Traffic Impact Memorandum

The Lodges at Phenix Glen

Cranston,
Rhode Island

Prepared for **The Procaccianti Group**
Cranston, RI

Prepared by ***VHB*/Vanasse Hangen Brustlin, Inc.**
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Memorandum

To: Michael Voccola
The Procaccianti Group
1140 Reservoir Avenue
Cranston, RI 02920

Date: January 30, 2012

Project No.: 72335.00

From: Robert Clinton, P.E.
Transportation Project Manager

Re: The Lodges at Phenix Glen
950 Phenix Avenue, Cranston, RI
Traffic Impact Memorandum

Vanasse Hangen Brustlin, Inc. (VHB) has evaluated the potential traffic impacts and access needs for the proposed development of a mixed use development at 950 Phenix Avenue (the Site), in Cranston. A Site location map is shown in Figure 1.

This assessment indicates that the proposed development will have a minimal impact on traffic operations on the surrounding roadway system. Site access and off-site improvements have been designed to minimize impacts to traffic operations on the area roadway system and to address existing traffic issues. The following memorandum summarizes our findings.

DEVELOPMENT PROPOSAL

The proposed mixed-use development includes the construction of 192 apartments and up to 7,200 square feet (sf) of retail space (the Project) on the Site. As shown on the Site Plan, primary access to the Site is proposed via a new signalized driveway on Phenix Avenue. The primary Site driveway will form the fourth leg of the existing signalized intersection of Natick Avenue/Phenix Avenue. A secondary, unsignalized driveway will be provided to the north of the primary driveway, which will primarily serve the retail component of the Project. The retail development will be served by surface parking, while the residential component of the Project will include surface as well as structured parking spaces.

EXISTING CONDITIONS

The following provides a summary of the existing study area roadways and intersections. Figure 2 shows the existing lane utilization and traffic control for the study area intersections.

Study Area Roadways

Natick Avenue is a two-lane major arterial roadway running in a generally north-south direction south of the primary Site driveway. At major intersections, the cross section widens to accommodate exclusive left and right turn lanes in the northbound and southbound directions. Land use along the roadway is either undeveloped land, or residential in nature. South of Wilbur Avenue, the roadway narrows, and serves as a residential collector roadway.

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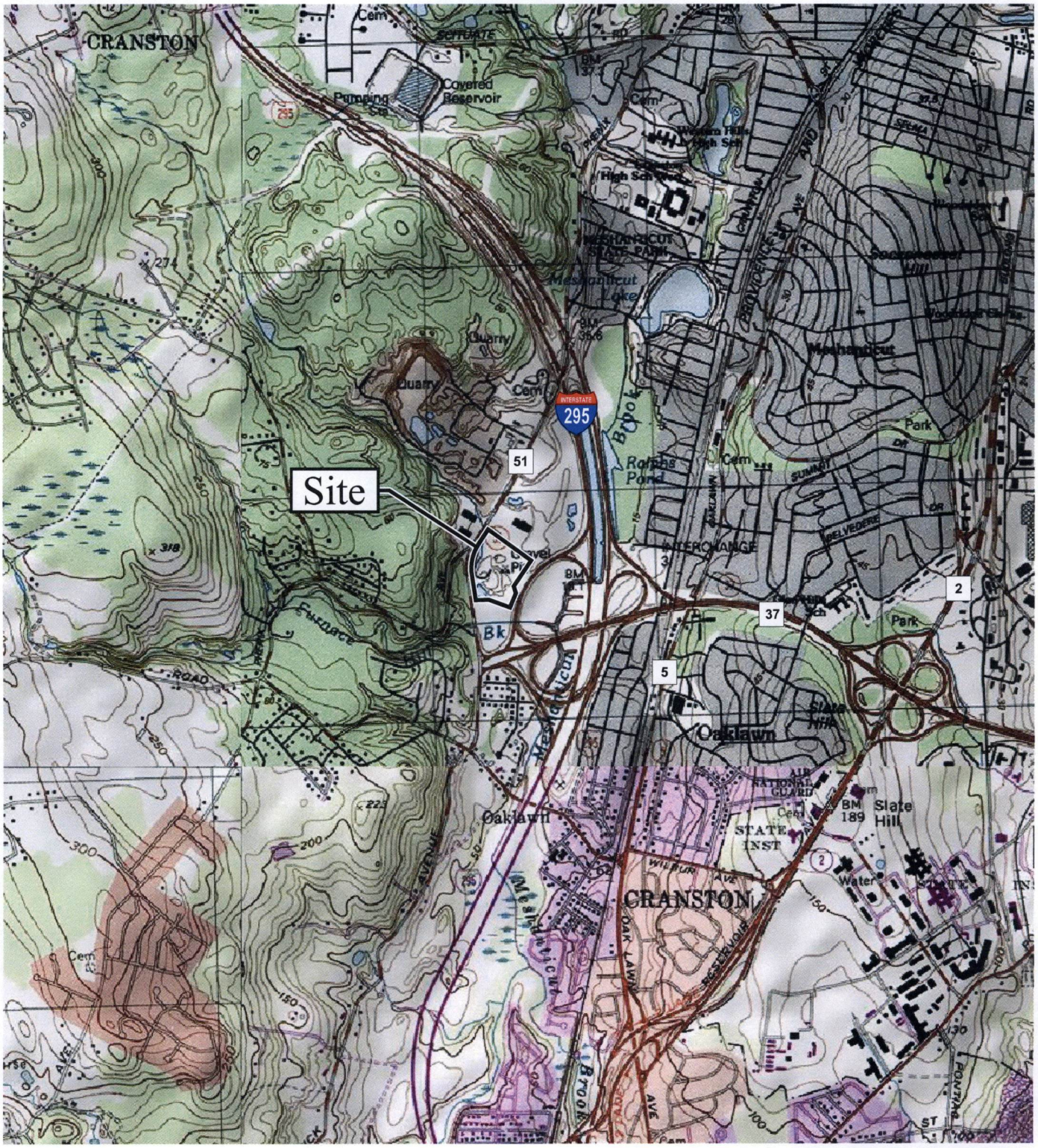


