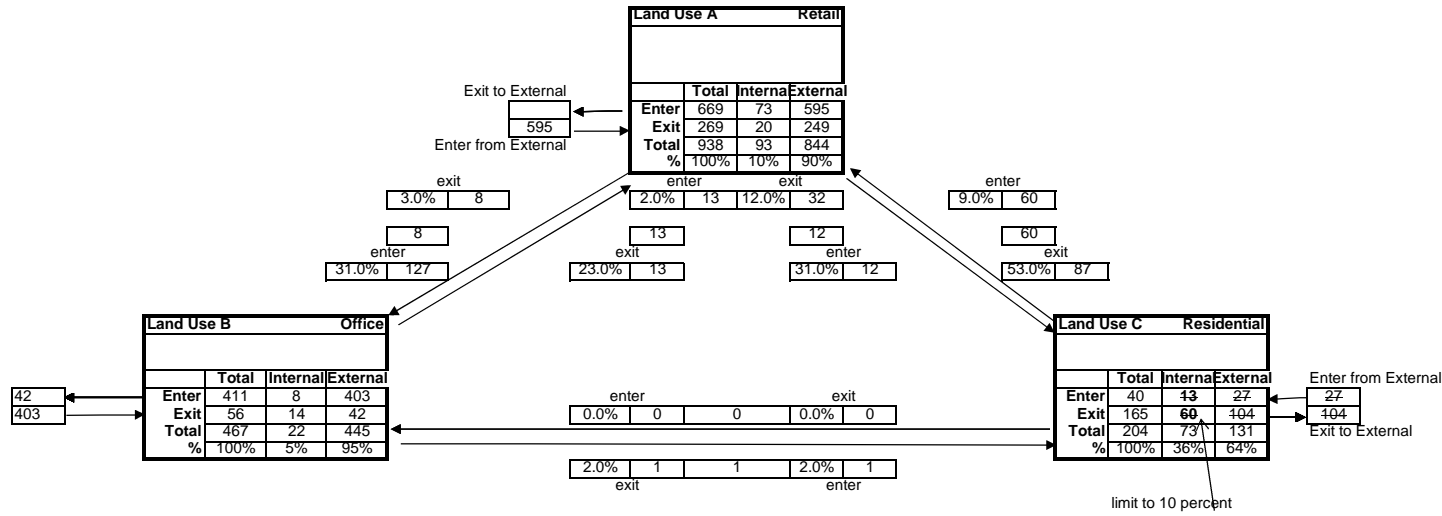
Trip	INBOUND			OUTBOUND		
	From ITE	Adj.	Mirror Trip	From ITE	Adj.	Mirror Trip
Office in from Retail	23	23	Retail out to Office	23	23	
Office in from Reside	0	0	Residential out to C	0	0	
Retail in from Office	34	34	Office out to Retail	34	34	
Retail in from Resider	44	44	Residential out to F	44	44	
Residential in from Of	3	3	Office out to Resid	3	3	
Residential in from Rt	49	49	Retail out to Resid	49	49	
Totals	153	153		153	153	

Saturday Peak Hour

ITE Code and Land Use	Size	Percent Enter	Total Trips			Auto Trips			Internal Trips			External Trips			Diverted Trips			Pass-by Trips			New Trips								
			In	Out	Total	Portion	In	Out	Total	In	Out	Total	In	Out	Total	Portion	In	Out	Total	Portion	In	Out	Total						
310 Hotel	160 rooms	56%	64	50	115	100.00%	64	50	115				64	50	115											64	50	115	
820 Retail	610,000 s.f.	52%	1,343	1,240	2,582	100.00%	1,343	1,240	2,582	20	26	46	1,323	1,214	2,537	18%	228	228	457	2%	25	25	51	1,069	960	2,029			
850 Grocery	140,000 s.f.	51%	775	744	1,519	100.00%	775	744	1,519	12	15	27	763	729	1,492	18%	134	134	269	2%	15	15	30	614	580	1,194			
710 Office	325,000 s.f.	54%	72	61	133	100.00%	72	61	133	22	14	37	50	47	96										50	47	96		
230 Condominiums	200 units	54%	54	46	101	100.00%	54	46	101	5	5	10	49	42	91										49	42	91		
220 Apartment	450 units	53%	124	110	234	100.00%	124	110	234	12	11	23	112	99	211										112	99	211		
252 Sr. Adult Housing - Attached	100 units	48%	14	16	30	100.00%	14	16	30	1	2	3	13	14	27										13	14	27		
			2,446	2,267	4,714		2,446	2,267	4,714	73	73	146	2,374	2,195	4,568									725		81	1,971	1,792	3,762

Trip	INBOUND			OUTBOUND		
	From ITE	Adj.	Mirror Trip	From ITE	Adj.	Mirror Trip
Office in from Retail	22	22	Retail out to Office	22	22	
Office in from Reside	0	0	Residential out to C	0	0	
Retail in from Office	14	14	Office out to Retail	14	14	
Retail in from Resider	91	17	Residential out to F	91	17	
Residential in from Of	1	0	Office out to Resid	1	0	
Residential in from Rt	60	19	Retail out to Resid	60	19	
Totals	188	73		188	73	

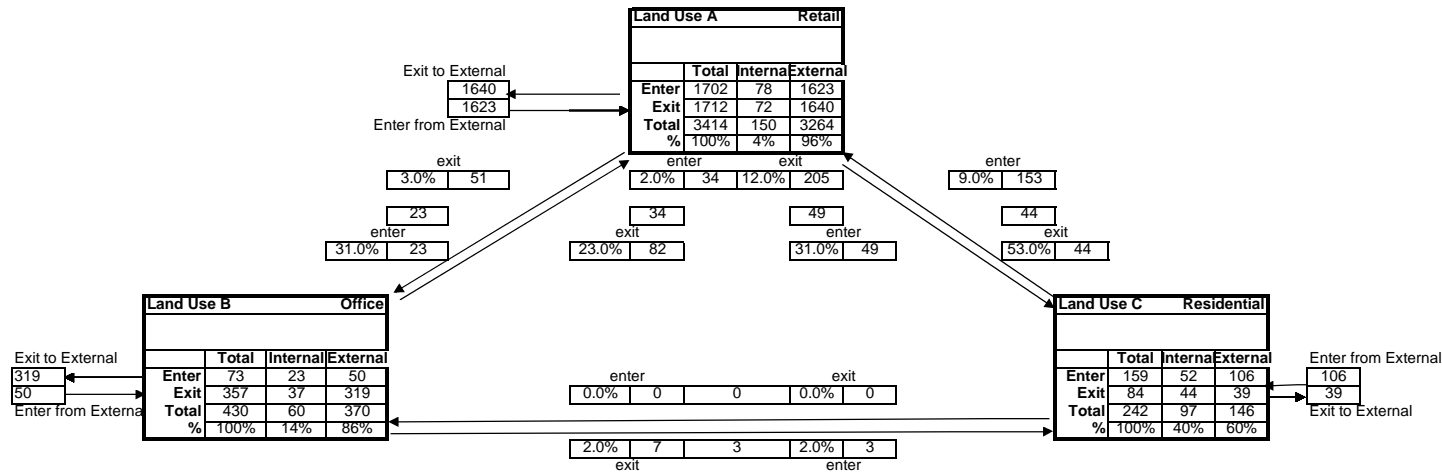
Morning Peak Hour Internal Trip Calculations



Internal Trip Capture Rates

				AM	PM rate
From	Office	to	Office	23.0%	
			Retail	2.0%	
			Reside	3.0%	
From	Retail	to	Office		
			Retail	12.0%	
			Reside		
From	Residential	to	Office	53.0%	
			Retail		
			Residential		
To	Office	from	Office		
			Retail	31.0%	
			Reside	0.0%	
To	Retail	from	Office	2.0%	
			Retail		
			Reside	9.0%	
To	Residential	from	Office	2.0%	
			Retail	31.0%	
			Residential		

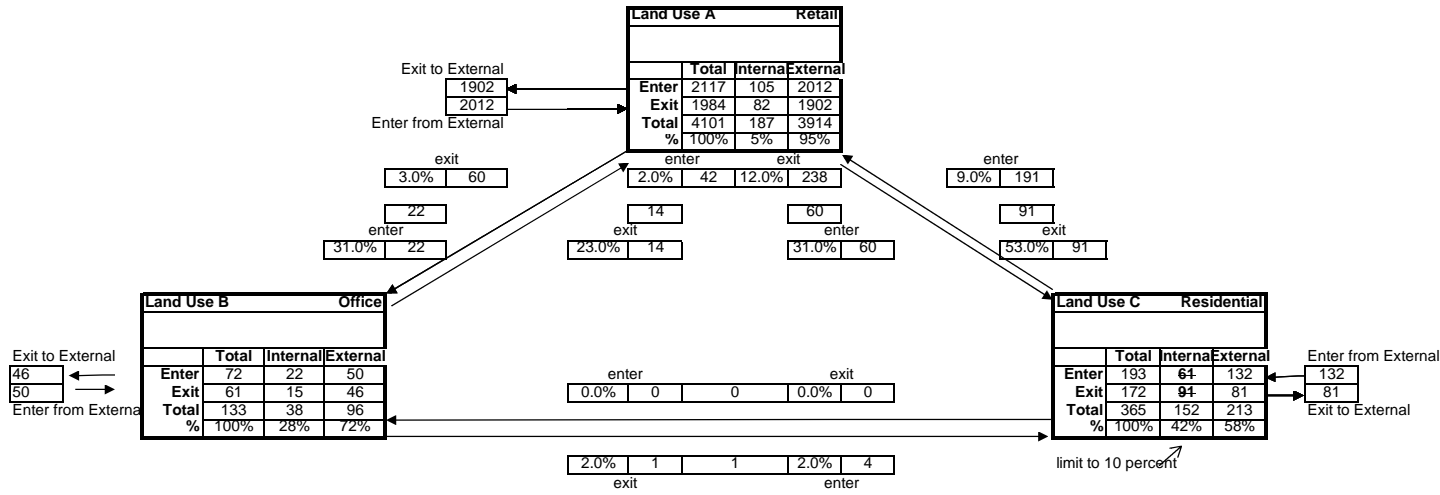
Afternoon Peak Hour Internal Trip Calculations



Internal Trip Capture Rates

				PM	PM rate
From	Office	to	Office	23.0%	
			Retail	2.0%	
			Reside	3.0%	
From	Retail	to	Office		
			Retail	12.0%	
			Reside		
From	Residential	to	Office	53.0%	
			Retail		
			Residential		
To	Office	from	Office		
			Retail	31.0%	
			Reside	0.0%	
To	Retail	from	Office	2.0%	
			Retail		
			Reside	9.0%	
To	Residential	from	Office	2.0%	
			Retail	31.0%	
			Residential		

Saturday Mid-day Peak Hour Internal Trip Calculations



Internal Trip Capture Rates

SAT				PM rate
From	Office	to	Office Retail Reside	23.0%
From	Retail	to	Office Retail Reside	3.0%
From	Residential	to	Office Retail Reside	53.0%

To	Office	from	Office Retail Reside	31.0%
To	Retail	from	Office Retail Reside	2.0%
To	Residential	from	Office Retail Reside	2.0%
To	Residential	from	Office Retail Reside	31.0%

Attachment B

Transit Mode Share

MEMORANDUM

TO: Efi Pagitsas

March 15, 2006

FROM: Thomas J. Humphrey

RE: **Analysis of Projected Commuter Rail Shares of Trips Generated by
Development at Route 128 Station**

Introduction and Summary

As requested, I have reviewed the consultant's estimates of the commuter rail shares of total trips generated by proposed development at Route 128 Station. These trips would be generated by four categories of development: residential, office, retail, and hotel. The estimated commuter rail share of residential-based trips for either phase of development are plausible. The absolute numbers estimated for hotel development are so small that they have little effect on the total results.

