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Memorandum

To: Mr. Patrick Burns
Expansion Project Manager
City Market
82 S Winooski Ave
Burlington, VT 05401

Date: April 29, 2016

Project #: 57843.00

From: David Saladino, PE, AICP
Director, Transportation Engineering &
Nick Sanders, PE
Senior Traffic Engineer

Re: Proposed City Market/Onion River Co-op (South End)
Traffic Impact Study
Flynn Avenue - Burlington, VT

VHB has completed a traffic impact study (TIS) for the proposed City Market/Onion River Co-op grocery store to be located on the southwest corner of Flynn Avenue and Briggs Street in Burlington, Vermont. The site, which currently consists of several buildings including Upstairs Antiques, Evergreen Roofing, and rail transload facilities, has numerous full access/egress points on both Flynn Avenue and Briggs Street.

The proposed redevelopment program consists of demolishing the existing structures and constructing a 23,700± square foot City Market grocery store. The scope of work for this evaluation is generally limited to Flynn Avenue and Briggs Street in the vicinity of the site and includes the intersections of Pine Street at Flynn Avenue, Briggs Street at Flynn Avenue, and the proposed site driveways. This memorandum includes the following:

- A description of the existing roadway network in the vicinity of the site;
- A summary of the crash data within the study area;
- A description of the proposed development program;
- A trip generation estimate for the proposed development program;
- A description of the traffic volume network development;
- An evaluation of traffic operations within the study area; and
- Conclusions and recommendations to support the project.

EXISTING CONDITIONS

The site is located on the southwest corner of Flynn Avenue and Briggs Street in the South End of Burlington, Vermont. Three full access/egress cub cuts are located on Flynn Avenue and three additional full access/egress driveways are located on Briggs Street. The location of the site in relation to the local roadway network is shown in **Figure 1**.

Flynn Avenue and Briggs Street are both straight and level in the vicinity of the site and provide adequate sight lines. Specifically, Flynn Avenue provides a clear line of sight over 800 feet west of the site driveway and over 500 feet east of the site driveway. Briggs Street provides a clear line of sight to and from Flynn Avenue (approximately 375 feet north of the site driveway) and to and from Morse Place (approximately 675 feet south of the site driveway). These sight lines on Flynn Avenue and Briggs Street exceed the American Association of State and Highway Transportation Officials (AASHTO) recommended guidelines for stopping sight distance (SSD) of 155 feet and intersection sight distance (ISD) of 280 feet (for a 25 mph roadway).

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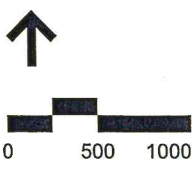

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Figure 1
Site Location Map

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Flynn Avenue is a two-lane roadway (one lane in each direction) that provides an east-west connection between US 7 (Shelburne Road) to the east and Oakledge Park on Lake Champlain to the west. The posted speed limit along Flynn Avenue is 25 miles per hour (mph). A sidewalk is provided along the northern side of Flynn Avenue between Pine Street and Oakledge Park. On the south side of Flynn Avenue a sidewalk is provided between the site (just east of Briggs Street) and US 7. Land uses along Flynn Avenue are a mix of commercial, light industrial, and residential.

Pine Street is a two lane roadway (one travel lane in each direction) that provides a north-south connection between Downtown Burlington and Queen City Park Road in Burlington's South End. Sidewalks are provided along both sides of Pine Street. Pine Street accommodates cyclists with "bike route" and "share the road" signage along the northbound travel lane and a bike lane adjacent to the southbound travel lane (north of Flynn Avenue). A sheltered bus stop is located on the west side of Pine Street just north of Flynn Avenue with regularly scheduled service provided by Chittenden County Transit Authority (CCTA). Land use along Pine Street is a mix of commercial and residential. The posted speed limit along Pine Street is 30 mph.

Flynn Avenue and Pine Street intersect to form a 4-way signalized intersection. Flynn Avenue provides a single multi-use lane in both the eastbound and westbound directions. Pine Street provides a left-turn lane and a shared through/right lane in the southbound direction and a single multi-use lane in the northbound direction. Pedestrians are accommodated with crosswalks on all four intersection approaches and concurrent pedestrian phases.

Briggs Street and an offset commercial driveway for 208 Flynn Avenue intersect Flynn Avenue from the south and north respectively to form a 4-way unsignalized intersection. Flynn Avenue provides a single multi-use lane in both the eastbound and westbound directions. Briggs Street and the commercial driveway operate as the minor street approaches (although there are currently no stop signs) with single multi-use lanes in both the northbound and southbound directions. The north side of Flynn Avenue has both head-in angled parking and parallel parking spaces.

CRASH SUMMARY

A review of VTrans' most recent High Crash Location (HCL) Report (2010 – 2014) revealed that no intersections or roadway segments within the project study area were classified as a HCL by VTrans. Additional crash data provided by VTrans were compiled and evaluated within the project study area. The detailed crash data covers the most recent 5-year period available: January 1, 2010 through December 31, 2014. The primary study area intersection is summarized below and the detailed VTrans crash summaries are included in the Appendix.

The intersection of Pine Street at Flynn Avenue experienced 39 crashes over the 5-year period for an average of 8 crashes per year. Of these 39 crashes, 10 (26%) were broadside crashes, 8 (21%) were rear-end crashes, 5 (13%) were right-turns with through movement crashes, 5 (13%) were same direction sideswipe crashes, 4 (10%) were opposite direction sideswipe crashes, 1 (3%) was a head on crash, and 6 (15%) crashes were classified as other or unknown. One of the crashes reported during this 5-year resulted in a fatality and 4 crashes resulted in injury.