Source: USGS Quadrangles

Vanasse Hangen Brustlin, Inc.

0 1000 2000 Feet

Site Location Map
950 Phenix Avenue
Cranston, Rhode Island

Figure 1

The westerly end of Route 37 terminates at Natick Avenue at a signalized intersection. Route 37 provides regional highway access to I-295, Route 2, I-95 and Route 1 for traffic on Natick Avenue.

Phenix Avenue (Route 51) is a two-lane major arterial roadway that has a predominantly north-south orientation. Near the Site, the roadway has an east-west orientation west of Natick Avenue and a north-south orientation north of the Site driveway. Land use along the roadway, west of Natick Avenue, is primarily residential. North of the Site driveway, land use is primarily commercial.

Wilbur Avenue is a two-lane local roadway that connects Phenix Avenue (Route 51) in the west to Oaklawn Avenue (Route 5) in the east. Land use along the roadway is primarily residential along with some institutional uses.

Study Area Intersections

Natick Avenue and Phenix Avenue (Route 51) intersect to form a three-way fully actuated signalized intersection. The Natick Avenue northbound approach consists of an exclusive left-turn lane and a through lane. The Phenix Avenue southbound approach consists of one shared through/right-turn lane. The eastbound Phenix Avenue approach consists of an exclusive left-turn lane and an exclusive right-turn lane. The northbound approach operates with leading protected left-turn signal phasing. Sidewalks are provided on both sides of Natick Avenue and Phenix Avenue. Signalized pedestrian crosswalks are provided across the westerly and northerly legs of the intersection.

Natick Avenue and Route 37 intersect to form a four-way fully actuated signalized intersection. Natick Avenue northbound consists of a shared left-turn/through lane and an exclusive right-turn lane under yield control. The Natick Avenue southbound approach consists of an exclusive left-turn lane and a shared through/right-turn lane. Route 37 westbound consists of a left-turn/through lane and an exclusive right-turn lane under yield control. A narrow residential driveway forms the eastbound, fourth leg of the intersection. The eastbound approach consists of a shared left-turn/through/right-turn lane. This residential driveway has negligible traffic; therefore, the intersection operates and has been analyzed as a "T" intersection. Sidewalks exist on both side of Natick Avenue. Unsignalized crosswalks exist across the Route 37 approach of the intersection.

Natick Avenue and Wilbur Avenue intersect to form a four-way fully actuated signalized intersection. The Natick Avenue northbound approach consists of a shared left-turn/through/right-turn lane. The Natick Avenue southbound approach consists of an exclusive left-turn lane and a shared through/right-turn lane. The Wilbur Avenue eastbound and westbound approaches consist of a shared left-turn/through/right-turn lane. A sidewalk exists on the easterly side of Natick Avenue and the northerly side of Wilbur Avenue, in the northeasterly corner of the intersection. No crosswalks are provided at this intersection.