For the Phase I development, office-based trips also account for a small part of the total projected ridership. However, for the Phase I + II development, office-based trips account for the largest shares of weekday ridership, and they appear to be about four times as large as would be likely. Retail trips are the largest source of estimated trips in the Phase I development and the second-largest source in the Phase I + II development, but they also appear to be about four times as large as would be likely. A detailed analysis is presented below.

Details of Findings

Trips Generated by Residential Development

The commuter rail share of all peak-period trips generated by residential development at the Westwood site is estimated by the consultant at 29%. This is between the observed values of 40-46% for the development at Salem Station and 11% to 18% at Windsor Gardens. At present, Route 128 and Salem are each served by 10 inbound AM peak trains, but Windsor Gardens is served by only 5. In the PM peak, Route 128 is currently served by 7 outbound trains, compared with 10 to Salem and 5 to Windsor Gardens. These figures suggest that the share of residential trips captured at Route 128 could be closer to that at Salem than to that at Windsor Gardens. With a share of 46% in the AM peak, commuter rail would serve 65 trips rather than 41 with the Phase I development, and 156 rather than 99 with the Phase I + II development. With a share of 40% in the PM peak, commuter rail would serve 65 trips rather than 45 with the Phase I development, and 152 rather than 110 with the Phase I + II development.

Trips Generated by Hotel Development

The consultant's estimate of commuter rail share of all peak-period trips generated by hotel development at the Westwood site is 6%. This presumably includes hotel workers and guests. No comparable situations are cited in the analysis. However, the maximum estimates of hotel-based weekday commuter rail trips range from 9 with a 235-room hotel to 16 with a 450-room hotel. Since these are very small components of the total estimated commuter rail ridership, they need not be of great concern even if they are too high.

Trips Generated by Office Development

The consultant's estimate of commuter rail share of all peak-period trips generated by office development is 11.0%. In absolute terms, this is only 16-17 trips for the Phase I development, so as in the case of hotel development, any over-estimation need not be of great concern. However, for the Phase I + II development, the projected totals of 401 AM peak and 386 PM peak trips account for the largest components of the total estimated commuter rail ridership, at 69% and 52%. Therefore, they need to be examined more carefully.

The 2001 CTPS Reverse Commuting Study used an upper-bound estimate of 11% for the commuter rail share of work-trips to Westwood from homes anywhere in Boston. This depended on an underlying assumption of convenient access between commuter rail stations and work locations, which would be the case for a Route 128 development. However, only about 10% of all jobs in Westwood are held by Boston residents. If this were also true of a Route 128 development, with the Phase I + II office complex generating 3,643 AM peak trips and 3,502 PM peak trips, Boston residents would be expected to make 364 and 350 of these. At 11%, the commuter rail shares of these trips would be 40 and 39.

Commuter rail would be expected to capture much smaller shares of work trips to Route 128 from locations other than Boston. Many of these trips would be expected to originate at points that do not have convenient access to stations on the Attleboro/Stoughton commuter rail line. The 2003 survey of passengers using the TMA shuttle from Route 128 Station found that origins of those transferring from outbound trains were about evenly divided between Boston residents and passengers who first traveled into Boston from suburbs to access the commuter rail line. A similar ratio would raise the Westwood development office-based ridership on outbound AM peak and inbound PM peak trains to 80 and 78.

The final component of commuter rail ridership to be considered would be that between Route 128 and stations further south. Counts taken in December 2000 found that the number of inbound AM peak alightings at Route 128 was 24% as large as the number of outbound AM peak alightings. With similar proportions, office-based Westwood ridership to and from points further south would be about 19 in each peak-period, raising the grand totals to 99 and 97. These are 75% lower than the estimates in the consultant's analysis.

Trips Generated by Retail Development

Retail-based trips would include a combination of trips by retail-establishment employees and customers of those establishments. For most retail businesses, customer trips would be the larger of the two groups. The commuter rail share of retail-based trips could theoretically include some riders from each group. However, use of the commuter rail system for shopping trips in the past has been very low. The 1993 MBTA commuter rail survey found that only 1.1% of the weekday trips on the lines then in operation had shopping as the activity at either end of the trip. The 1998 Old Colony Lines survey found even smaller percentages of shopping trips. Customers of "big-box" stores, buying large quantities of merchandise at one time, or buying large items such as furniture, would be even less likely than other retail customers to travel by commuter rail. For these reasons, estimates of commuter rail trips generated by retail development at Route 128 should be based mainly on employee trips.

The amount of retail development was assumed to be the same for either the Phase I project or the Phase I + II project, so the number of retail trips estimated by the consultant for either project was the same. The consultant's estimate of trips generated by retail development did not include separate breakdowns of employee and customer trips. The estimated total number of weekday trips by all means was 1,030 in the AM peak and 3,750 in the PM peak. This large difference is presumably a result of the late opening times of many retail business. The commuter rail share was estimated at 6%, or 62 in the AM peak and 225 in the PM peak.

Since customer trips could be expected to make up the majority of total trips generated by retail development, an upper-bound estimate of employee trips would be provided by assuming that they would equal half of all trips. This would be 515 in the AM peak and 1,875 in the PM peak. If it is assumed that retail employees of the development would be as likely as office employees to live in Boston and to use commuter rail, then applying the same factors used in the analysis above, 10% would live in Boston and 11% of these would travel by commuter rail. This would make 6 trips in the AM peak and 21 in the PM peak. Applying the same add-ons used for suburban trips via Boston and trips from points south of Route 128 would raise the total commuter rail trips to 14 in the AM peak and 51 in the PM peak. These are only 23% as large as the consultant's estimates.

TJH/tjh

TRANSIT SHARE

Residential Transit Share

2000 Census Data - Residential Development

9.74% Live in Westwood and Commute by Train/Bus to Work
10.28% Live in Westwood in Westwood Station area and Commute by Train/Bus to Work
28.43% of Residents in vicinity of Westwood Station work in Boston
36.24% of Residents in vicinity of Westwood Station who work in Boston take the T to work
0.00% of Residents in vicinity of Westwood Station who work outside of Boston take the T to work

Memorandum Re Analysis of Projected Commuter Trail Shares of Trips Generated by Development at Route 128 Station (Efi Pagitsas, March 15, 2006)

40% to 46% Salem Station which is served by 10 inbound trains in the AM and 10 outbound trains in the PM (266 units)
11% to 18% Windsor Gardens (Norwood) which is served by 5 inbound trains in the AM and 5 outbound trains in the PM (914 units)
Westwood Station is served by 10 inbound trains in AM and 7 outbound trains in the PM
Conclusion - closer to Salem

Development of Transit Share for Westwood Station (Oak Square Resources, LLC, March 26, 2006)

33% Residential Transit Share
Based on:
AM PM
46% 40% Salem Station
18% 11% Windson Gardens Norwood
Average 32%

FEIR Westwood Station

46% Residential Transit Share

Tetra Tech Rizzo Interim Phase I 36% AM Residential Transit Share 22% PM Residential Transit Share

Double Norwood AM Transit Share - WS has double the service and is similarly located to hwy system

Office Transit Share

2000 Census Data - Office Development

1.78% total transit use for commute TO Westwood
2.06% total transit use for commute TO Westwood station area
8.94% of Workers in vicinity of Westwood Station come from Boston
91.06% of Workers in vicinity of Westwood Station come from outside of Boston
13.20% of Workers in the vicinity of Westwood Station who come from Boston take the T to work
0.97% of Workers in the vicinity of Westwood Station who live outside of Boston take the T to work

Memorandum Re Analysis of Projected Commuter Trail Shares of Trips Generated by Development at Route 128 Station (Efi Pagitsas, March 15, 2006)

2.7% total transit for commute TO Westwood Station
Based on CTPS 2001 Reverse Commuting Study and 2000 Census data
10% of workers in Westwood are Boston residents
11% of work trips to Westwood from Boston use Transit
0.5 transit trips arriving in AM at Westwood are from Boston

Development of Transit Share for Westwood Station (Oak Square Resources, LLC, March 26, 2006)

3% Transit Share for Office Trips

FEIR Westwood Station

3% Transit Share for Office Trips

Tetra Tech Rizzo Interim Phase I 3.0% Office Transit Share

Use CTPS Memo method

Retail Transit Share

2000 Census Data

Memorandum Re Analysis of Projected Commuter Trail Shares of Trips Generated by Development at Route 128 Station (Efi Pagitsas, March 15, 2006)

1.4% Transit Share for Retail Trips
Based on:
Employee Trips Only
50% of trips would be generated by employees
0.5 transit trips arriving in AM at Westwood are from Boston
11% of work trips to Westwood from Boston use Transit
10% of workers in Westwood are Boston residents
0.5 transit trips arriving in AM at Westwood are from Boston

Development of Transit Share for Westwood Station (Oak Square Resources, LLC, March 26, 2006)

3% Transit Share for Retail Trips
Based on:
Transit Share for Office Trips can be used for retail employees