Only one crash was reported at the intersection of Flynn Avenue at Briggs Street during the 5-year period. This crash was caused by a motorist failing to yield the right-of-way and resulted in property damage only.

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DEVELOPMENT PROGRAM

The site is located on the southwest corner of Flynn Avenue and Briggs Street in the South End of Burlington, Vermont. The proposed redevelopment program consists of demolishing the existing structures and constructing a 23,700± square foot City Market grocery store. Primary access and egress is proposed on Briggs Street approximately 375 feet south of Flynn Avenue. Secondary access, which is primarily intended for truck deliveries, is proposed on Flynn Avenue approximately 225 feet west of Briggs Street. The proposed layout of the project is shown in **Figure 2**.

TRIP GENERATION

Trip generation estimates for the proposed City Market grocery store were calculated using rates published by the Institute of Transportation Engineers (ITE) Trip Generation[1] (Land Use Code 850 – Supermarket) for the weekday evening peak hour as that period reflects the peak periods for both the proposed grocery store and the surrounding street network. It should be noted that the ITE average rate is slightly higher than Vermont-specific trip generation rate published by ITE in the June 2012 ITE Journal. Using the more conservative national ITE average rates, the proposed development is expected to generate approximately 225 trips (115 entering and 110 exiting) during the weekday evening peak hour. City Market anticipates the store generating approximately 30 truck delivery trips per week, with the majority of the deliveries occurring between 6:00 AM and 10:00 AM. These truck trips are incorporated into the trip generation estimates provided below.

Table 1 summarizes the trip generation estimates for the proposed development. Calculations supporting the proposed trip generation estimates for the project are provided in the Appendix.

TABLE 1: TRIP GENERATION SUMMARY

	Proposed City Market Grocery Store – Site Generated Trips				
Peak Period	Total	Non-Auto *(Walk/Bike/Transit)*	Pass-By *(Briggs St/Flynn Ave)*	Diverted *(Pine St/US 7)*	New
Weekday PM Peak Hour (vph)	*100%*	*20%*	*10%*	*35%*	*35%*
Enter	115	25	10	40	40
Exit	110	20	10	40	40
Total	225	45	20	80	80

vph = vehicles per hour.

Non-Auto trips are based on "Food Shopping in the Urban Environment: Parking Supply, Destination Choice and Mode Choice", (TRB 2011 Annual Meeting, Maley and Weinberger).

Pass-by and Diverted trip percentages are based on "Trip Generation Handbook" by ITE.

[1] Trip Generation 9th Edition, Institute of Transportation Engineers, Washington D.C., 2012.

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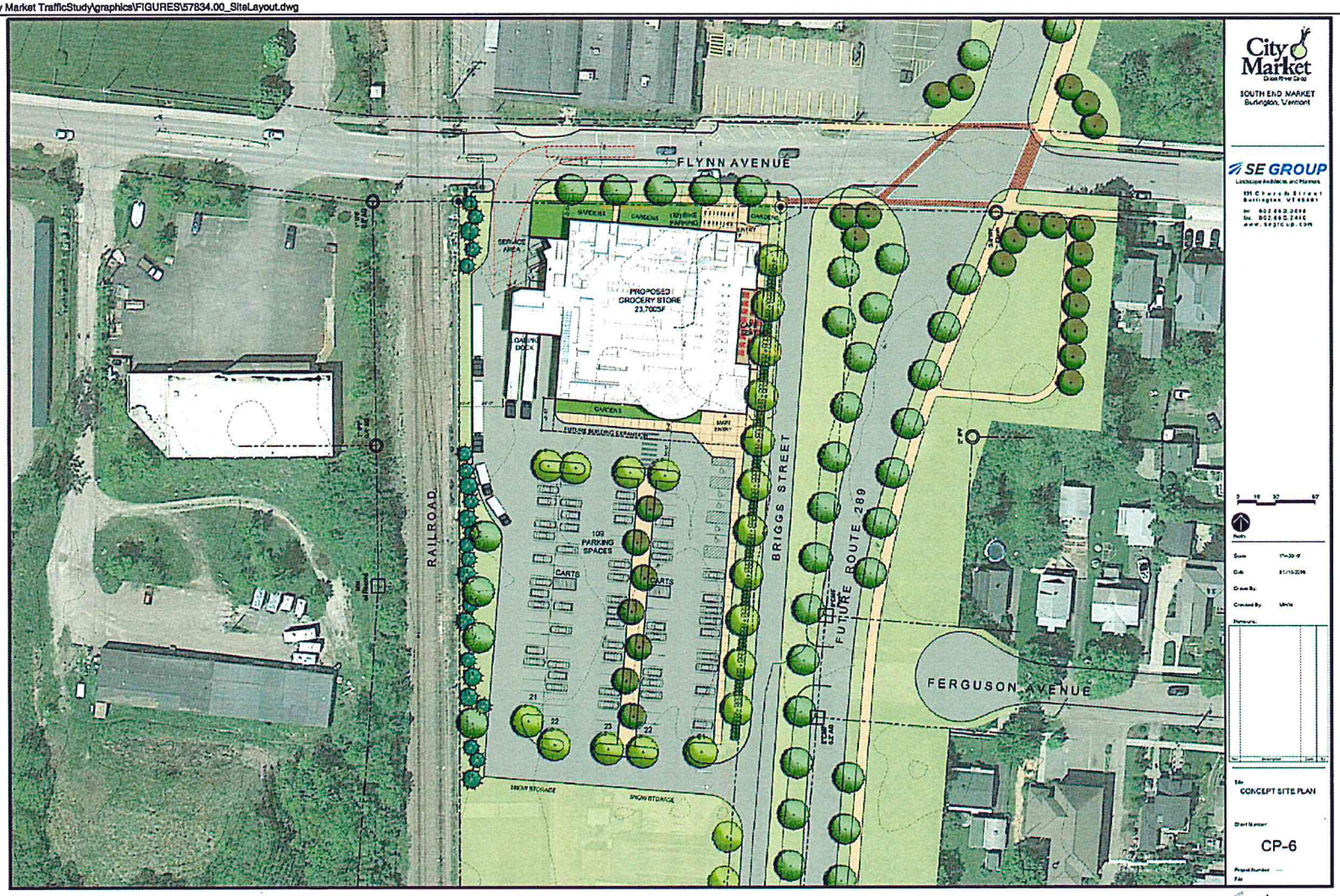