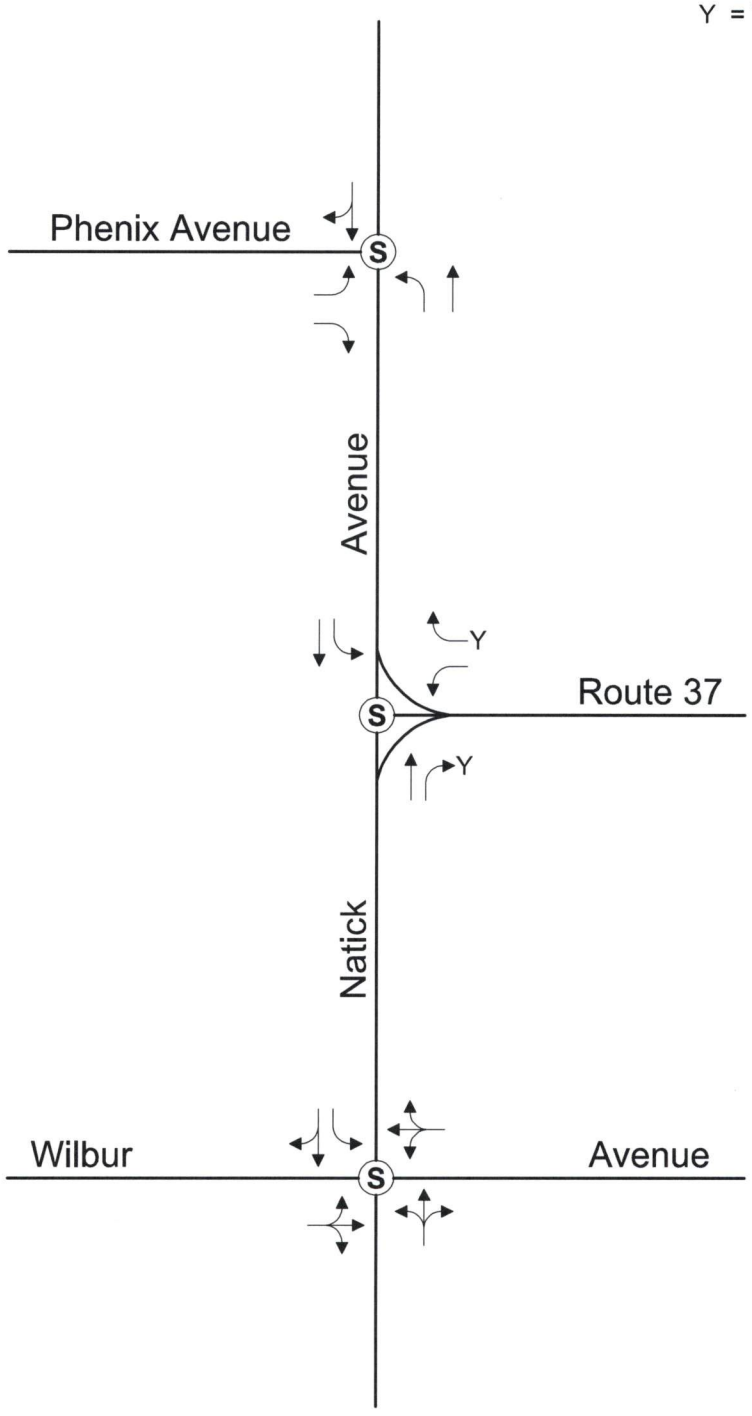
Traffic Volumes

To assess existing traffic conditions of the area roadway network, peak hour turning movement and classification (TMC) counts were conducted at the study area intersections on Tuesday, March 22, 2011 from 7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM, to generally coincide with the expected peak times of the Project. The 2011 existing weekday morning and evening peak hour traffic volume networks are summarized in Figure 3.

FUTURE CONDITIONS

No-Build Traffic Volumes

To assess future traffic conditions without the Project (i.e., the *No-Build* condition), existing traffic volumes were projected to a 5-year planning horizon. These traffic volumes are based on traffic growth likely to be experienced in the area which is driven by the expected land development, economic activity, and changes in population demographics.