FEIR Westwood Station

1.5% Transit Share for Retail Trips

Tetra Tech Rizzo Interim Phase I 1.5% Retail Transit Share

50% employee is high, but 1.5% seems reasonable

Attachment C

Trip Distributions and Project Trip Figures

Office Distribution Analysis																										
Resident Town for Population Working in Westwood	Percent of Population	Route 138 from the south	Washington St. from the south	I-95 from the south	Rte 1 from the south	Route 1A (Washington St.) from the south	Route 109 (High Street) from the south	Route 109 (High Street) from the north	Route 128/I-95 from the north	Route 1A (Washington St.) from the north	Route 1 from the north	East Street from the north	Route 138 SB from the north	I-93 from the east	Randolf Street from the east	Neponset Street from the east	Pleasant Street from Canton	Neponset Street from within Norwood	Nahantan Street from within Norwood	Canton Street EB from within Westwood	University Avenue NB from within Westwood	Washington Street SB from within Westwood	East St. NB from within Westwood	Nahantan Street from within Westwood	Pond Street from within Westwood	
Monson	0.15%								100%																	
Natick	0.77%								100%																	
Needham	0.44%								100%																	
New Bedford	0.11%													90%	10%											
New Hampshire	1.05%								100%																	
Newton	1.61%												100%													
Norfolk	0.11%			100%																						
North Andover	0.40%								40%					60%												
North Attleborough	2.14%			100%																						
Northborough	0.13%								100%																	
Norton	1.21%			100%																						
Norwell	0.13%													100%												
Norwood	5.35%				45%	35%												5%	15%							
other state	0.42%								100%																	
Peabody	0.06%								20%					80%												
Pembroke	0.73%	10%												90%												
Plainville	0.84%			100%																						
Plymouth	0.77%	10%												90%												
Quincy	2.87%													100%												
Randolph	1.15%													20%	80%											
Raynham	0.90%			100%																						
Reading	0.53%								40%					60%												
Rehoboth	0.47%			100%																						
Rhode Island	7.57%			100%																						
Rockland	0.35%													50%	50%											
Rowley	0.29%								100%																	
Sandwich	0.63%	10%												80%	10%											
Saugus	0.20%												15%	85%												
Scituate	0.57%													100%												
Sharon	0.68%		50%	40%	10%																					
Shrewsbury	0.35%								100%																	
Somerville	0.75%												10%	90%												
South Hadley	0.13%								100%																	
Stoughton	2.25%	50%	15%																							
Sutton	0.29%								100%																	
Swampscott	0.42%																									
Taunton	1.78%			100%																						
Tewksbury	0.51%								40%					60%												
Wakefield	0.29%								40%					60%												
Walpole	0.46%			100%																						
Waltham	0.24%								100%																	
Watertown	0.99%								100%																	
Wellesley	0.46%								100%																	
Westford	0.13%								100%																	
Westwood	0.37%																							100%		
Westwood	0.37%																							50%	50%	
Westwood	0.20%																								100%	
Westwood	0.29%																								100%	
Westwood	0.20%																									
Westwood	0.13%																									
Westwood	0.35%																									
Weymouth	2.18%													100%												
Whitman	0.57%													90%	10%											
Winchester	0.13%																									
Worcester	0.44%								100%																	
Wrentham	1.63%			100%																						
Yarmouth	0.23%	10%												80%	10%											
	100.00%	2.54%	2.11%	25.38%	4.36%	2.30%	3.70%	0.00%	11.36%	0.39%	3.75%	2.12%	4.71%	29.08%	3.02%	0.70%	1.49%	0.27%	0.80%	0.48%	0.03%	0.35%	0.10%	0.56%	0.39%	
		Route 138 from the south	Washington St. from the south	I-95 from the south	Rte 1 from the south	Route 1A (Washington St.) from the south	Route 109 (High Street) from the south	Route 109 (High Street) from the north	Route 128/I-95 from the north	Route 1A (Washington St.) from the north	Route 1 from the north	East Street from the north	Route 138 SB from the north	I-93 from the east	Randolf Street from the east	Neponset Street from the east	Pleasant Street from Canton	Neponset Street from within Norwood	Nahantan Street from within Norwood	Canton Street EB from within Westwood	University Avenue NB from within Westwood	Washington Street SB from within Westwood	East St. NB from within Westwood	Nahantan Street from within Westwood	Pond Street from within Westwood	
		3%	2%	25%	4%	2%	4%	0%	11%	1%	4%	2%	5%	29%	3%	1%	1%	0%	1%	1%	0%	0%	0%	1%	0%	

Residential Distribution - 2000 Journey to Work Data for Population which Lives in Westwood in the Vicinity of University Avenue																										
Town of Employment for Westwood Residents	Percent of Population	Route 138 from the south	Washington St. from the south	I-95 from the south	Rte 1 from the south	Route 1A (Washington St.) from the south	Route 109 (High Street) from the south	Route 109 (High Street) from the north	Route 128/I-95 from the north	Route 1A (Washington St.) from the north	Route 1 from the north	East Street from the north	Route 138 SB from the north	I-93 from the east	Randolf Street from the east	Neponset Street from the east	Pleasant Street from Canton	Neponset Street from within Norwood	Nahantan Street from within Norwood	Canton Street EB from within Westwood	University Avenue NB from within Westwood	Washington Street SB from within Westwood	East St. NB from within Westwood	Nahantan Street from within Westwood	Pond Street from within Westwood	
Randolph	0.28%													20%	80%											
Rockland	0.44%													50%	50%											
Rockland	0.28%													50%	50%											
Salem	0.09%													100%												
Sharon	0.66%		50%	40%	10%																					
Sherborn	0.22%						100%																			
Somerville	0.78%												10%	90%												
Somerville	0.28%												10%	90%												
Southborough	0.22%								100%																	
Stoughton	0.55%	50%	15%														35%									
Stoughton	0.28%	50%	15%														35%									
Stoughton	0.94%	50%	15%														35%									
Sudbury	0.33%								100%																	
Taunton	0.89%			100%																						
Wakefield	0.22%								40%					60%												
Walpole	1.33%			100%																						
Walpole	0.33%			100%																						
Walpole	0.66%			100%																						
Walpole	0.55%			100%																						
Waltham	0.66%								100%																	
Waltham	0.94%								100%																	
Waltham	0.33%								100%																	
Waltham	0.28%								100%																	
Watertown	0.14%								100%																	
Watertown	0.42%								100%																	
Wellesley	0.61%								100%																	
Wellesley	0.22%								100%																	
West Bridgewater	0.33%	20%				10%								60%	10%											
Westborough	0.39%								100%																	
Westborough	0.33%								100%																	
Weston	0.28%								100%																	
Westwood	0.17%																							100%		
Westwood	0.22%																							100%		
Westwood	0.72%																							100%		
Westwood	0.66%																								100%	
Westwood	0.55%																								100%	
Westwood	0.66%							30%	70%																	
Westwood	0.66%							30%	70%																	
Westwood	1.11%							30%	70%																	
Westwood	0.33%							30%	70%																	
Westwood	0.72%																				100%					
Westwood	0.50%																				100%					
Westwood	0.33%																				100%					
Westwood	0.89%																				100%					
Westwood	1.05%																				100%					
Westwood	0.55%																				25%		75%			
Westwood	0.33%																				25%		75%			
Westwood	0.22%																				25%		75%			
Westwood	0.33%																					100%				
Westwood	0.86%																					100%				
Westwood	0.44%																					100%				
Westwood	1.79%																					100%				
Weymouth	0.66%													100%												
Weymouth	0.44%													100%												
Woburn	0.22%								100%																	
Worcester	0.28%								100%																	
	100.00%	1.06%	1.91%	5.86%	5.68%	3.84%	2.01%	1.00%	20.37%	1.27%	9.93%	6.77%	8.75%	15.71%	1.23%	0.73%	1.35%	0.54%	1.62%	3.49%	0.28%	3.43%	0.83%	1.11%	1.22%	
		Route 138 from the south	Washington St. from the south	I-95 from the south	Rte 1 from the south	Route 1A (Washington St.) from the south	Route 109 (High Street) from the south	Route 109 (High Street) from the north	Route 128/I-95 from the north	Route 1A (Washington St.) from the north	Route 1 from the north	East Street from the north	Route 138 SB from the north	I-93 from the east	Randolf Street from the east	Neponset Street from the east	Pleasant Street from Canton	Neponset Street from within Norwood	Nahantan Street from within Norwood	Canton Street EB from within Westwood	University Avenue NB from within Westwood	Washington Street SB from within Westwood	East St. NB from within Westwood	Nahantan Street from within Westwood	Pond Street from within Westwood	
		1%	2%	6%	6%	4%	2%	1%	20%	1%	10%	7%	9%	16%	1%	1%	1%	1%	2%	3%		3%	1%	1%	1%	

Retail Distribution - (Towns within 30 minu																												
	Dist. Factor	Competition Factor (VAI)	Percent of Pop.	Route 138 from the south	Washington St. from the south	I-95 from the south	Rte 1 from the south	Route 1A (Washington St.) from the south	Route 109 (High Street) from the south	Route 109 (High Street) from the north	Route 128/I-95 from the north	Route 1A (Washington St.) from the north	Route 1 from the north	East Street from the north	Route 138 SB from the north	I-93 from the east	Randolf Street from the east	Neponset Street from the east	Pleasant Street from Canton	Neponset Street from within Norwood	Nahantan Street from within Norwood	Canton Street EB from within Westwood	University Avenue NB from within Westwood	Washington Street SB from within Westwood	East St. NB from within Westwood	Nahantan Street from within Westwood	Pond Street from within Westwood	
Westwood	1	1	3.00%							15%	5%																	
Weymouth	0.7	0.3	2.41%													100%												
Wrentham	0.7	0.3	0.47%			100%																						
Abington	0.7	0.3	0.65%													80%	20%											
Bridgewater	0.7	0.3	1.12%	20%				10%								60%	10%											
Brockton	0.7	0.3	4.21%	20%				10%								60%	10%											
East Bridgewater	0.7	0.3	0.58%	15%												70%	15%											
Hingham	0.7	0.2	0.59%													80%	20%											
Norwell	0.7	0.2	0.29%													100%												
Rockland	0.7	0.3	0.79%													50%	50%											
West Bridgewater	0.7	0.3	0.30%	20%				10%								60%	10%											
Whitman	0.7	0.3	0.62%													90%	10%											
Boston	0.7	0.2	17.52%										40%	10%	25%	25%												
Chelsea	0.7	0.1	0.52%										15%	15%	70%													
			100%	2.60%	3.71%	14.18%	3.27%	2.69%	4.07%	0.78%	12.71%	0.70%	8.65%	4.58%	8.26%	23.14%	3.86%	1.10%	2.07%	0.30%	0.91%	0.31%	0.00%	0.52%	0.21%	1.01%	0.34%	
				Route 138 from the south	Washington St. from the south	I-95 from the south	Rte 1 from the south	1A (Washington St.) from the south	109 (High Street) from the south	109 (High Street) from the north	Route 128/I-95 from the north	1A (Washington St.) from the north	Route 1 from the north	East Street from the north	Route 138 SB from the north	I-93 from the east	Randolf Street from the east	Neponset Street from the east	Pleasant Street from Canton	et Street from within Norwood	Nahantan Street from within Norwood	Canton Street EB from within Westwood	ty Avenue NB from within Westwood	gton Street SB from within Westwood	East St. NB from within Westwood	Nahantan Street from within Westwood	Pond Street from within Westwood	
				2%	4%	14%	3%	3%	4%	1%	13%	1%	9%	5%	8%	23%	4%	1%	2%		1%			1%		1%		