Figure 2
Site Layout Plan

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The trip generation estimate includes the effects of the following four specific trip types:

1) Non-automobile trips are trips that do not utilize a personal automobile, such as walkers, bicyclists, and transit users.
2) Pass-by trips are those that are already on the adjacent streets (i.e. Flynn Avenue) and are drawn to the site from the passing traffic stream.
3) Diverted trips are those that are drawn from nearby roadways (e.g. Pine Street or US7) that are not directly adjacent to the site.
4) New trips are defined as trips whose primary origin or destination is the proposed development.

The amount of pass-by and diverted traffic for the project was determined based on rates published by the ITE in the Trip Generation Handbook[2]. Non-automobile trips were estimated from data published in "*Food Shopping in the Urban Environment: Parking Supply, Destination Choice and Mode Choice*" (TRB 2011 Annual Meeting, Maley and Weinberger).

As a further trip reduction measure, City Market does not offer onsite employee parking and offers free bus passes (up to the cost of a monthly unlimited pass) to encourage employees to use other modes of transportation to commute to and from work. In addition, City Market reimburses employees up to $240 per year for bike commuting expenses. Despite these additional employee trip reduction measures taken by City Market, no further reduction in automobile trips was applied during the traffic analysis to provide a conservative evaluation.

No reduction in background traffic was made to account for the elimination of the existing site-generated uses, including the Barrett Trucking salt-related trips, making the traffic assessment that follows even more conservative.

TRAFFIC NETWORKS

Turning movement traffic counts collected by the Chittenden County Regional Planning Commission (CCRPC) at Pine Street and Flynn Avenue in June of 2014 and by VHB at Flynn Avenue and Briggs Street in January of 2016 during the weekday evening peak period were used as the basis for this evaluation. To evaluate the impact of the proposed development within the study area, the 2014 and 2016 peak hour traffic volumes counts were projected to the opening year (2017) of the development and a 5-year forecast horizon (2022). Copies of the traffic volume count data are provided in the Appendix.

Seasonal Variation

Since it is impractical to design for the highest volume encountered during the year, VTrans guidelines recommend a compromise between capacity and cost. Design Hourly Volume (DHV) criteria allow roads to be designed for the 30th highest hourly volume of the year. Historical data from the closest, most comparable VTrans continuous count stations located on VT 127 in Burlington (P6D001), US 7 in Colchester (P6D040), and US 2 in Williston (P6D061) were

[2] Trip Generation Handbook, 2nd Edition - Institute of Transportation Engineers, Washington D.C., 2004.

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reviewed to establish an appropriate DHV condition. The majority of the 30th highest hours at these three count stations occurred during the weekday evening peak hours, indicating that a weekday evening DHV condition is appropriate. As such, a 1.05, and 1.23 DHV adjustment was applied to the June and January weekday evening peak hour data, respectively. Detailed calculations for the DHV adjustments are provided in the Appendix.

Background Growth

Traffic growth is a function of expected land development in the region. To predict a rate at which traffic can be expected to grow during the forecast period, historical traffic growth was examined. The regression analysis for the urban highway group prepared by VTrans suggests that regional short term traffic growth will be approximately flat (i.e. 0 percent annually). Discussions with the City of Burlington planning staff revealed that there were not any other significant developments in the area that would affect traffic volumes. Therefore, it was concluded that an average annual growth rate of 0.75 percent would provide a conservative assessment of traffic growth in the proximate area for this evaluation. VTrans regression analysis is provided in the Appendix.

No Build and Build Traffic Networks

The 2017 and 2022 No Build traffic volumes were developed by applying the average annual growth rate of 0.75 percent per year to the 2014 and 2016 DHV adjusted peak hour traffic volumes. The 2017 and 2022 No Build weekday evening peak hour volumes are shown in **Figures 3-4**.