Not To Scale

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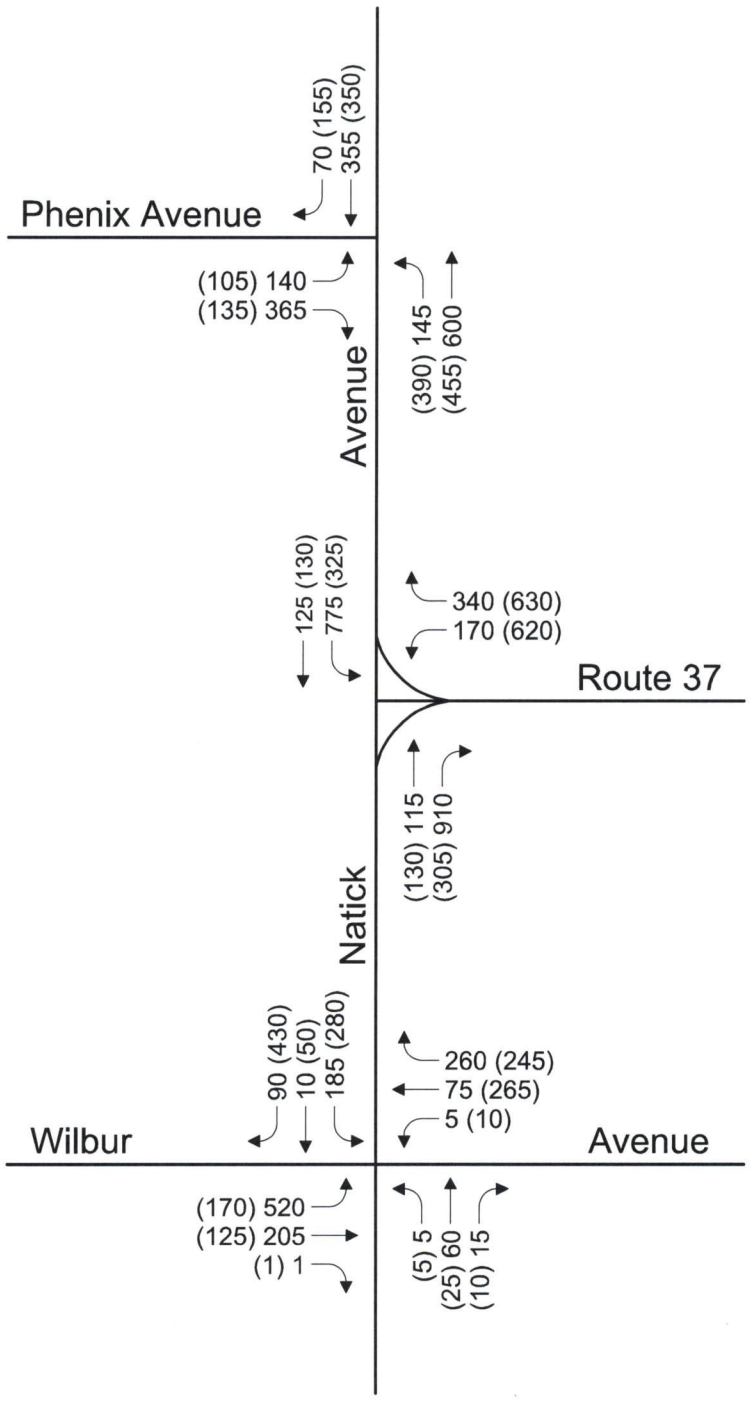
Existing Lane Utilization/Traffic Control
950 Phenix Avenue
Cranston, Rhode Island

Figure 2

Weekday Morning
(#) Weekday Evening



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2011 Existing Conditions
Peak Hour Traffic Volumes
950 Phenix Avenue
Cranston, Rhode Island

Figure 3

A review of historic data published by the Rhode Island Department of Transportation (RIDOT) suggest that daily traffic volumes in the area have generally remained the same or decreased slightly over recent years. However, to provide a conservative analysis and to account for traffic from any currently unknown minor development projects in the area, a 0.5 percent per year background growth rate was utilized for the 2016 No-Build analysis. Based on feedback from planning staff at the City of Cranston, there are no known significant projects in the area that would have an impact on traffic flow within the study area.

It should be noted that at the time of performing traffic counts for the Project, a culvert construction project was underway on the southerly portion of Natick Avenue, south of Wilbur Avenue. It is possible that the traffic volume on the southerly leg of Natick Avenue could have been influenced by detours associated with the culvert construction. The culvert project was completed and traffic flow on Natick Avenue was restored to its normal condition during the second half of 2011. To compensate for the effect of the culvert related detours in the existing conditions analysis, traffic volumes were adjusted based on discussions with the City Traffic Engineer.

Figure 4 shows the 2016 No-Build peak hour traffic volume network based on the application of a nominal background traffic growth rate and adjusting the traffic volume on the westerly leg of Wilbur Avenue and the southerly leg of Natick Avenue to compensate for the detours associated with the culvert closure.