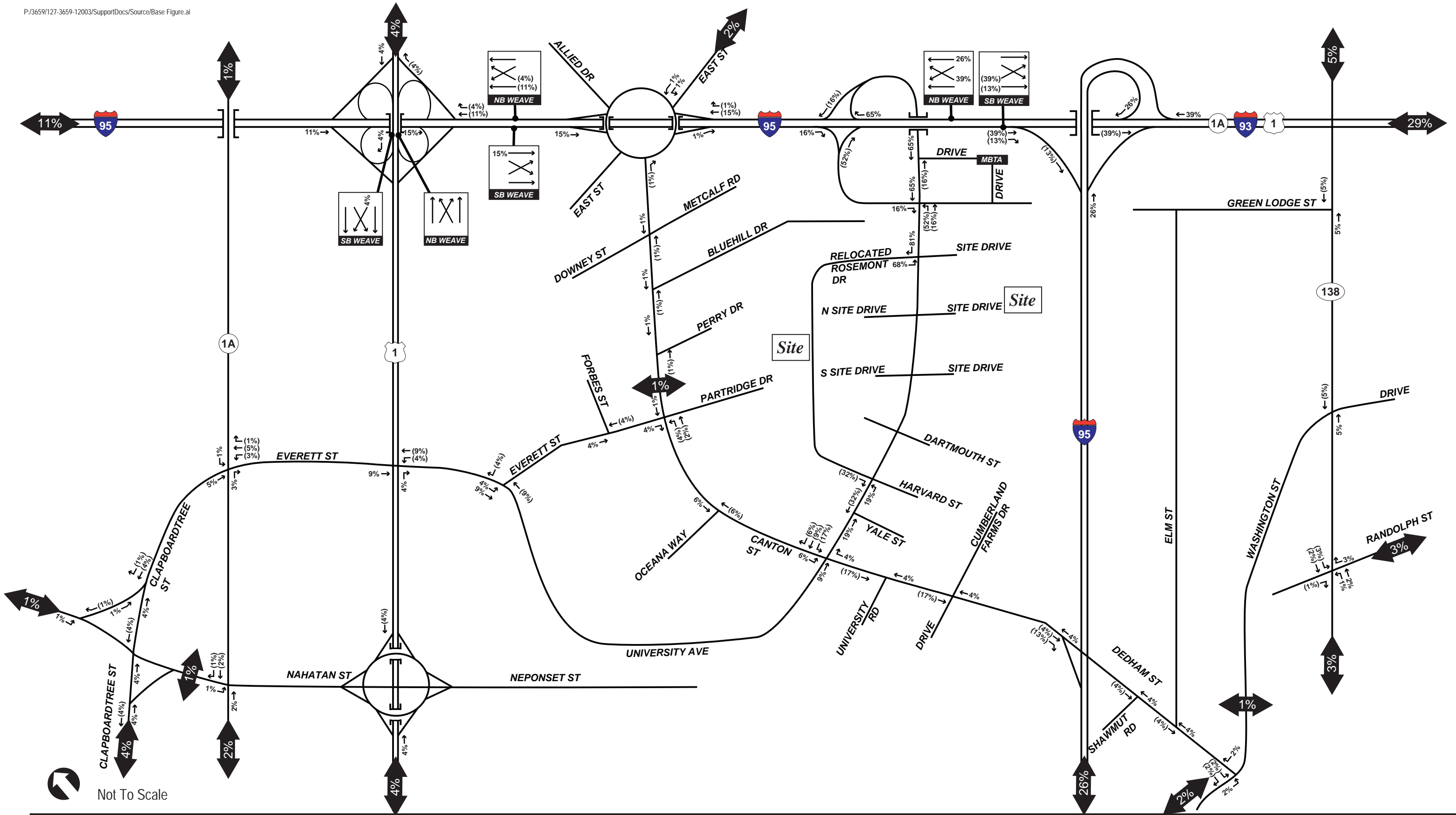
Diverted Link Trip Distribution

	FEIR Fig. 4-9 2011 No-Build		FEIR Fig. 4-9 2011 No-Build		Rounded Average
	PM	PM Dist.	SAT	SAT Dist.	
Rte 128 SB to I-95 SB	2345	12%	1389	9%	10%
Rte 128 NB to I-95 SB	2838	14%	2185	13%	14%
I95 NB to Rte 128 SB	1893	10%	2249	14%	12%
I95 NB to Rte 128 NB	1521	8%	1379	8%	8%
Rte 128 NB	2636	13%	2345	14%	14%
Rte 128 SB	3047	15%	2555	16%	16%
Rte 1 NB	1418	7%	1311	8%	7%
Rte 1 SB	1800	9%	1568	10%	9%
Washington Street at Dedham Street NB	698	4%	564	3%	4%
Washington Street at Dedham Street SB	779	4%	616	4%	4%
University Avenue NB LT*	261	1%	54	0%	1%
University Avenue NB RT*	467	2%	48	0%	1%
Total	19703	100%	16230	100%	98%

*Westwood Station Boulevard is out - assume 2 percent diverted from EB Canton Street