The directional distribution of site-generated traffic was approximated based on existing travel patterns within the project study area. The distribution of new site-generated traffic is shown in the Appendix. Pass-by and diverted trip distributions were based on existing traffic flows on the adjacent roadway system. Based on the expected trip distribution, the site-generated trips were added to the 2017 and 2022 No Build peak hour traffic volumes to establish the 2017 and 2022 Build networks. It should be noted that no reduction of traffic was taken for the existing uses on site to provide a conservative evaluation for the Build condition. The Build networks are shown in **Figures 5-6**. Figures illustrating the assignment of project-related traffic on study area roadways are provided in the Appendix.

At the request of the City of Burlington, the 2022 forecast year condition was also evaluated with the Champlain Parkway in place. Traffic volume projections from the Southern Connector /Champlain Parkway MEGC-M5000(1) study prepared by CHA were used to identify the forecast traffic volumes with the Parkway in place. The 2022 No Build and Build forecast year condition traffic volume networks with the Champlain Parkway in place are shown in **Figures 7-8**.

TRAFFIC ANALYSES

Intersection capacity analyses were performed for the study area intersections. Levels of service (LOS) were calculated based on the criteria published in the 2000 Highway Capacity Manual[3]. Level of service is the term that defines the conditions that may occur on a given roadway or at an intersection when accommodating various traffic volume loads.

[3] Highway Capacity Manual, Federal Highway Administration, Transportation Research Board, 2000.

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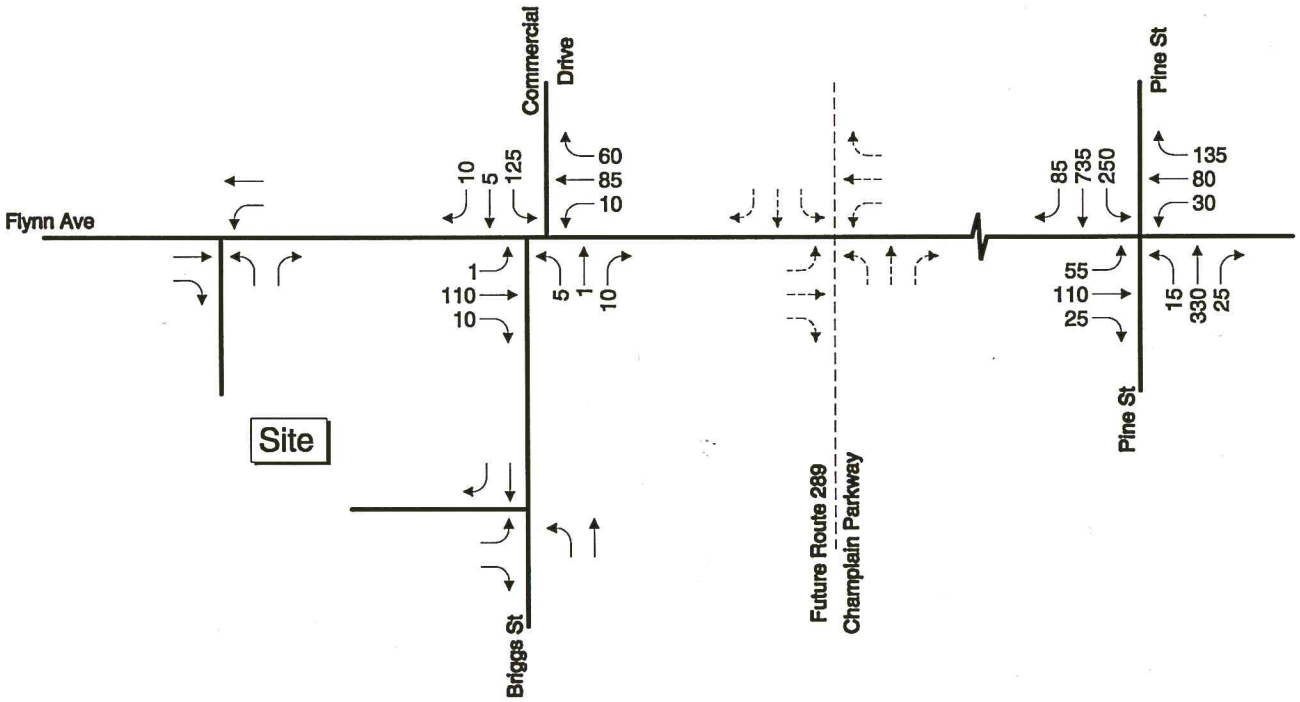

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Figure 3
2017 No Build Weekday Evening
Peak Hour Traffic Volumes