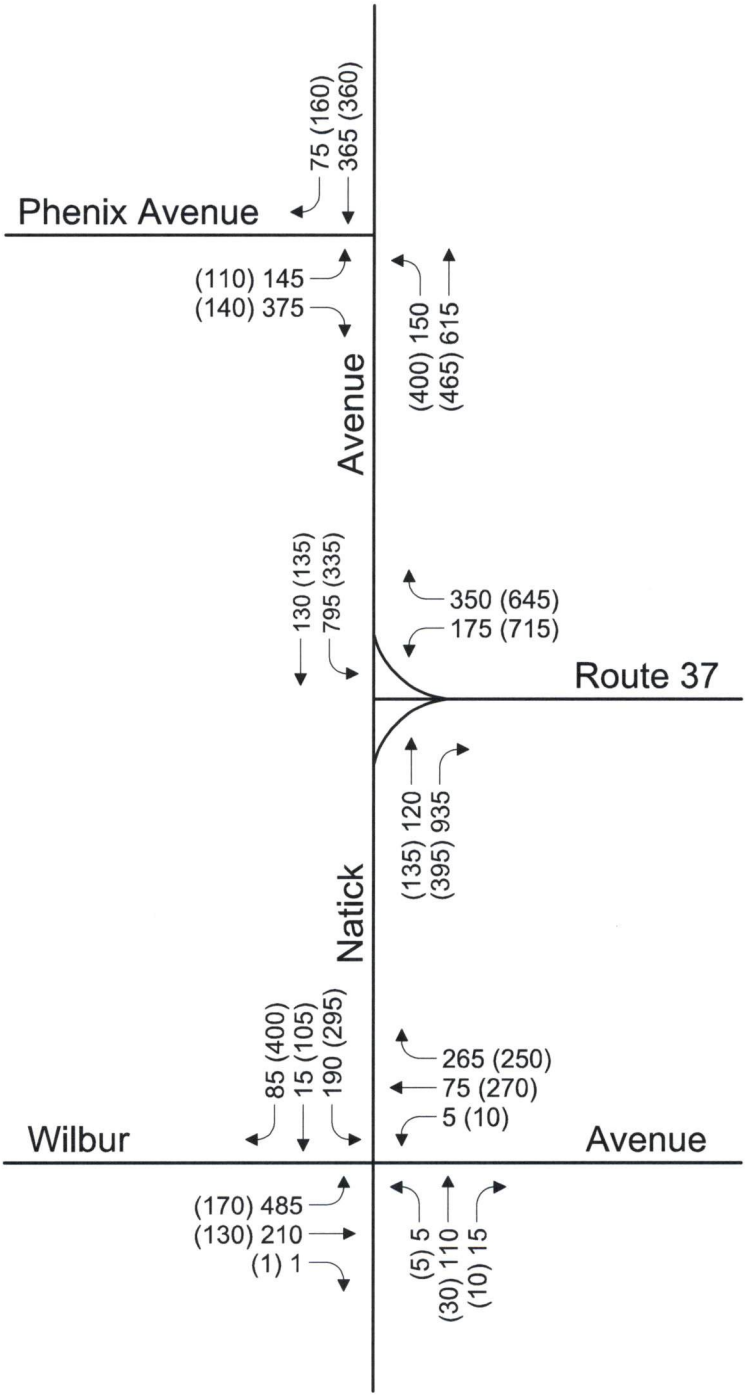
Trip Generation

To estimate the volume of traffic generated by the Project, traffic projections were derived from trip generation rates published in the Institute of Transportation Engineers (ITE) *Trip Generation*[1]. ITE trip generation information for Apartments (land use code [LUC] 220) was used to calculate weekday morning and evening peak hour estimates for the 192-unit residential component of the Project.

The specific mix of the uses/tenants of the 7,200 sf commercial component of the Project has not yet been finalized at this time. Therefore, for traffic analysis purposes, VHB developed two sets of trip generation estimates for the commercial component. In the first scenario for the commercial development, VHB assumed trip rates based on ITE Specialty Retail (LUC 814). For the second analysis scenario, VHB assumed a combination of coffee/donut shop with drive through window (LUC 937), a bank without drive through window (LUC 911), limited Specialty Retail (LUC 814) and general office space (LUC 710). The two sets of calculations can be viewed as the upper and lower end range of trip generation volumes that can be expected for the commercial space, with the actual trip generation lying somewhere in between the two scenarios, depending on the actual mix of tenants that would occupy the space. Table 1 summarizes the calculations based on the gross trip estimates for the commercial component of the Project (without any adjustment for pass-by trips).