2%

100%

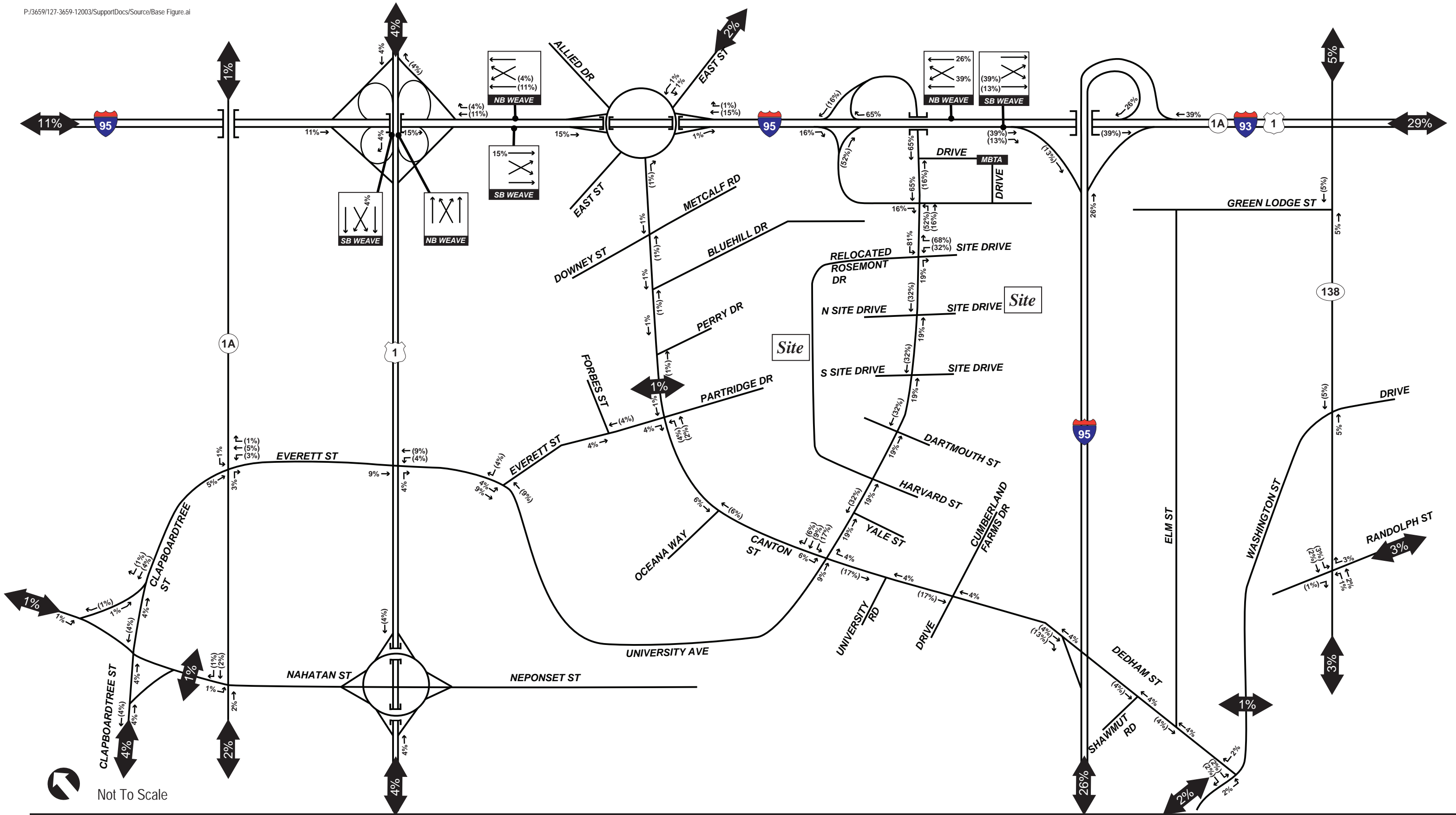


University Station
Westwood, Massachusetts

Office -
Trip Distribution (2017) Figure 2A



Legend	
XX	Entering
(XX)	Exiting



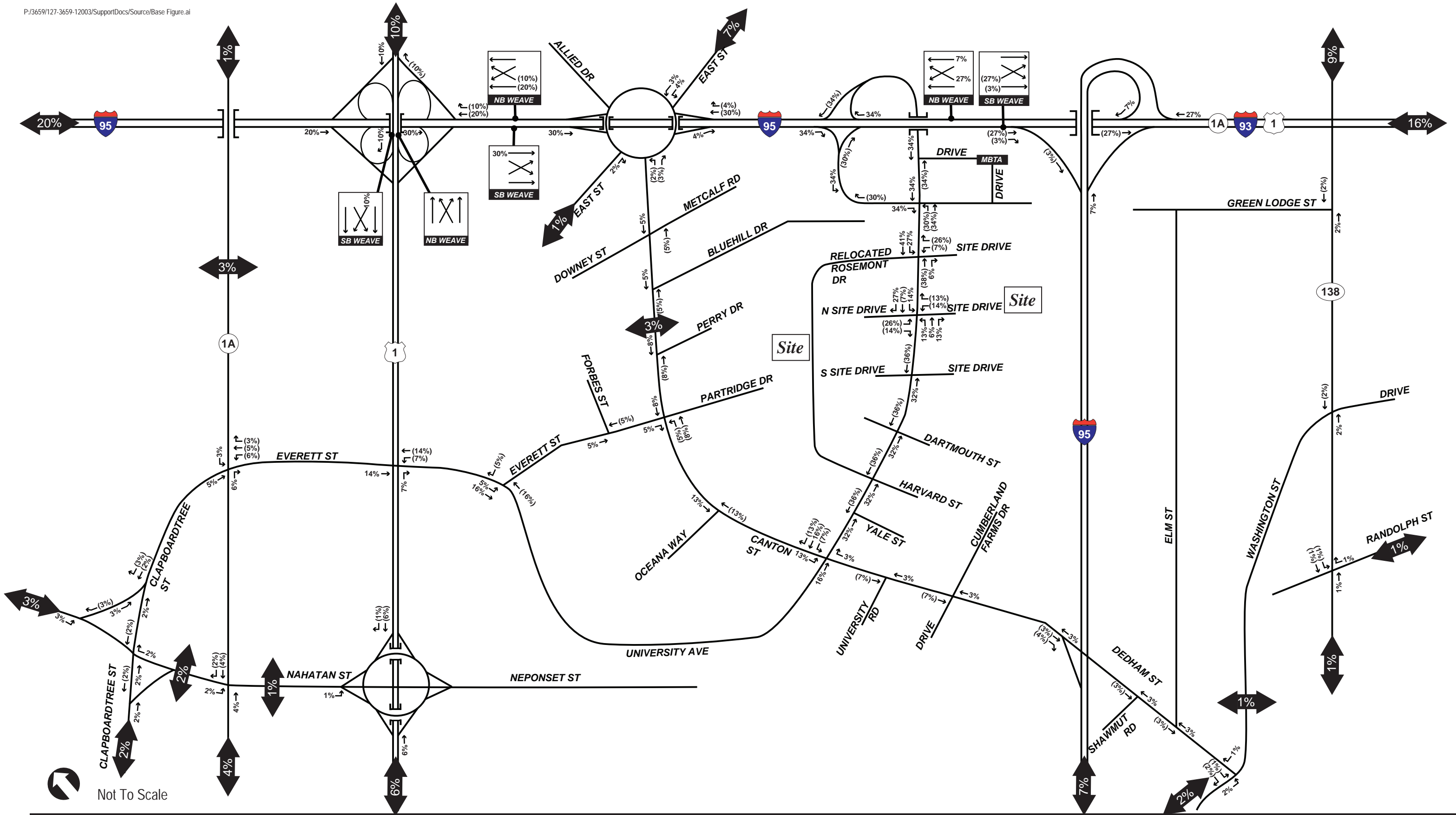
Not To Scale

Legend	
XX	Entering
(XX)	Exiting



University Station
Westwood, Massachusetts

Hotel -
Trip Distribution (2017) Figure 2B

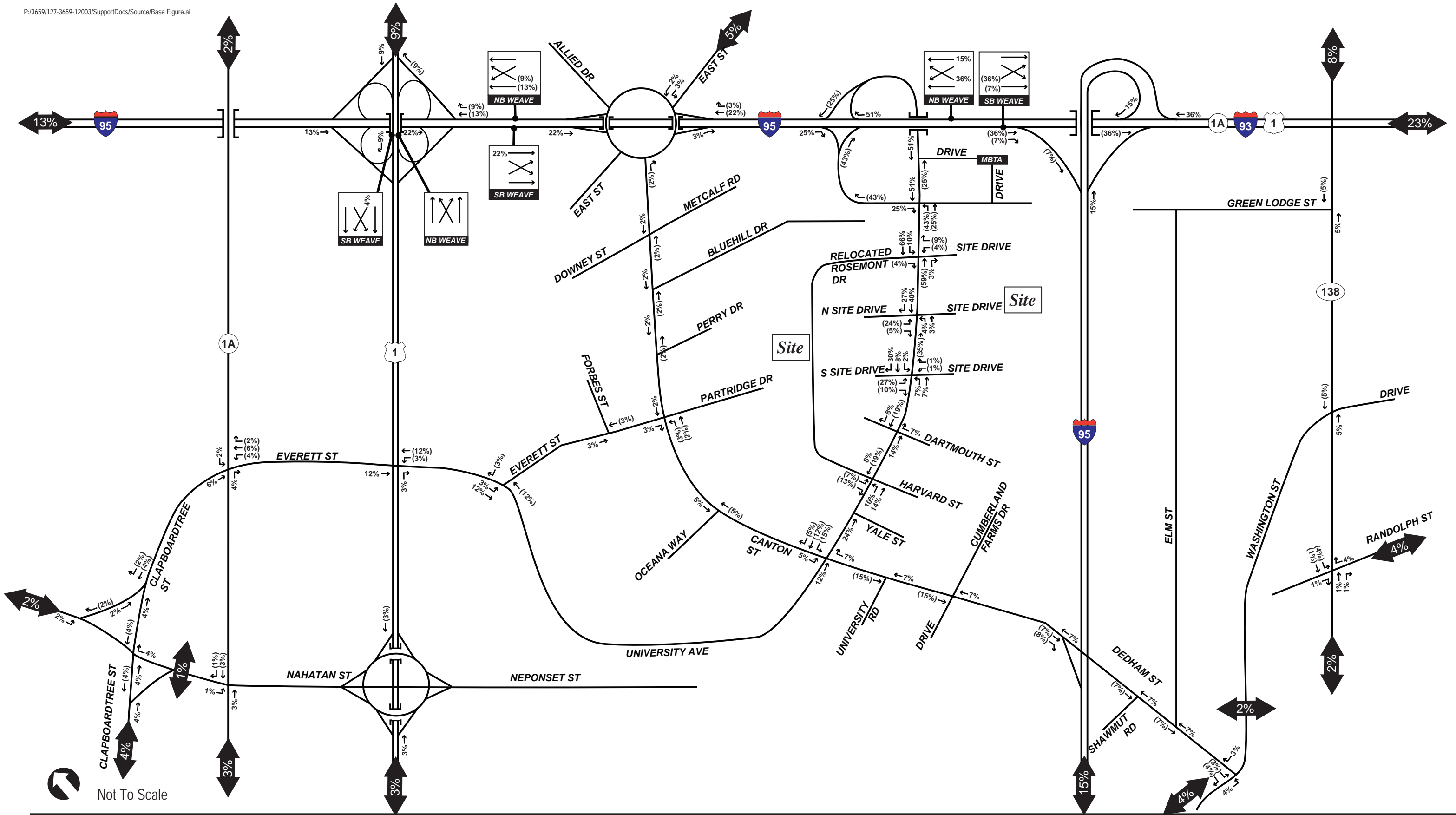


University Station
Westwood, Massachusetts



Legend	
XX	Entering
(XX)	Exiting

Residential -
Trip Distribution (2017) Figure 2C



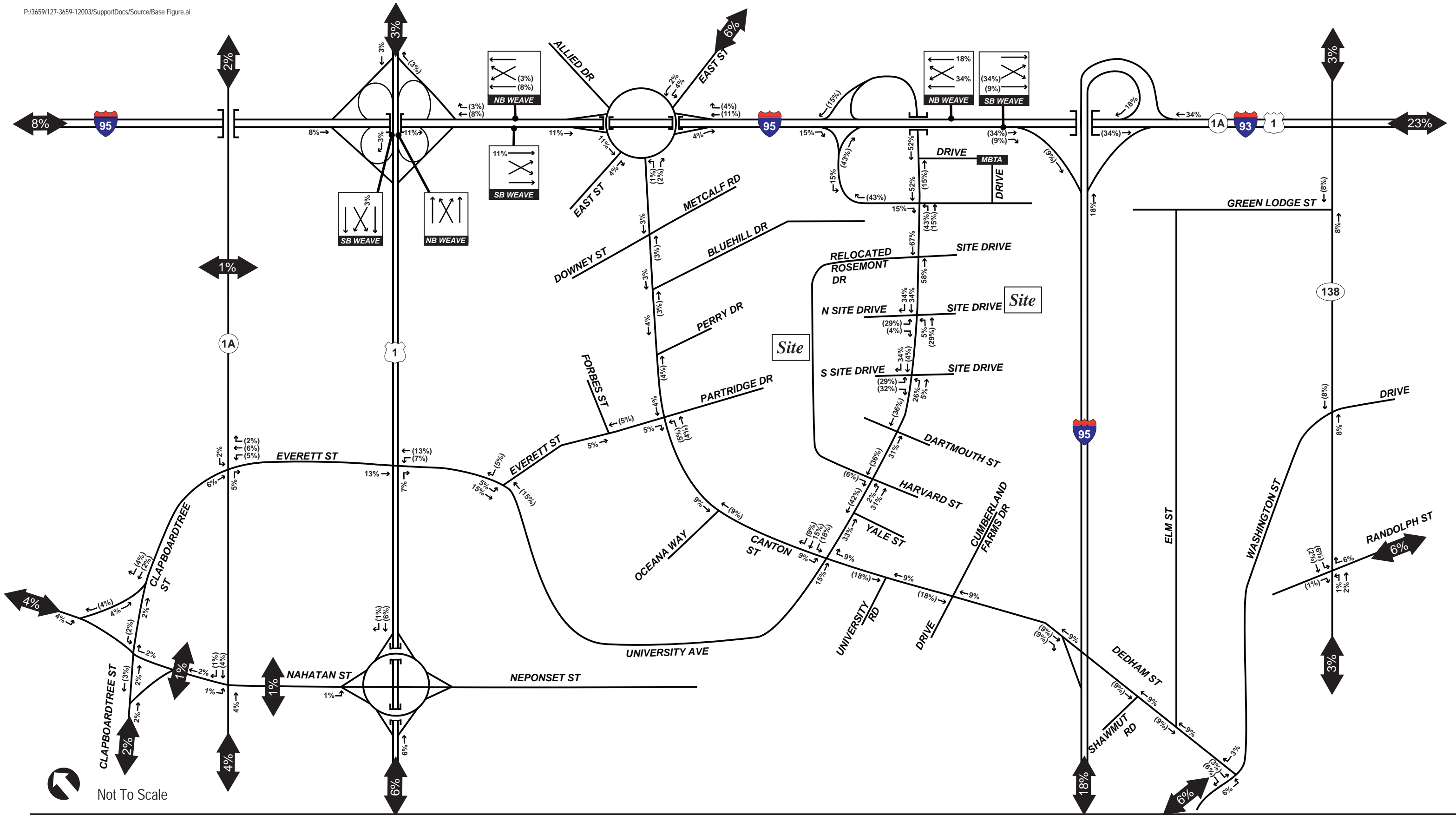
Legend	
XX	Entering
(XX)	Exiting



University Station
Westwood, Massachusetts

Retail - New Trip
Distribution (2017)

Figure 2D



Not To Scale

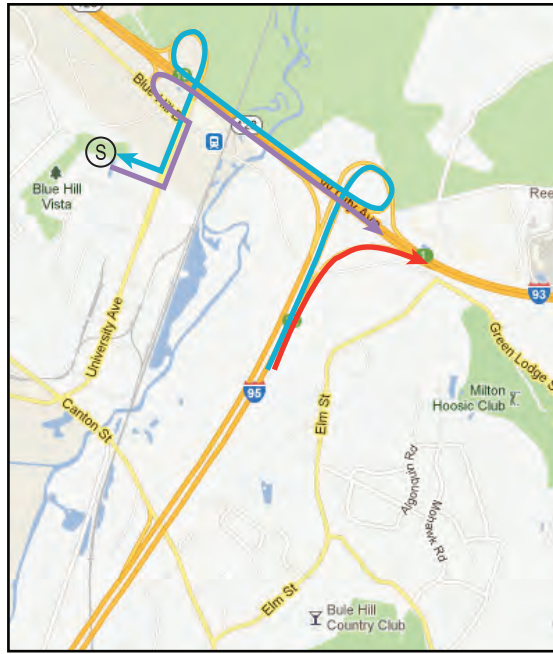
Legend	
XX	Entering
(XX)	Exiting



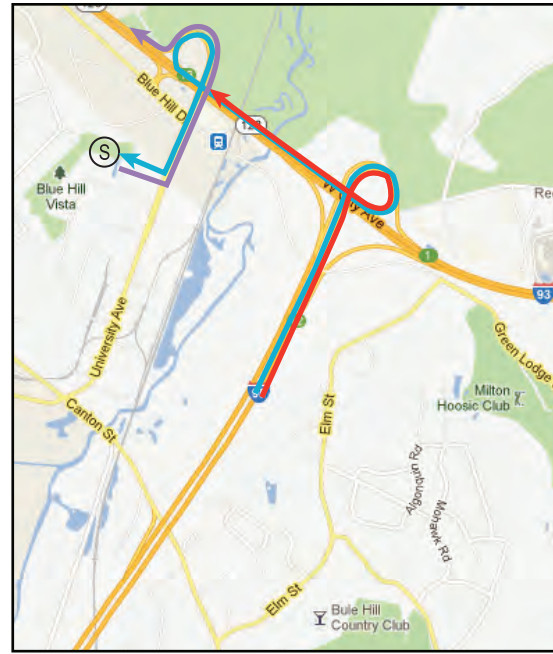
University Station
Westwood, Massachusetts