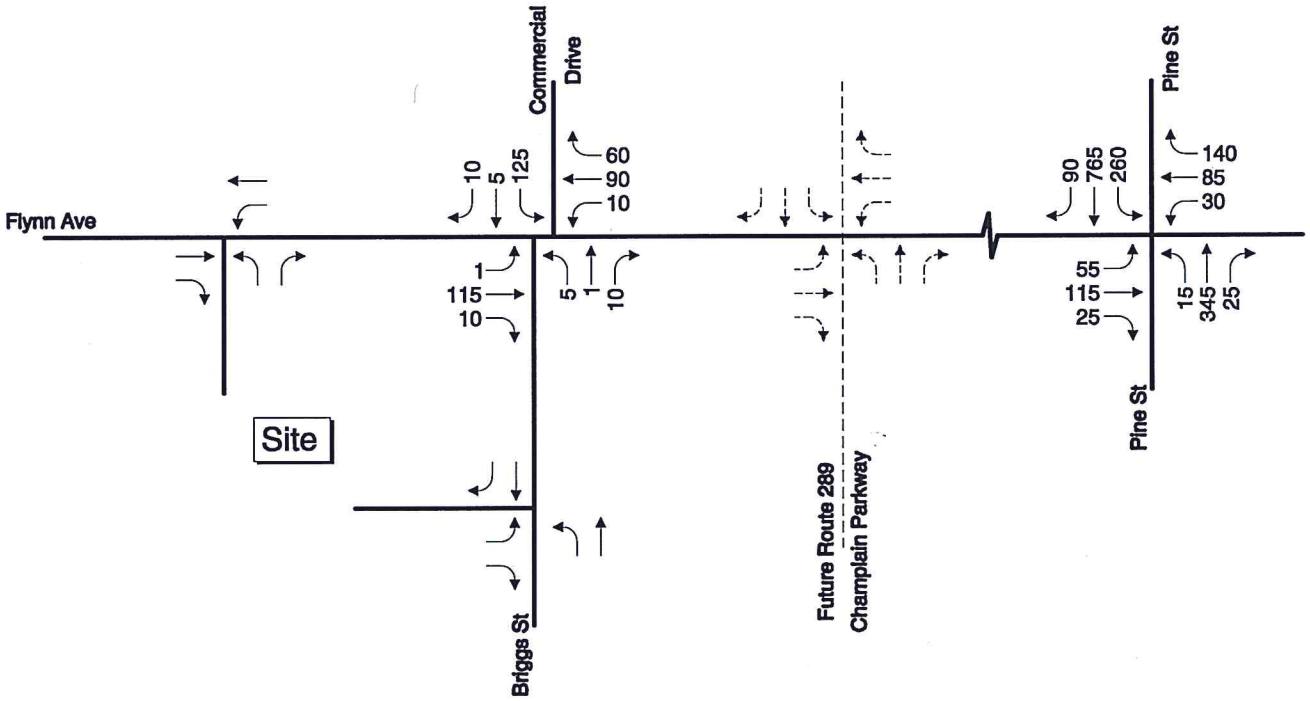

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Figure 4
2022 No Build Weekday Evening
Peak Hour Traffic Volumes

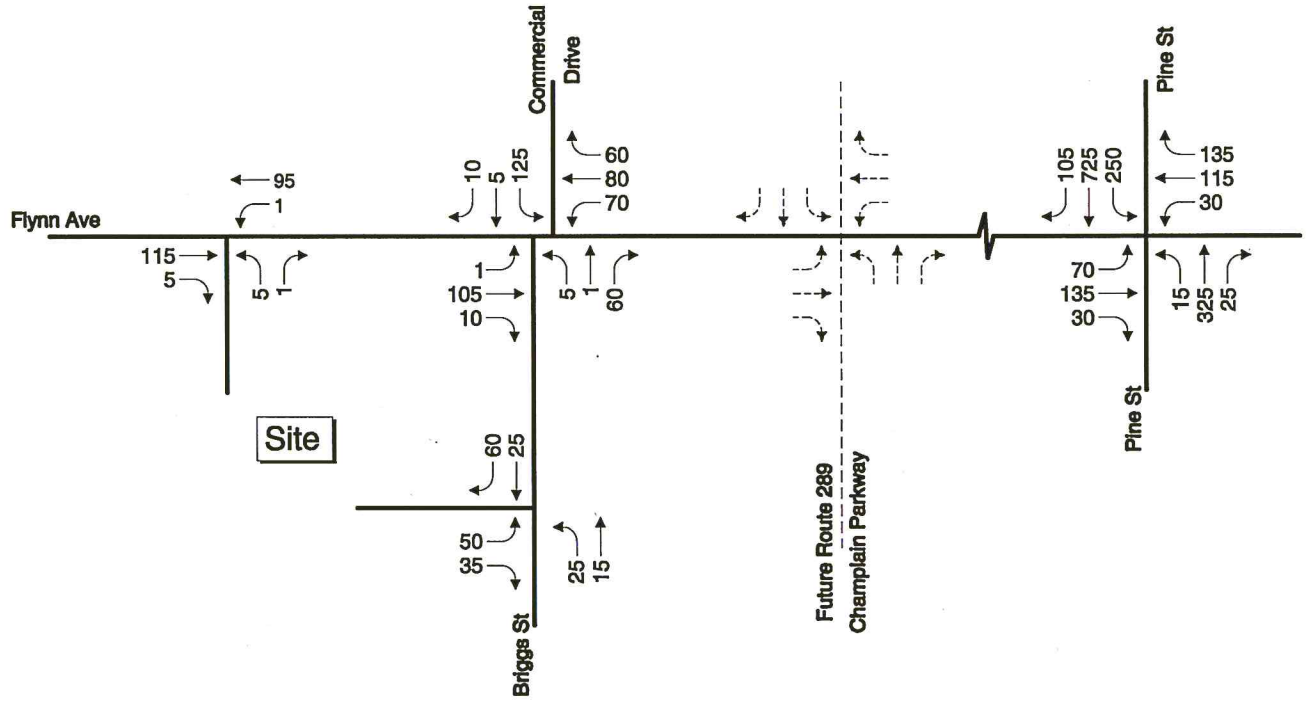

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Figure 5
2017 Build Weekday Evening
Peak Hour Traffic Volumes