[1] Trip Generation, 8th Edition, Institute of Transportation Engineers, Washington, D.C. (2008)

Weekday Morning
(#) Weekday Evening



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2016 No-Build Conditions
Peak Hour Traffic Volumes
950 Phenix Avenue
Cranston, Rhode Island

Figure 4

As shown in Table 1, assuming the lower end of trip generation rates for the commercial use, the Project is estimated to generate approximately 110 gross vehicles per hour (vph) (25 entering and 85 exiting) during the morning peak hour and 145 vph (90 entering and 55 exiting) during the evening peak hour. Assuming a more aggressive combination of tenants in the commercial space (Scenario 2), the Project is estimated to generate approximately 270 gross vehicles per hour (vph) (110 entering and 160 exiting) during the morning peak hour and 210 vph (120 entering and 90 exiting) during the evening peak hour. It should be noted that both estimates are of gross vehicle trips, before adjusting for pass-by trips. Pass-by trips represent vehicular trips to/from the commercial development that can be expected to be drawn from the existing vehicular volume on Natick Avenue/Phenix Avenue. The net effect of pass-by trips is a reduction in the volume of *new* vehicular trips generated by the Project. Pass-by trip calculations are presented in the next section.

To present a conservative (worst-case) evaluation of traffic impacts, all detailed analyses in the remainder of this document were performed based on assuming Scenario 2 commercial development on the site.

Table 1: Trip Generation Summary (Gross Trips' Calculation)

Time Period/ Movement	192 Apartments[1]	Scenario 1 - Commercial Use [2]	Scenario 2 - Commercial Use [3]	Total Gross Trips – Scenario 1	Total Gross Trips – Scenario 2
Morning Peak[4]					
Enter	20	5	90	25	110
Exit	80	5	80	85	160
Total	100	10	170	110	270
Evening Peak[4]					
Enter	80	10	40	90	120
Exit	45	10	45	55	90
Total	125	20	85	145	210

Source: Trip Generation, 8th Edition; Institute of Transportation Engineers (ITE); Washington, D.C. (2008)

1. Based on 192 apartment units and using ITE LUC 220 (apartments)
2. Based on 7,200 sf commercial use and LUC 814 (Specialty Retail)
3. Based on 1,500 sf coffee/donut shop w/ drive thru (LUC 937); 1,000 sf walk-in bank (LUC 911), 2,500 sf, specialty retail (LUC 814) and 2.200 sf general office tenant (LUC 710)
4. Traffic volumes expressed in trips per hour

As noted earlier, an important and well documented characteristic of retail developments is that a large percentage of traffic generated by them is drawn from the traffic stream passing the site, and is not *new* traffic on the roadway. *Pass-by* trips are defined as site-generated vehicle trips that are travelling on the roadways adjacent to the site independent of the proposed development. As motorists travel past the site on their way to another primary destination, they stop at the site. After making a purchase, they return to the road system to complete their journey. ITE indicates that during the weekday morning and evening peak hours between 45 and 47 percent of a fast-food restaurant's business (such as the coffee/donut shop in Scenario 2) consists of pass-by traffic. An additional 24 to 27 percent of a site's total business also consists of diverted link trips during these same peak hours, respectively. These are trips to the site that require a diversion from a main roadway to another roadway with access to the site. This results in less than 30 percent of the total peak hour traffic generated by the site being new vehicle traffic on the local roadway system. Therefore, for analysis purposes, VHB has assumed that 25 percent of the trips that could be generated by the coffee/donut shop in Scenario 2 will be new trips. Similarly, VHB assumed that 47 percent of the traffic generated by the walk-in bank and 25 percent of the traffic generated by the small specialty retail component in Scenario 2 are comprised of pass-by and diverted link trips. Table 2 below summarizes the calculations of *new* trips associated with the Project (assuming Scenario 2 commercial development), after applying the pass-by trip adjustments.

Table 2: Trip Generation Summary (Net New Trips' Calculation)

Time Period/ Movement	192 Apartments[1]	Commercial Use Gross Trips [2]	Pass-by Trips [3]	Net New Trips[4]
Morning Peak[5]				
Enter	20	90	65	45
Exit	80	80	65	95
Total	100	170	130	140
Evening Peak[5]				
Enter	80	40	30	90
Exit	45	45	30	60
Total	125	85	60	150

Source: VHB calculations

1. From Table 1
2. From Table 1
3. Pass-by adjustments based on 75% for coffee/donut shop, 47% for the walk-in bank and 25% for the specialty retail
4. Net New Trips = Residential Trips + Gross Commercial Trips – Pass-by Commercial Trips
5. Traffic volumes expressed in trips per hour

Trip Distribution

The directional distribution of site-generated traffic approaching and departing the site is a function of population densities, existing travel patterns, competing retail opportunities, and the efficiency of the existing roadway system to carry the new traffic. For the purposes of this study, the distribution of traffic was estimated based on the existing traffic patterns within the project limits.