Wegman's - New Trip
Distribution (2017)

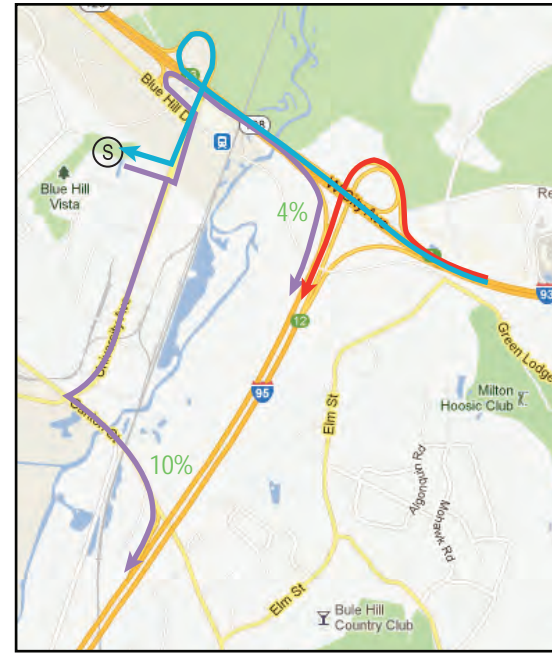
Figure 2E



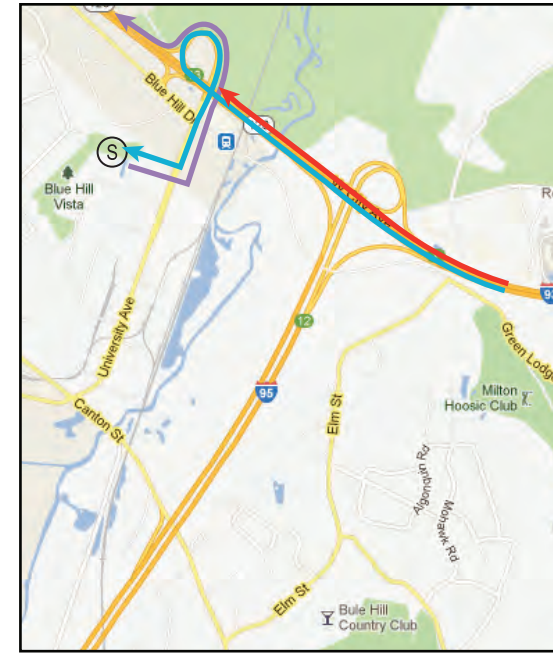
From I-95 NB to I-93 NB (12%)



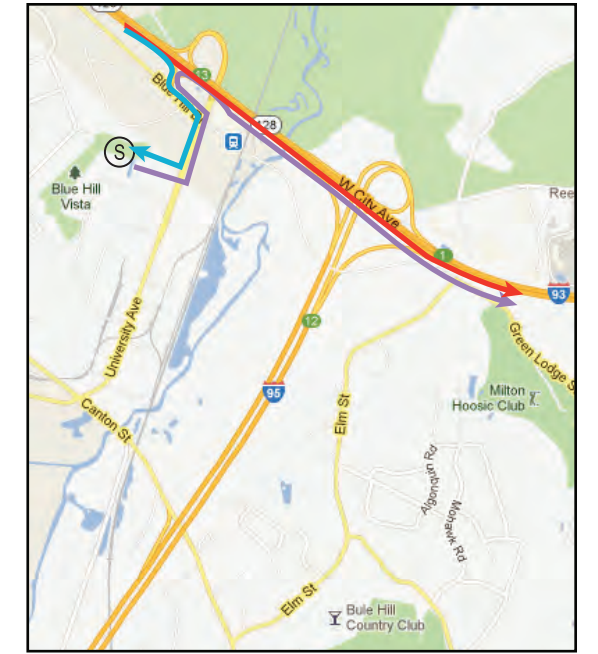
From I-95 NB to Rte. 128 NB (8%)



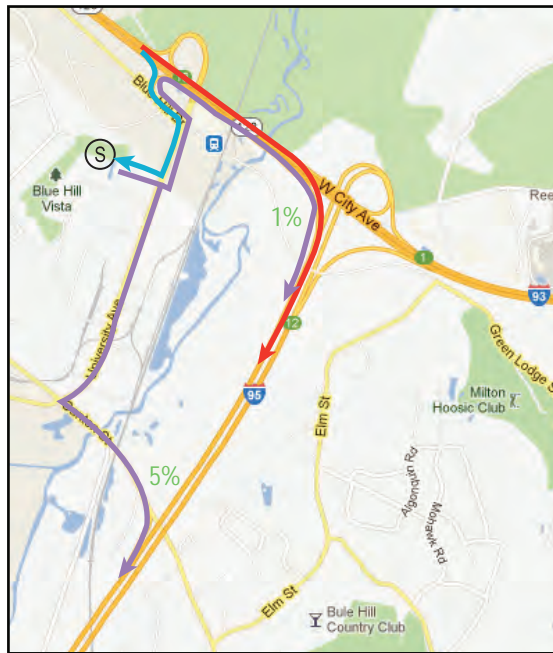
From I-93 SB to I-95 SB (14%)



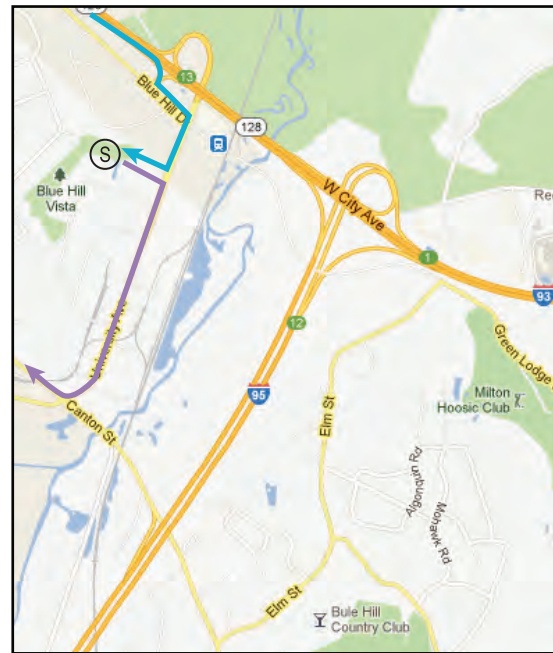
From I-93 SB to Rte. 128 NB (14%)



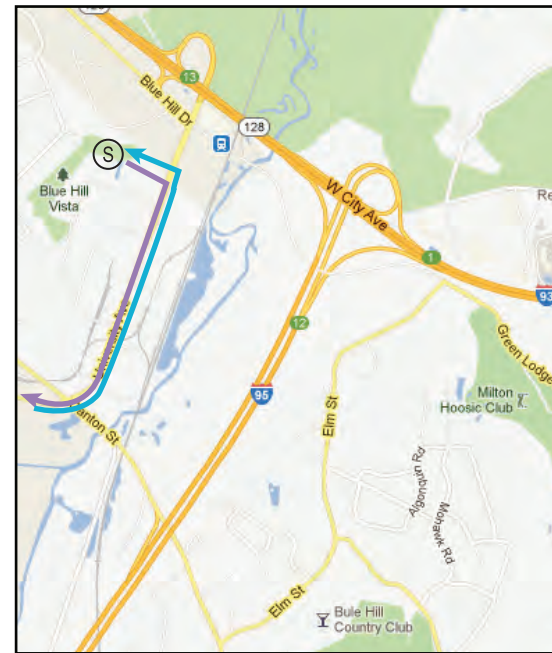
From Rte. 128 SB to I-93 NB (20%)



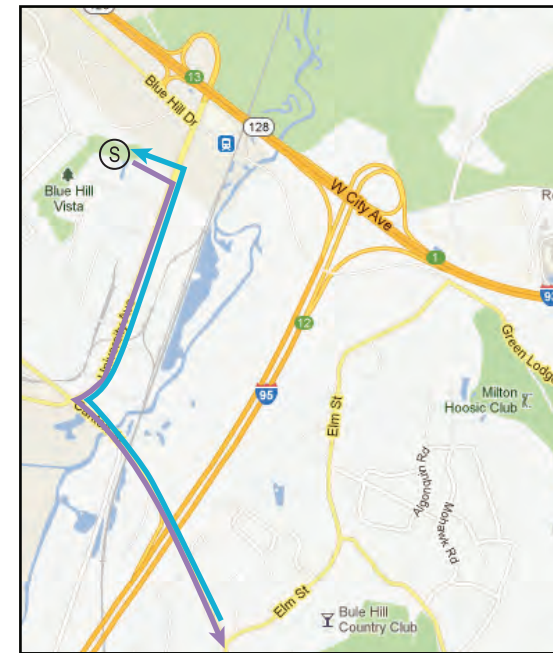
From Rte. 128 SB to I-95 SB (6%)



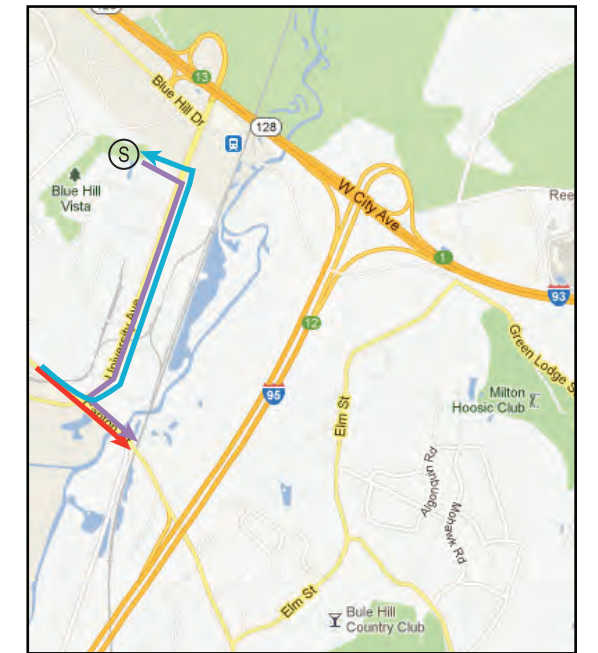
From Rte. 1 SB (9%)