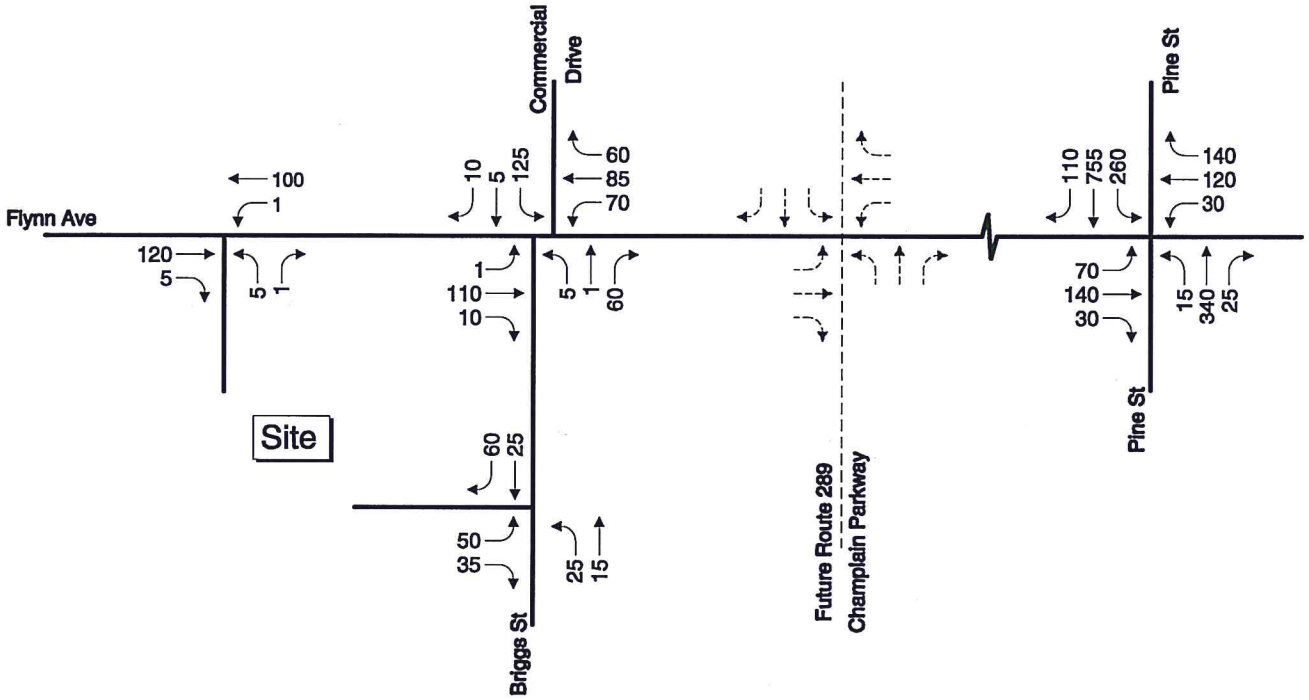

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Figure 6
2022 Build Weekday Evening
Peak Hour Traffic Volumes