Build Traffic Volumes

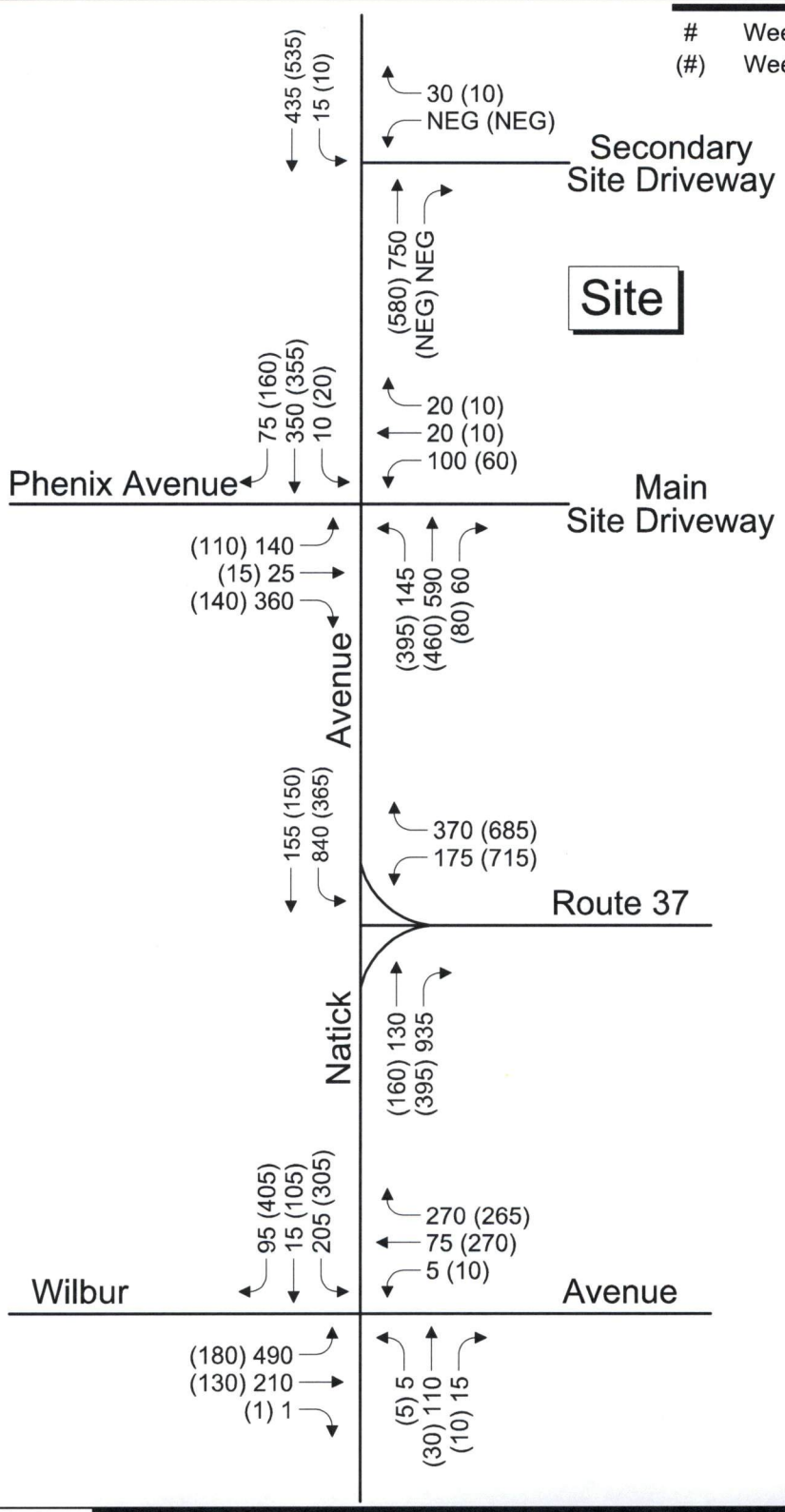
Site-generated new traffic was added to the 2016 No-Build peak hour traffic volumes and to develop the 2016 Build weekday morning and weekday evening peak hour traffic volumes shown in Figure 5.

TRAFFIC OPERATIONS ANALYSIS

The amount of new traffic projected to be generated by the Project is expected to have an insignificant impact on traffic operations. In order to quantify the impacts to traffic, VHB has prepared the following section of this memorandum to describe the quality of the traffic flows at the study intersections given the existing and projected travel demands. As a basis for this assessment, capacity analyses were conducted for the Existing, No-Build, and future Build conditions. The analyses were conducted using procedures contained in the 2000 Highway Capacity Manual[2]. A discussion of the evaluation criteria and summary of the results of the analyses is presented below.