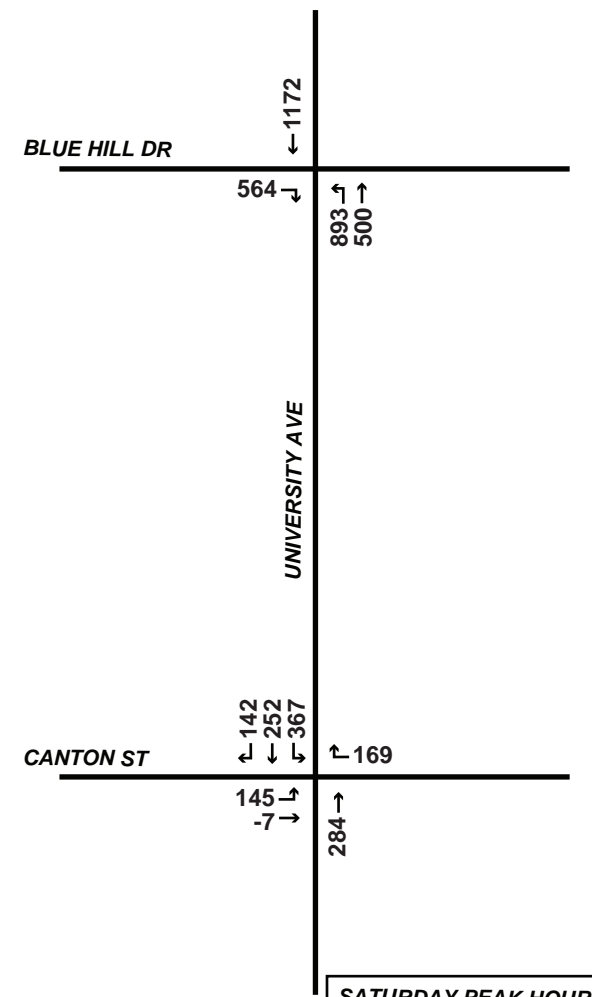
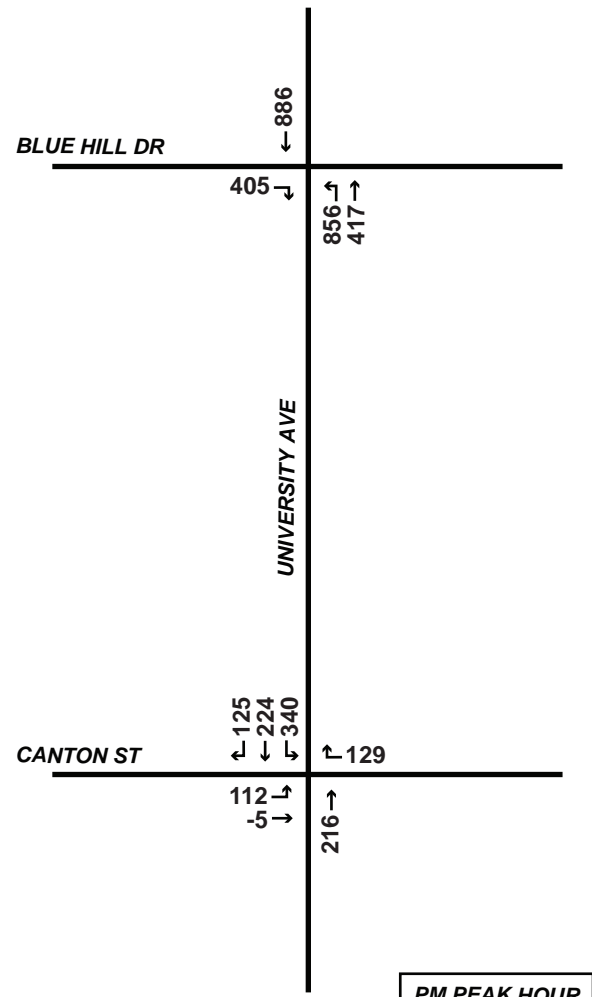
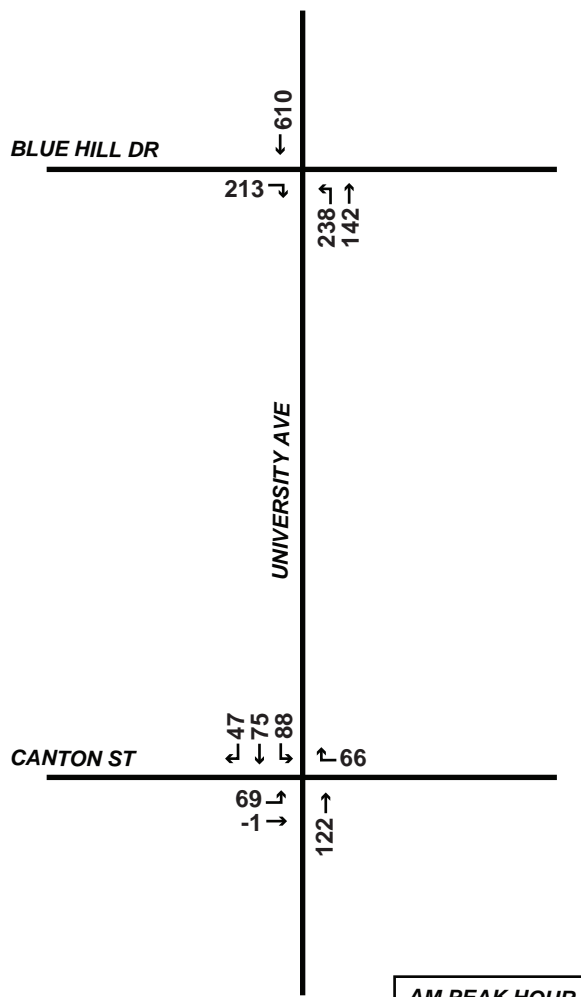
From Rte. 1 NB (7%)



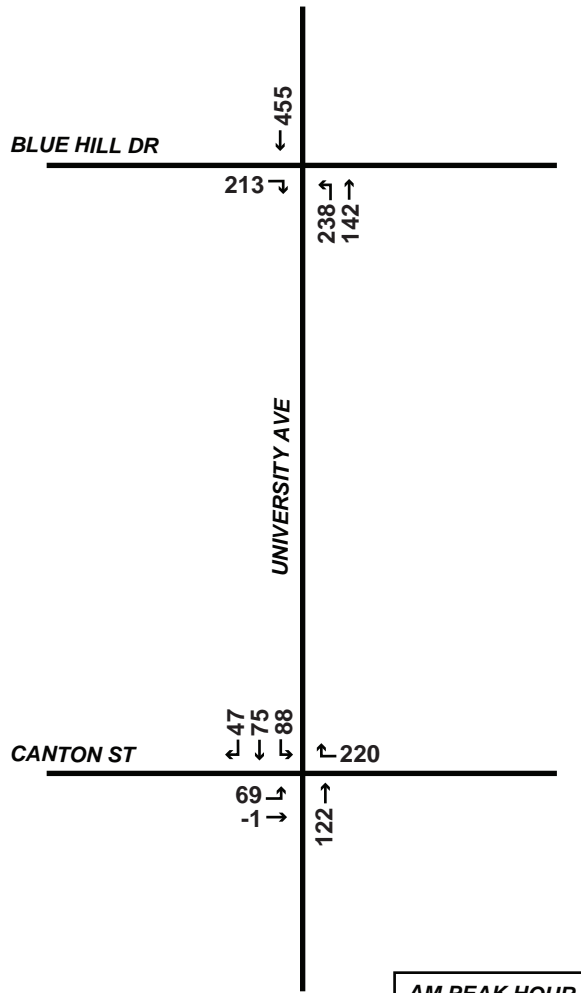
From Washington St (8%)



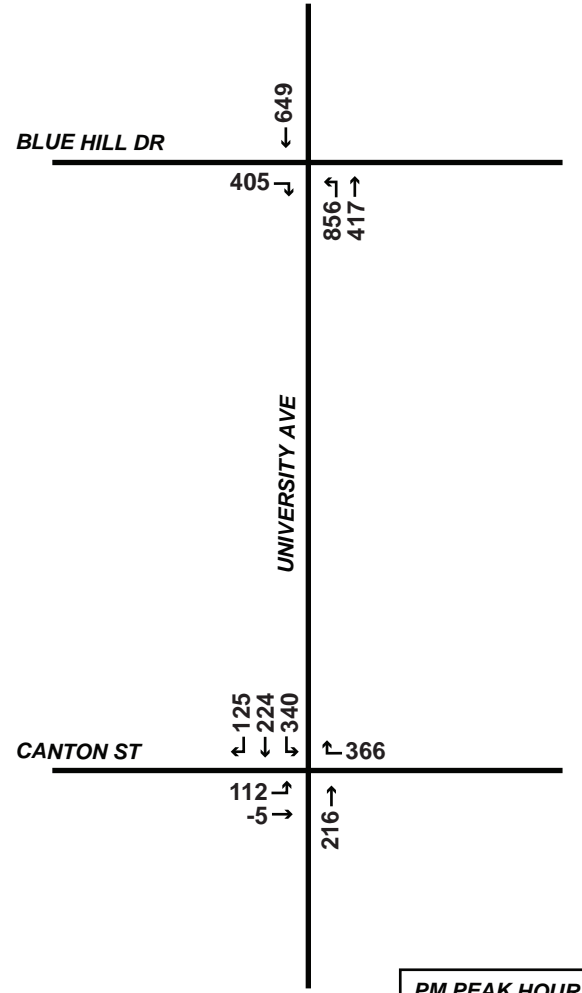
From Canton St. EB (2%)