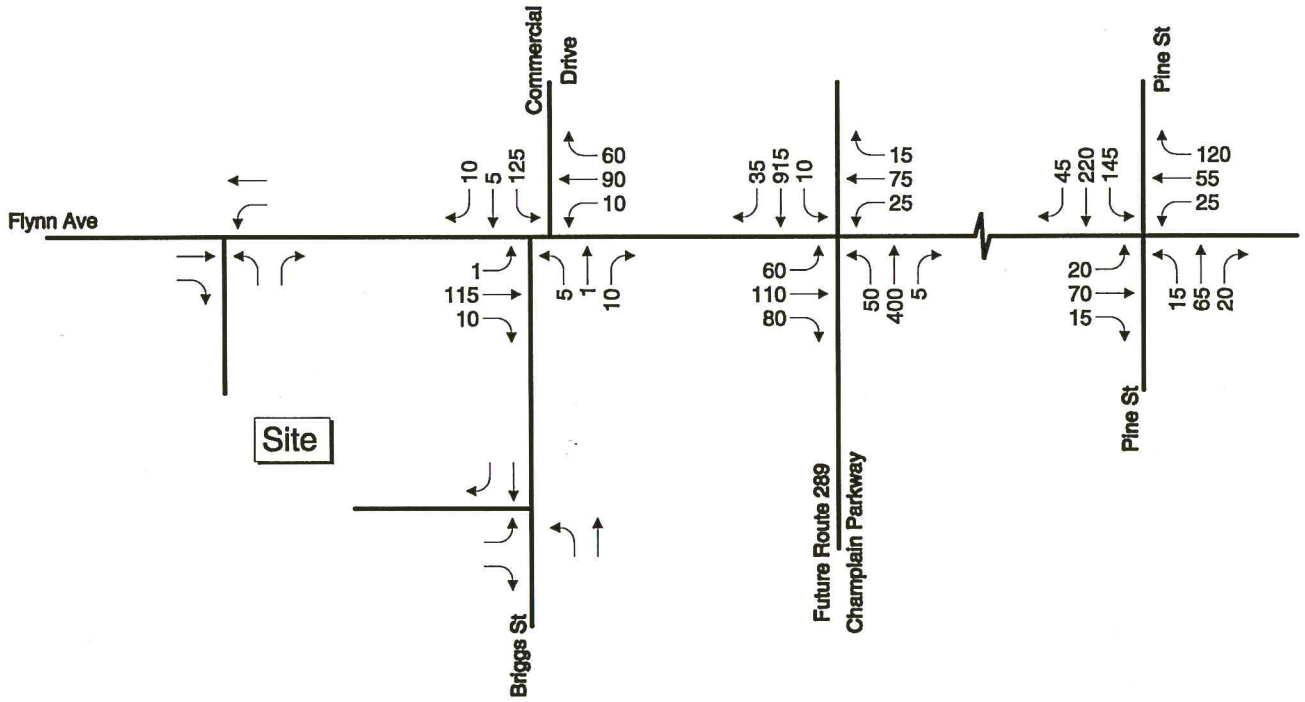

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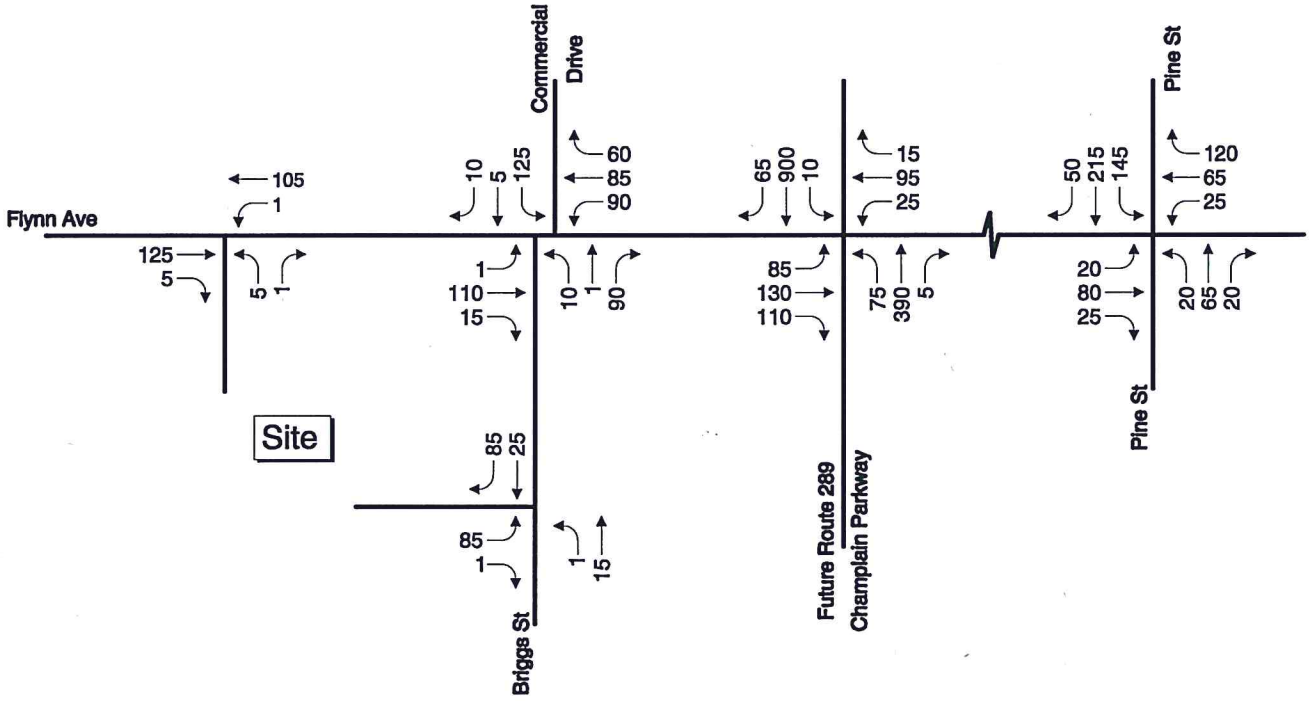
Figure 7
2022 No Build Weekday Evening
With Champlain Parkway
Peak Hour Traffic Volumes



Not to Scale

Figure 8
2022 Build Weekday Evening
With Champlain Parkway
Peak Hour Traffic Volumes

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Levels of service range from A to F with LOS A representing the best vehicular operating conditions and LOS F representing the most congested. Copies of the level of service calculations have been provided in the Appendix.

Table 2 summarizes the operational analysis at the *signalized* study area intersections. As shown, the intersection of Flynn Avenue at Pine Street is expected to operate at LOS B with or without the proposed project. Increases in delay at the intersection resulting from the project will be relatively small (2 – 3 seconds).

Traffic volumes are expected to be diverted from Pine Street to the Champlain Parkway once complete. As a result, the intersection of Flynn Avenue at Pine Street is expected to operate at LOS A with or without the proposed development with the Champlain Parkway in place. The new intersection of Flynn Avenue at the Champlain Parkway is expected to operate at LOS D under No Build conditions and at LOS E conditions with the addition of the proposed development.

TABLE 2: SIGNALIZED INTERSECTION CAPACITY ANALYSIS SUMMARY

		No Build PM			Build PM		
Location	Year *(Condition)*	v/c*	Delay**	LOS***	v/c	Delay	LOS
Flynn Ave at Pine St	2017	0.83	13	B	0.89	15	B
	2022 *(w/o Parkway)*	0.85	13	B	0.92	16	B
	2022 *(w/ Parkway)*	0.34	9	A	0.36	9	A
Flynn Ave at Champlain PKWY	2022 *(w/ Parkway)*	0.90	45	D	0.98	65	E

** Volume to capacity ratio.*

*** Delay expressed in seconds per vehicle.*

**** Level of service.*

w/ Parkway – Evaluation includes the Champlain Parkway (2 Lane Alternative).