Level of Service (LOS) is a term used to describe the different operating conditions that occur on a given roadway or intersection under various traffic volume loads. It is a qualitative measure of the effect of a number of factors including roadway geometrics, travel delay, and freedom to maneuver. Six levels of service are defined for each type of facility. Levels of service are given letter designations from A to F, with LOS A representing the best operating conditions and LOS F representing the worst. The level of service designation is reported differently for signalized and unsignalized intersections. For signalized intersections, the analysis considers the operation of all traffic entering the intersection and the level of service designation represents the overall traffic operating conditions at the intersection.

[2] Highway Capacity Manual; Transportation Research Board, Washington, D.C. (2000).



Not To Scale

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2016 Build Conditions
Peak Hour Traffic Volumes
950 Phenix Avenue
Cranston, Rhode Island

Figure 5

Capacity Analysis Results

Signalized capacity analyses for the intersections of Natick Avenue/Phenix Avenue, Natick Avenue/Route 37, and Natick Avenue/Wilbur Avenue are summarized in Table 3 and the analysis worksheets are included in the attachment to this document.

As shown, some of the movements at the study locations are congested under the existing and No-Build conditions. However, since the estimated trip generation for the Project is relatively small when compared to the existing traffic volumes in the area, the analysis shows that adding the site generated traffic to the study area would not substantially affect intersection operations at the three study intersections under the 2016 Build conditions.

Table 3: Signalized Intersection Capacity Analysis Summary

	Existing			2016 No-Build			2016 Build			2016 Build with Site Mitigations		
Location	V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS
Natick Avenue at Phenix Avenue												
Weekday Morning	0.58	12.3	B	0.60	12.6	B	0.69	15.2	B	0.70	14.4	B
Weekday Evening	0.66	14.2	B[4]	0.68	15.4	B[4]	0.68	15.9	B	0.65	13.1	B
Natick Avenue at Route 37												
Weekday Morning	0.81	33.2	C	0.88	39.4	D[5]	0.87	41.1	D[5]	0.89	33.0	C
Weekday Evening	0.78	22.9	C	0.87	26.4	C[6]	0.91	31.7	C[6]	0.91	30.4	C
Natick Avenue at Wilbur Avenue [9]												
Weekday Morning	0.75	14.8	B[7]	0.76	17.0	B[7]	0.78	17.4	B[7]	0.79	17.4	B
Weekday Evening	0.72	12.6	B[8]	0.68	14.3	B[8]	0.70	14.8	B[8]	0.70	15.0	B

Source: Synchro 7 software using the procedures in the 2000 Highway Capacity Manual. Compiled by VHB.

1 V/C = Volume to capacity ratio
2 Delay = Vehicle delay expressed in seconds per vehicle
3 LOS = Level of service
4 Natick Avenue northbound left-turn queues extends beyond the existing storage lane
5 Both the Natick Avenue northbound right-turn and southbound left-turn queues extend beyond the existing storage lanes
6 Southbound left-turn queues extend beyond the existing storage lanes
7 The 95th percentile queue on Wilbur Avenue eastbound approach extends beyond 407 feet.
8 Natick Avenue southbound left-turn queue extends beyond the existing storage lane
9 Traffic volumes have been redistributed under the No-Build and Build conditions to account for culvert construction work on Natick Avenue, south of Wilbur Avenue

PROPOSED IMPROVEMENTS

As stated previously the projected traffic generated by the proposed development is not expected to have a significant impact on traffic at the study area intersections. Nonetheless, in order to improve the existing deficiencies in the area, the Proponent proposes to implement the following off-site traffic improvements. Figures 6 and 7 conceptually depict the scope of the improvements outlined below.

- Widen the eastbound Phenix Avenue approach to the Phenix Avenue/Natick Avenue intersection to provide a longer right-turn lane;
- Restripe the Phenix Avenue/Natick Avenue southbound approach to provide a right-turn lane;
- Restripe Natick Avenue between Route 37 and Phenix Avenue to provide longer left-turn lanes on the northbound approach to Phenix Avenue and southbound approach to Route 37;
- Restripe Natick Avenue to provide two lanes for a longer length on the northbound approach to Route 37 and southbound approach to Wilbur Avenue; and
- Optimize the traffic signal timings at the study area intersections.

Figure 6

Proposed Striping Improvements on
Natick Avenue (Sheet 1 of 2)
950 Phenix Avenue
Cranston, Rhode Island

Figure 7

Proposed Striping Improvements on
Natick Avenue (Sheet 2 of 2)
950 Phenix Avenue
Cranston, Rhode Island