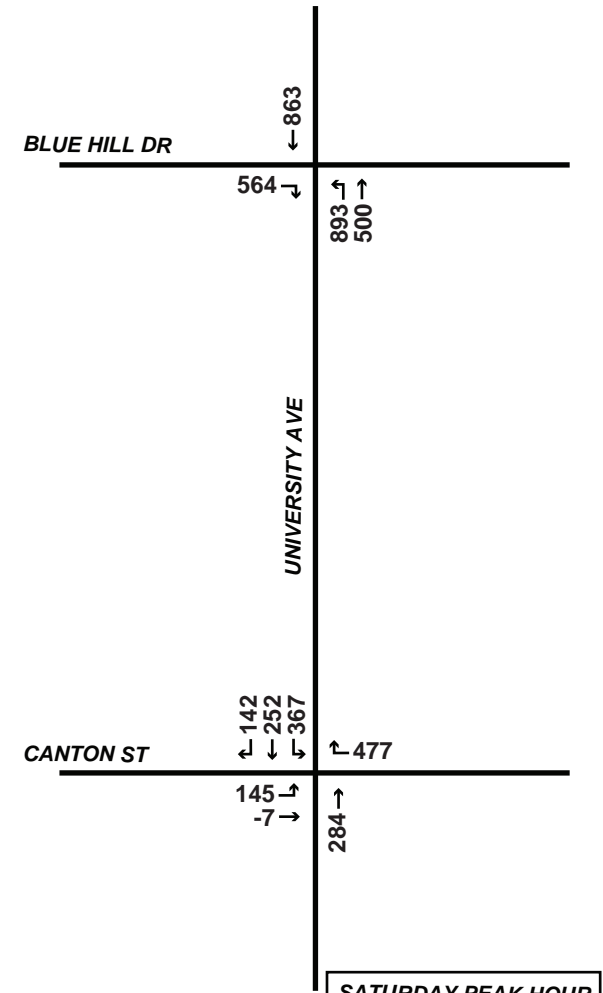
Not To Scale



AM PEAK HOUR



PM PEAK HOUR



SATURDAY PEAK HOUR



Not To Scale



University Station
Westwood, Massachusetts

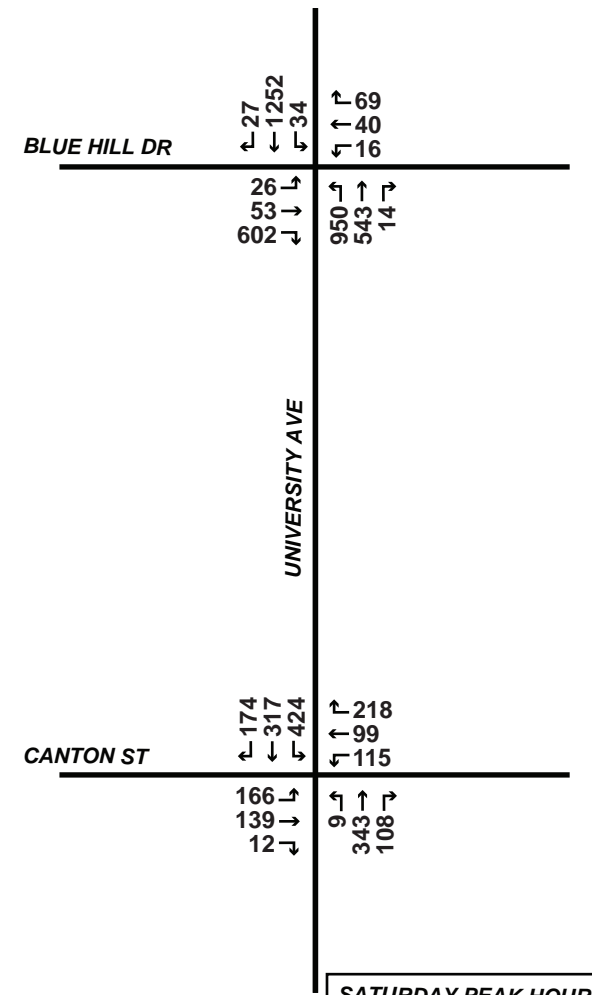
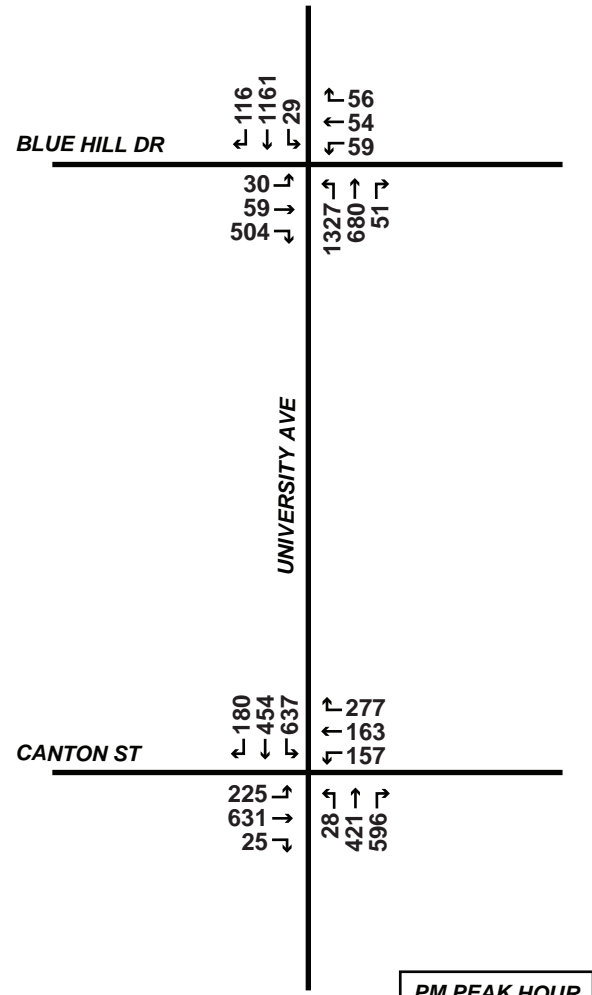
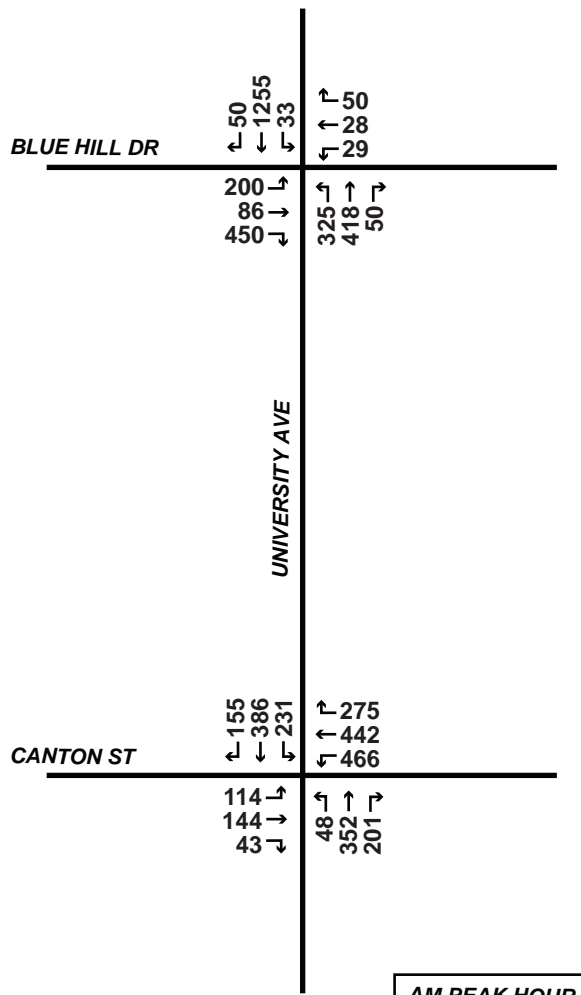
2022 Project Trips
(Full Development)

Figure 2H

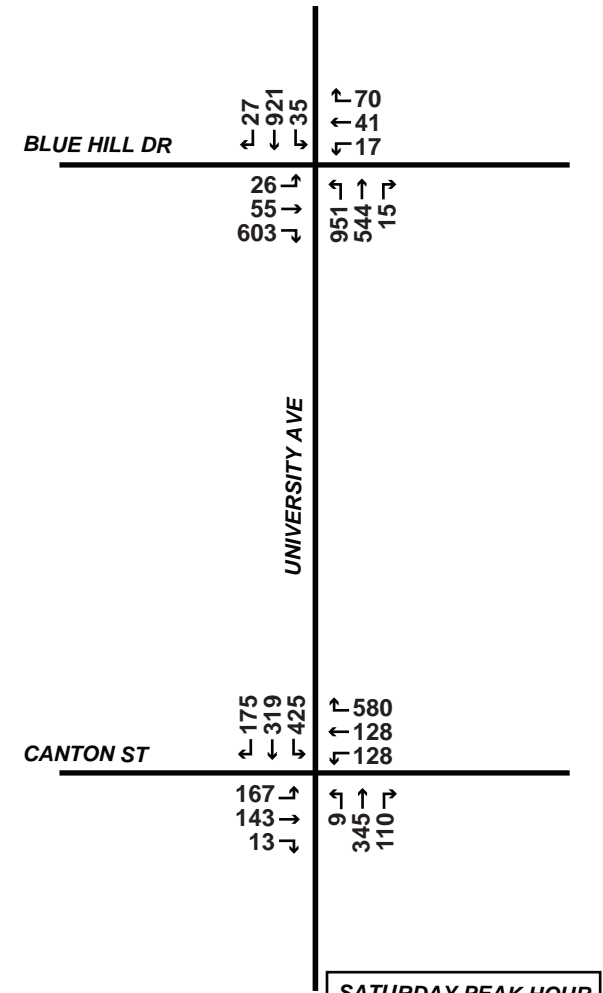
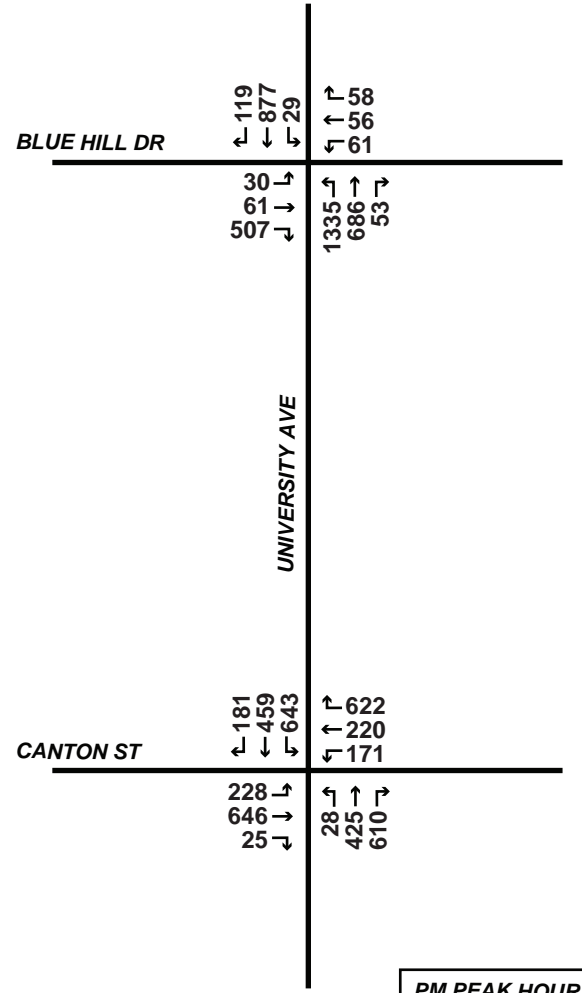
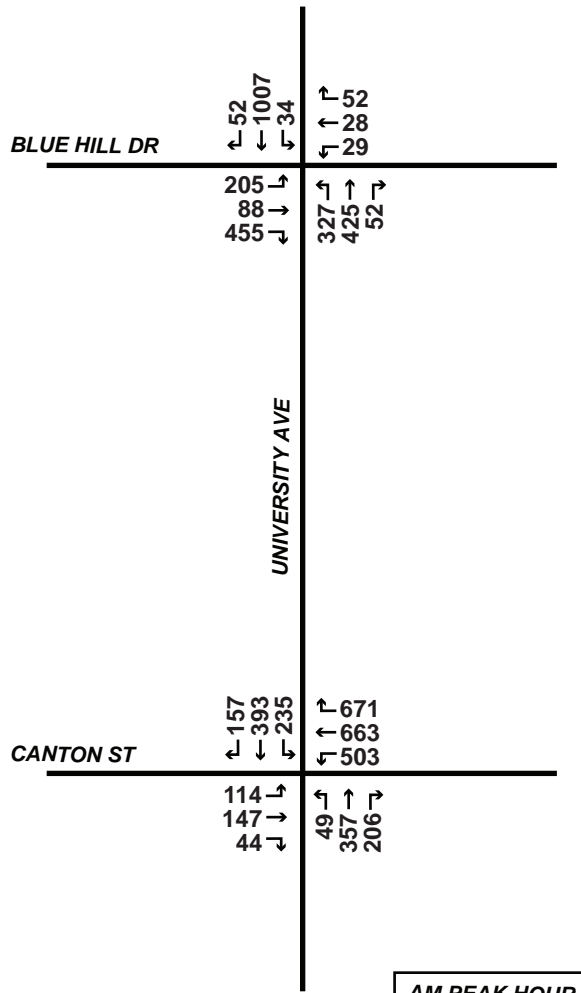



Attachment D

2017 and 2022 Build Condition Traffic Volume Figures



 Not To Scale



 Not To Scale