Table 3 summarizes the operational analysis at the *unsignalized* study area intersections. All movements at the intersection of Flynn Avenue at Briggs Street and the 208 Flynn Avenue commercial driveway (to the north) are expected to operate at LOS B or better through the 2022 forecast year with or without the proposed development. With the Champlain Parkway in place, the southbound approach from the 208 Flynn Avenue driveway is expected to operate at LOS C and the northbound approach from Briggs Street is expected to operate at LOS B in the forecast 2022 Build condition. Both proposed site driveways are expected to operate at LOS A through the 2022 forecast year condition with or without the Champlain Parkway.

It should be noted that the capacity analysis results for the Champlain Parkway condition do not fully account for the proximity of the proposed signal on Flynn Avenue at the Champlain Parkway. Potential queuing on Flynn Avenue generated by the Champlain Parkway signal would impact the ability for vehicles to enter Flynn Avenue from Briggs Street or the 208 Flynn Avenue driveway. In particular, access from the 208 Flynn Avenue driveway will be significantly impacted by the proposed signal, given the lack of separation between the driveway and the signal's eastbound stop bar. This condition is attributable to the geometric design of the Flynn Avenue and Champlain Parkway intersection, not to City Market.

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TABLE 3: UNSIGNALIZED INTERSECTION CAPACITY ANALYSIS SUMMARY

Location / Movement	2017 No Build PM			2017 Build PM		
	Demand*	Delay^	LOS+	Demand	Delay	LOS
Briggs St at Flynn Ave						
NB movements from Briggs St	15	10	A	65	10	A
SB movements from 208 Flynn Ave	140	12	B	140	15	B
Flynn Ave at Site driveway						
NB movements from Site	-	-	-	5	10	A
Briggs St at Site driveway						
EB movements from Site	-	-	-	85	9	A

Location / Movement	2022 No Build PM *(w/o PKWY)*			2022 Build PM *(w/o PKWY)*		
	Demand	Delay	LOS	Demand	Delay	LOS
Briggs St at Flynn Ave						
NB movements from Briggs St	15	10	A	65	10	A
SB movements from 208 Flynn Ave	140	12	B	140	15	B
Flynn Ave at Site driveway						
NB movements from Site	-	-	-	5	10	A
Briggs St at Site driveway						
EB movements from Site	-	-	-	85	9	A

Location / Movement	2022 No Build PM *(w/ PKWY)*			2022 Build PM *(w/ PKWY)*		
	Demand	Delay	LOS	Demand	Delay	LOS
Briggs St at Flynn Ave						
NB movements from Briggs St	15	10	A	100	10	A
SB movements from 208 Flynn Ave	140	12	B	140	17	C
Flynn Ave at Site driveway						
NB movements from Site	-	-	-	5	10	A
Briggs St at Site driveway						
EB movements from Site	-	-	-	85	9	A

* Demand in vehicles per hour.
^ Delay in seconds per vehicle.
\+ Level of service.
w/ PKWY – Evaluation includes the Champlain Parkway (2 Lane Alternative).

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CONCLUSIONS

The proposed redevelopment program consists of demolishing the existing structures on site and constructing a 23,700± square foot City Market grocery store. The trip generation estimates indicated that the proposed development will generate approximately 225 trips (115 entering and 110 exiting) during the weekday evening peak hour. However, only 35% of the site generated traffic is expected to be new vehicular trips, when taking into account non-automobile trips (such as walkers, bicyclists, and transit users), pass-by trips and diverted trips. As such, only 80 *new* vehicular trips (40 entering and 40 exiting) are expected on the adjacent roadway system during the evening peak hour as a result of the proposed development.

Primary access and egress is proposed on Briggs Street approximately 375 feet south of Flynn Avenue and secondary access (primarily intended for truck deliveries) is proposed on Flynn Avenue approximately 225 feet west of Briggs Street. Sight lines at the proposed site driveways exceed AASHTO's recommended guidelines. All movements at the site driveway intersections of Flynn Avenue and Briggs Street are expected to operate at LOS A through the 2022 forecast Build condition with or without the Champlain Parkway.

Prior to the construction of the Champlain Parkway, the site driveways and study area intersections are projected to operate acceptably under both the No Build and Build scenarios. However, given neighbor concerns over increased traffic on adjacent streets, City Market should continue to work collaboratively with the neighbors and Burlington's Department of Public Works staff to identify potential options to address neighbors' concerns about increased traffic prior to the construction of the Champlain Parkway – including opportunities to create interim dead-end streets on Ferguson Avenue, Lyman Avenue, and Morse Place.

Following the construction of the Champlain Parkway, the newly created intersection at Flynn Avenue is expected to operate at LOS E conditions with the addition of the City Market store. Within the context of an urban setting, LOS E conditions are fairly common during the peak hour – and is the operating level projected for this intersection in the Champlain Parkway's *Supporting Traffic Analyses*.

In an effort to further minimize vehicular traffic on the adjacent roadway system and promote public transportation, the City Market is working with CCTA to modify the existing Route 5 bus route to service the site via Pine Street and Flynn Avenue. To further promote multimodal transportation to and from the proposed development, City Market proposes to construct a sidewalk along the southern side of Flynn Avenue adjacent to the site and provide on-site covered bicycle parking for both employees and customers.

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